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Evaluating the effects of increasing mathematics graduation requirements: A survey of the effects of state policy change in Illinois

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EVALUATING THE EFFECTS OF INCREASING MATHEMATICS GRADUATION
REQUIREMENTS: A SURVEY OF THE EFFECTS OF
STATE POLICY CHANGE IN ILLINOIS

An Abstract of a Dissertation

Submitted

in Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

Approved:

Dr. Robert Decker, Committee Chair

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December 2013

ABSTRACT

In the summer of 2005, Illinois lawmakers made the decision to elevate the graduation standards for students, joining an increasing number of states who decided current requirements in their state were insufficient. This legislation affected aspects of English, science, and mathematics. The most significant change resulted in the increase of mathematics study from two years of mandatory study to three years in order to graduate. Any district that did not already require students to take three years had to decide how to react to this new requirement. This quantitative research study was designed to examine what effects this change had on mid-sized Illinois high schools. The research focused on how the graduation requirement change affected the curriculum, graduation rates, and enrollment in upper-level classes. Principals, curriculum directors, and division chairs provided their responses and options to a questionnaire that asked about various aspects of the graduation change. The effect on schools were compiled and analyzed. In preparation for the change, a majority of schools adapted their curriculum by adding courses to the catalogue, predominantly with upper-level classes taken after a student completes geometry. Special Education classes, vocationally-oriented mathematics classes, integrated algebra and geometry classes, and supportive interventions were also added to accommodate the needs of students. Despite curriculum modifications, on-line credit recovery programs, and class-specific interventions, graduation rates within the sample, as well as across all schools in Illinois, declined sharply during this period of transition. While the graduation rate decline cannot be

solely attributed to the requirement change, the overlap of these events is cause for concern. Enrollment in upper-level mathematics classes overwhelmingly rose during this transition period from two required years to three years. Results indicate that Illinois students have a wide variety of classes available to them, and students are more persistent in their study of mathematics than prior to the graduation requirement change. This study will be useful to policy makers considering the potential pros and cons of such a graduation change in mathematics as well as to school administrators trying to discover how to adapt to such a graduation requirement change.

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Doctor of Education

Approved:

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DEDICATION

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CHAPTER 1

INTRODUCTION

On August 24, 2005, the Illinois State Legislature enacted Senate Bill 575, which raised high school graduation requirements for all Illinois public high school students commencing with ninth grade students who graduated in the spring of 2009 and continuing each year thereafter. Included in this law were changes to the state graduation requirements for science, mathematics, and English. For each discipline affected, the rationale for increased requirements centered on the need to intensify the rigor in which Illinois' public high schools prepared their students not only for graduation, but also for the expectations of the workplace.

The bill unanimously and rapidly sailed through both the Senate and House of Representatives with bi-partisan support. Then Governor Rod Blagojevich hailed the bill as necessary, since mathematics skills were so critical in today's high-tech workplace. The Illinois Government News Network (2005) captured Blagojevich's thoughts when he said, "I know that the senators share my same desire to see our students performing at their highest level and prepared for wherever life might take them after they leave our public schools."

Raising the number of years studied in core disciplines to complete graduation requirements was neither a new phenomenon in Illinois, nor anywhere else in the United States. As noted in "Policy Matters" by the American Association of State Colleges and Universities (2006), raising graduation requirements is a common method used to increase the expectations for high school graduates.

The specific details of this policy change created multiple considerations for Illinois school districts. Science requirements were raised from one required year to two years of science study. High schools had to certify that at least two years of English preparation for graduation was considered “writing intensive” in conjunction with four completed years of study in English. The most publicized and discussed policy change, however, was in mathematics—increasing from two years of study to a required third year. Additionally, the change specified that the three-year requirement must include both algebra and one course covering concepts of geometry.

For most high schools in Illinois, English and science graduation requirement expansions were not that unsettling; the state’s new requirements seemed to be “catching up” to what many local school districts previously enacted independently in these two areas. However, the mathematics changes were a little different, since many districts did not yet require three years of study to graduate. While requiring a third year of study that included algebra and geometry was not a revolutionary concept, not every district had already accepted this practice. Depending on the size and background of the district, this policy change was either relatively simple or presented many challenges. Regardless of the context and situation within each district, consideration of how to implement this curriculum enhancement was needed—this was now the law of the state, and some schools had more to plan for than others.

As with many state law changes, the result was a complex change both at the school and the district levels. Districts had to ask themselves many questions. How would they tackle such items as staffing, new course offerings, professional development,

curriculum, needs of both Special Education and English Language Learners, logistics of explaining the change to students and parents, and the effects on graduation rates, just to name a few. Despite these concerns, the perceived benefits of increased comprehensive preparedness of Illinois' students for the demands of the 21st century workforce outweighed any concerns, and the bill became law. It was time for districts to ensure that these policy changes were implemented.

Research Rationale

From a state policy standpoint, it is quite challenging to create a meaningful impact on student academic achievement. Aside from creating state exit examinations for graduates, adding more required years of study to a particular discipline is a common response from law makers as to how states or districts can attempt to improve achievement.

Designing the perfect mixture of requirements for students of a state or school district is a challenging task to complete. The proper "recipe" for what creates graduates who are post-secondary ready is indisputably based on opinion laden with value judgments and will inevitably affect a student's overall educational commitment as well as multiple undefined aspects of the total school experience. Decisions about graduation requirements can be politically motivated; thus, reaching consensus regarding what is most beneficial for students becomes overwhelming.

There seems to be an on-going conversation about the difficulty of the curriculum experienced by American students. This debate is not limited to just educators. It is likely that principals, superintendents, and school board members in Illinois would be

eager to know the results of a survey conducted to identify what effects Illinois' attempt to address the issue of post-secondary preparedness among the state's students had on school districts.

Purpose and Research Questions

Increasing graduation requirements has had a fundamental impact on high schools; this examination of the effects of Senate Bill 575 revealed valuable information about how schools in Illinois have adjusted to this change. There were multiple aspects of the change that dramatically affected schools. Three of the most important were curriculum, graduation rate, and number of upper-level mathematics courses taken within each school.

Identifying the effects on these three areas of a high school graduate's experience is tremendously worthwhile. A great deal of effort was made in school districts across Illinois to implement the mathematics graduation requirements prescribed for Illinois in Senate Bill 575. This study examined the effect at the school level. Analysis of any complex change of this scale is a worthy endeavor. This research examined the benefits and challenges experienced in selected schools as a result of this policy change.

The effect that this state policy change had at the school level is an important consideration for policy-makers, local school boards, superintendents, and anyone in a position to implement enhanced mathematics graduation requirements. The research focused on the effects of these changes at the school level where the effects were most visible. Also assessed was the impact this policy change created in schools to determine

whether or not the effect matched the intended benefits of the legislators who adopted this bill in the hopes of improving education in Illinois.

This study examined three research questions:

1. What are the effects, if any, on the mathematics curriculum with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?
2. What are the effects, if any, on graduation rate with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?
3. What are the effects, if any, on enrollment in upper-level mathematics courses such as Algebra II and above, with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?

Narrowing the focus of the research to curriculum, graduation rate, and enrollment in upper-level mathematics courses was not meant to indicate in any way that the effects of this policy change was limited to just these three areas. These areas were chosen because they received a tremendous amount of attention when discussing benefits and concerns of graduation changes. Schools were affected in many ways by the addition of one more year of mathematics study for all students.

It should also be noted that the state's change in requirements in mathematics may have already been in place in individual districts prior to the state's decision.

Acknowledgment that the impact of this change may not have been very noticeable for

some districts who already asked their students to complete three years of mathematics study should be made.

Definition of Terms

The described research questions for this dissertation will rely on the use of three important educational terms. These terms will be the focus of the effect of the Illinois mathematics graduation policy change.

Mathematics Curriculum—The mathematics curriculum is the specific, identified content that has been determined for implementation inside the classroom by the school, district, or state for any mathematically-related course. For the purposes of this study, distinctions will neither be measured nor be made between the intended curriculum and the attained curriculum of what is actually taught or learned. Marzano (2003) identifies the curriculum as the broadest and most theoretical expression of what will be taught to students who have enrolled in a particular course. He refers to what is supposed to be taught as the intended curriculum, an expression not used in this study. Cuban (1993) explains the curriculum as a “map” of theories, intentions, details, or evidence of a list of topics to be taught that would create a “teacher-proof” curriculum. The curriculum may also be referred to in educational research as the “overt,” “explicit,” or “written” curriculum.

Graduation rate—The process used in Illinois by the Illinois State Board of Education (Illinois State Board of Education, 2009) uses to identify students who may be calculated as achieving graduation and, thus, the graduation rate is determined by the following definition: “Only includes students who graduate with a regular high school

diploma in four years or less as a high school graduate in the original cohort—that is, the cohort with which he or she started 9th grade.” The state also provides multiple explanations and definitions for ambiguous terms that affect graduation rates, especially regarding transfers and special education students in specialized programs. For this study, the State of Illinois’ definition of graduation rate will be used.

Upper-Level Mathematics courses—By using the provided language of the state’s graduation policy detailing what is required of all students in mathematics, Algebra I and a class containing geometrical concepts, it is obvious that the state has identified any mathematics course past geometry as an “upper-level” mathematics course. In reality, it is a subjective argument as to when a mathematics course earns the title of “upper-level.” For this study, this operational definition is the most useful, since the research measured the outcome that this state policy change had on the students of Illinois. Any course past geometry was considered an “upper-level” class, i.e. Algebra II, Pre-Calculus, Statistics, Calculus, etc.

Data Gathering Method

This quantitative study examined the experiences of schools throughout the state of Illinois. To assess the experiences of schools and the effects of this change on their curriculum, graduation rate, and enrollment in upper-level mathematics courses, a survey was made to gather information. The survey was designed to isolate aspects of those three critical areas to draw comparisons for analysis. Information was gathered using a popular and commonly used electronic tool: Survey Monkey. The invitation to participate in the survey was limited to a designated population of schools in Illinois and

was extended to principals or designees for a response through U.S. mail, email, and personal contact via the telephone.

Assumptions

It was assumed by the researcher that all Illinois high schools and school districts complied with fidelity to the state graduation policy change. There was very little direct oversight to such matters, but it had to be assumed that every school district ensured that each of its students completed three years of mathematics including Algebra I and concepts of geometry before being allowed to graduate in accordance with state law.

Limitations

There were some limitations for this study. First, this research focused on a specific range of schools in Illinois limited by the school's size. There were many other schools, both larger and smaller, that experienced similar or different experiences depending on unique circumstances that were not reported in this research study. Secondly, there were undoubtedly many more effects caused by this policy change than were measured by the three research questions. The research questions focused on just three crucial aspects of this policy change. Third, for reasons explained in the methodology section in Chapter 3, no Chicago Public Schools (CPS) were included in the sample. Finally, the effects of the graduation change were examined in the area of mathematics.

The researcher urges the reader to be cautious with regard to assumptions made from this study due to the stated limitations of the study.

CHAPTER 2

REVIEW OF LITERATURE

In 2005, Illinois joined the growing number of states who decided to change state graduation requirements for all students. Whether you see the decision made by Illinois state legislators positively, as a method to improve, or cynically, as succumbing to political pressure, the reality is that the decision had a dramatic impact on schools, teachers, school counselors, administrators, and most importantly, the students attending public high schools in Illinois. Trepidation became prevalent among educators when considering the consequences of this legislation to multiple aspects of the high school curriculum. The goal of this study is to examine what effects the alteration of quantity of years of mathematics study had on curriculum, graduation rate, and enrollment in upper-level mathematics courses. However, to fully understand the outcomes of the graduation requirement changes on these three areas, it is also important to understand the historical context that initiated this political movement and to examine outcomes by many states across the United States already affected by this change.

Impetus to Change State Graduation Requirements

The discussion of what graduation requirements are most appropriate for American students has been going on for over 100 years. The discussion about what is best for students has always been a sort of academic “parlor game,” where opinions about what is best for students vary widely. There has never been a shortage of opinions on the subject of graduation requirements. Perhaps this is because there is a perception that graduation requirements are negotiable and easy to alter.

Mirel (2006) demonstrates that the discussion of what should be required from a high school graduate dates back to reconstruction after the Civil War. As American society has changed from agricultural, to both industrial and technological, the needs of students have undoubtedly changed and graduation requirements have naturally followed. High school students today need an entirely different education than students during the industrial revolution. The need to prepare students for the demands of the workforce in 2013 is much different than those in any other era; and so it has been for years with policy makers feeling a responsibility to adjust what is required of students so they may become ready for post-secondary success.

The impetus to change is based on many factors. One of those factors is public opinion about the nature of public education. There has long been an existing public perception that our American high schools are falling behind their global counterparts (Fulgini & Stevenson, 1995). This perception is fed through the media and is based on both fact and fiction. The perceived concern that students in South Korea, Japan, and China are outperforming American students has been present for some years and has established an understanding among many that something must be done to rectify this problem, despite scant or improperly applied data validating the problem.

There remains an abundance of reform ideas circulating among policy makers and educational leaders today, and mathematics continues to be a central part of the discussion. Since the pressure to select a method of reform that includes reading and mathematics programs is unavoidable for most districts, the actual decision becomes how to reform, not whether to reform. District leaders must decide how to increase the

likelihood of post-secondary readiness by adapting various aspects of a student's experience. Curriculum policy changes are continually made by local districts and individual states. While a state may mandate change for every district in the state, some districts may choose to expand on those requirements to suit the needs of their local context. Regardless of the genesis of the graduation requirement change, the ramifications of these policy changes dramatically affect districts, teachers, and students. While origins are easy to locate, what is not always clear is how each school implemented these mandated changes and what effects the changes had on these schools.

Within today's educational context, two basic methods for educational reform exist: change what happens internally within the classroom and/or initiate change to the larger educational system. Both internal-classroom and external-system adjustment methods will affect the educational experience of students. Correspondingly, whether a decision is made to focus on classroom methodological adaptations or system changes, there will be a culture change to a school that implemented nearly every required "scientifically, research-based educational reform." It is presumed that this type of policy change is exactly what legislators and reformists intended when No Child Left Behind (NCLB) was created.

Mathematics is a major part of the reform discussion. The methods to improve schools and their instruction within vary almost as much as the intentions of those who suggest them. Some take traditional methods such as altering the means of instruction, while others suggest that the established concept of a conventional high school is outdated and should be changed. Some suggest that learners in 2013 need more

technology in their instruction. Do charter schools create an environment more likely for innovation and better instructional methods? Would an intensive focus on mathematics and science be beneficial, despite the known benefits students acquire from exposure to the fine arts? These are but a few of the considerations that must be made by both federal and local policy makers.

While the current debate concerning how to reform continues, there is a strong consensus that has been generally accepted: the more mathematics a student takes, the higher the student performs on standardized tests of mathematics achievement (Gamoran, 1987; Hoffer, Rasinski, & Moore, 1995; Rock & Pollack, 1995). These researchers tied course-taking patterns to levels of performance on standardized tests, while allowing for differences in students' backgrounds both personally and academically. The exposure to more mathematics instruction helped students perform better on the tests, which would seem rather intuitive. The results of tests such as these established a wide base for state policy makers to stand upon as the graduation reform movement took hold in the 1980's and 1990's. Witte (1992) explains that the policy of taking additional mathematics courses is sound policy, with profound effects for students after a change such as this is made. Sebring (1987) used data from High School and Beyond and College Entrance Examination Board (CEEB) as well as from nearly 4000 students in eight states and found "recent changes in high school graduation requirements could very well lead to higher achievement."

However, the acceptance of the premise that more mathematics is undoubtedly better for students is not universally accepted. Hoffer (1997) and Chaney, Burgdorf, and

Tash (1997) encourage educators to use some caution when accepting the “more equals better” approach. Hoffer’s research suggests that raising requirements is not sufficient if raising standardized test scores is the aim. He found that students who attended schools where three years of mathematics was required scored no higher than students in schools where two years was required. Chaney et al. also examined how achievement was affected by taking more mathematics courses by analyzing data on 3,369 students in 140 schools. Their research indicated that since many students were already completing the requirements and some of the courses students took did little to affect achievement, few students were truly affected by an additional required year of mathematics to graduate.

Early Influences on Graduation Requirement Change: *A Nation at Risk*

It is doubtful that President Reagan’s National Commission on Excellence in Education could have imagined how powerful their 1983 work *A Nation at Risk: The Imperative for Educational Reform* would remain nearly three decades later. This epic landmark in educational thought and debate has influenced hundreds, if not thousands, of educational reform initiatives designed to raise the academic performance of American students. Some of the resulting changes in policy and practice have been beneficial and ultimately led to improvement, while others have proven to be poorly conceived, motivated by politics, or simply just leading only to further questions, frustrations, and general reform fatigue. Without a doubt, the history of educational policy in the United States was dramatically affected by this work.

In the years following *A Nation at Risk*, state educational policy makers, school boards, superintendents, and principals experienced varying degrees of pressure to do

something about the predicted failure of public schools. Fending off the “rising tide of mediocrity” was a win-at-all-costs game for educators. As noted by Wilson and Rossman (1993), the evocative rhetoric within the publication created a sensation that something drastic must be done quickly. Intensive evaluation of how things were done in American schools was mandatory if America was to “forcefully repair the sinking vessel” (Hawley, 1988). This was a “game” that must be played by educators, since inaction to this malaise would surely cripple America’s economic engine. The American economy must not be left to the hands of poorly trained employees allowing our economic prominence to slip. Since that time, educational leaders and policy makers have been forced to constantly analyze the merits of the emerging reform ideas. Similar to America’s reaction to Sputnik, inaction to the report was simply not an option. The reaction to *A Nation at Risk* unleashed one of the greatest flurries of educational policy changes seen to date.

Most evident to the public following the release of *A Nation at Risk* were changes to state graduation requirements. Raising required graduation credits was easy for legislators to understand and equally easy for the public to see as evidence of this new “get tough” approach to the American high school student. By requiring students to take more years of study, there would be indisputable evidence that mediocrity and slipping by would not be tolerated in states and districts. This approach was logical in the context of *A Nation at Risk* and good politics—a mixture that could hardly be stopped.

It was clear quite early after the release of *A Nation at Risk* that states began to react to the call of enhanced rigor and a more demanding level of preparation for American students. Initially, states became intensely involved in the reaction to the

professed need for curriculum enhancement, since universally it was accepted that a weak curriculum was a primary cause of this crisis. The reaction to this perceived need by state governments to enhance curriculum was a natural one, considering that states have such a substantial fiscal investment in public education. The challenging facet of the situation was that state governments face limitations in many ways because most states do not possess sufficient curricular authority to decide textbook usage or type of instruction delivery. Thus, examining and adding years to graduation requirements became a natural method to address the educational woes in those states.

Data indicates that states stepped in to address this issue and to solve the problem in an unprecedented fashion. It did not take long to see the reaction--41 of 50 states had already either enhanced, established, or in some way altered graduation requirements by 1984 (Medrich, Brown, & Henke, 1992). From 1983 to 1985, there were approximately 700 new state policies initiated for legislation (Darling-Hammond & Berry, 1988.) Thirty-nine states increased the number of Carnegie Units required for graduation in the 1980's (Wilson & Rossman, 1993). Forty-four states increased the amount of requirements to graduation or established state graduation requirements from 1983 to 2008 according to the Council of Chief State School Officers (2008). The amount of changes, while unheard of in terms of scope, tended to follow the essence of the general outline proposed in *A Nation at Risk*. The publication explicitly recommended four years of English, three years of mathematics, three years of science, three years of social studies, one-half year of computer science, and at least two years of a foreign language for those students intending to go on to college.

Despite the national clamor for action, it took some states a while to make the recommended changes to the mathematics graduation requirements. By 1993, ten years after the release of *A Nation at Work*, states averaged only 2.4 years of mathematics study to graduate, falling short of the recommended three years set forth by the governmental commission (Stevenson & Schiller, 1999).

Hoxby (2003) noted that from 1983 to 2003 all racial and ethnic groups increased the amount of courses completed in mathematics. Asian and white students went from 2.4 years of study on average to 3.4 years. The growth was even more significant for groups who initially started with lower amount of mathematics completed (Hispanics, Native Americans, African-American). To illustrate the varying rates of speed at which states adjusted graduation rates, consider Illinois' proposal in 2005 for three years of mathematics, occurring 22 years after the release of the report.

While the pace of graduation requirement change was uneven nationally, it is clear that the recommendation outlined in *A Nation at Risk* for all American students to complete three years of mathematics study considerably affected the amount of mathematics taken nationally. Ingels, Planty, and Bozick (2005) cited the Council of Chief State Officers, noting that from 1987 to 2004 the number of states requiring at least 2.5 credits in mathematics for graduation had risen from 12 to 26. During a similar time frame, the average number of credits that schools required of students increased by 1.6 years, with the bulk of the difference being in mathematics and science (Stevenson & Schiller, 1999). Thirty-seven states increased graduation requirements in the area of mathematics only from 2000 to 2008 (Stillman & Blank, 2009).

As in most states, active conversations about graduation requirements ensued in Illinois shortly after the release of *A Nation at Risk*. In 1983, State Superintendent Donald D. Gill asked his Department of Research and Statistics and Department of Planning, Research, and Evaluation to examine the issue in response to legislative proposals about enhancing graduation requirements. Superintendent Gill asked that this report be prepared to present to the State Board of Education. In this study, he asked for a comparison of Illinois to the rest of the nation as well as for a literature review of what has been discovered already about the success of increasing graduation requirements.

Dr. Louis Ferratier and Edith Helmich (1983) were the published authors of the report “An Analysis of Illinois High School Graduation Requirements.” The researchers pulled data from 702 secondary principals in Illinois to gather information and created comparisons. The researchers summarized that the proposal’s inclusion of a new graduation requirement would have a profound impact and that there were six potential effects to consider regarding the proposed bill.

1. Illinois was about average nationally in terms of what requirements were needed for graduation.
2. However, when examining the academic core subject areas independently, half to nearly 75% of states had more requirements in English, mathematics, science, and social studies than did Illinois.
3. Only two schools statewide currently had graduation requirements that met or exceeded the proposed elements of the new law. Eighteen schools had all of

the academic components in place except for the fine arts and foreign language requirements.

4. The researchers concluded that the graduation changes would be challenging to complete for all students, “even college bound students.” A potential negative impact would be the difficulty for students to take courses that matched career interests. Ferratier and Helmich (1983) also noted that requiring just one year of a foreign language is not enough to gain any notable level of fluency, if authentic communicative ability was the intended goal of requiring students to take a year of a foreign language.
5. To comply with the new policies, school districts would have to complete major adjustments to school calendar, structure of the school day, resource allocation, and adjustments to many areas of the curriculum, even those outside the proposed graduation changes.
6. It was also noted that increasing graduation rates had not shown to have any positive relationship to academic performance in their review of the literature. The authors suggested that adding graduation requirements should not be seen as a “security blanket” to comfort those who are concerned about the performance of Illinois’ students.

In addition to these observations, the study completed a full investigation of both national graduation requirements and national academic performances and compared them to Illinois’ data. In the summary, Ferratier and Helmich (1983) concluded that the quantity of requirements had “no discernable effect on achievement other than a slightly

negative tendency for mathematics test scores to decline as requirements increase (SAT).” They boldly concluded that, in reality, increasing graduation requirements would have limited value. What they concluded is the most meaningful alteration to state policy and considerably more effective, as demonstrated through research: specifically describe what students should learn through outcome statements.

There was another interesting observation from the report. The authors commented that a high school diploma means very different things from one state to the next. They concluded that due to variances in expectations, requirement differences, curriculum rigor, and implementation modifications, a high school diploma by itself will never be a reliable method to acknowledge that a student has successfully attained those skills necessary to be ready for what awaits them after graduation.

Contemporary Influences

Because state graduation requirement changes have become ubiquitous, it is a stretch to consider Illinois’, or any state’s, graduation requirement augmentation a breakthrough reform of any sort. For years since *A Nation at Risk* was released, many educational organizations have agreed with that assessment and recommended a third year of mathematics study. The call to enhance graduation requirements has not died down, but this position has continued with some important variances that still support the basic premise that more mathematics study is better for the students.

There are major names in education that recommend students take three or more years of mathematics. For example, in their publications “Benefits of Additional High School Course Work and Improved Course Performance in Preparing Students for

College” (2008) and “Benefits of a High School Core Curriculum” (2006), ACT details the benefits of taking three years of mathematics using their research of thousands of students’ scores and comparing those who took two years to three years of mathematical study. ACT’s historical examination of students who completed more years of mathematics study compared to their classmates who took less is a very convincing examination of this curricular suggestion for high school graduation requirements. ACT has some of the most comprehensive data of any educational organization; the benefits can hardly be disputed.

Further, ACT’s policy report “Courses Count: Preparing Students for Post-Secondary Success” (ACT, 2005) illustrates the serious nature of the need to more thoroughly prepare students for post-secondary readiness. Some type of remediation in mathematics, reading, or writing was needed for over one quarter of freshmen enrolling in post-secondary education. For students attending public two-year institutions, the number rises to 40% needing remediation of some type. For this and many other reasons, ACT recommends at least three years of mathematics study, including Algebra II and beyond, in their recommended core curriculum.

ACT (2007) also conducted a survey of 35,000 teachers concerning the needs of the American high school student. In addition to aligning the high school curriculum with post-secondary expectations, focusing state standards on work-readiness, defining course outcomes, establishing core requirements for high school graduation was identified as a primary need in the American secondary educational system.

The Southern Regional Educational Board (SREB), through their high school arm High Schools That Work, has also detailed the benefits of extending the amount of mathematics high school students complete. Their publication “Getting Students Ready for College and Careers: Transitional Senior Mathematics” (SREB, 2009) demonstrated how a four-year sequence of mathematics can not only increase college readiness, but also decrease the amount of remedial classes college students may be required to complete in college.

High Schools That Work has also extolled the benefits of tying career and technical studies along with mathematical studies. In their publication “Using Lessons Learned: Improving the Educational Performance of Vocational Students” (Bottoms & Presson, 2000), students who showed elevated scores in mathematics are also completing vocational course work, while, at the same time, fulfilling mathematics graduation requirements.

Achieve Inc. is a bi-partisan, non-profit, independent reform organization designed to support standard-based reform initiatives across the United States. They strive to innovate and influence further research and educational policy decisions. They have become a major influence in educational policy thought in the United States and have been very productive in publishing position papers to influence policy makers.

In 2004, they produced a work titled “Ready or Not: Creating a High School Diploma that Counts” (2004) that is commonly known as the “American Diploma Project.” In the report, the nature of the problems of American high school graduates was thoroughly explained regarding their need for remedial help in college, their

alarming low rate of degree completion, their lack of basic skills, and their weak curricular path through high school. To restore the value of an American diploma, the committee suggested that states align their outcomes and graduation requirements to real-world standards, requiring all students to take a college- and workplace-ready curriculum, revising assessment to measure to the real world and not just college needs, and bridging the gap between high schools and colleges. These goals were created to allow states in their American Diploma Project Network to evaluate themselves to determine the level of success they were achieving.

Achieve, Inc. (2008) followed the “American Diploma Project” with another publication specifically detailing a potential national path to a standard core curriculum in “Out of Many, One: Towards Rigorous Common Core Standards from the Ground Up.” Promoting the alignment of state standards to the taught curriculum was a continuation of Achieve, Inc.’s initial work about amount of study recommended in each area mentioned in the “American Diploma Project.” The report suggests that student needs in mathematics do not vary dramatically, even when factoring in the diverse directions students take after graduation. A curriculum with a rigorous amount of years of study in courses that are non-remedial and that cover topics identified as standards is the most effective path to higher achievement in mathematics. This report, written in 2008, predicted what is currently developing with the Common Core State Standards.

The 25th anniversary of the release of *A Nation at Risk* also incited discussion about the aims of this epic influence of American educational thought. In fact, a follow-up publication was released titled “*A Nation Accountable: Twenty-Five Years After a*

Nation at Risk” (U.S. Department of Education,2008). This publication was not a nostalgic review for those who missed the original work. This piece was a review of the progress in the 25 years since *A Nation at Risk* was released and what still remains to be done.

The follow-up finds some interesting notes about how things related to graduation requirements have changed in the 25 years from 1983 to 2008. It is well documented that graduation requirement deficiencies were one of the five basic highlights of the original work; in that area, four times as many students (almost 65%) were completing the recommended curriculum than there were in 1983. On a related note, the Commission, while pleased with increased graduation rates, also noted the general weakness of the provided curriculum. Many students were hiding behind lofty sounding course names, which, in effect, were offering students little academic challenge or relevance.

The silver anniversary update specifically mentions the concern about graduation rates. There is explicit mention about the urban “dropout factories,” where less than 60% of students are still enrolled four years after enrolling as a freshman. The Commission notes “distressingly, these dropout factories have much higher percentages of low-income and minority students.” The Commission commends the educational community for removing its head from the sand in regard to the malaise it was under when the first report was released in 1983 but challenges educators to continue the work of improving graduation rates, strength of curriculum and content, standard and expectations, student time dedicated to learning, teacher quality, and leadership and financial support.

Much of the recent policy reform debate was prompted by the NCLB law requiring schools not achieving Annual Yearly Progress (AYP) or attaining acceptable graduation rates to implement reform and/or face restructuring. Because academic achievement is so important, yet so complex and misunderstood, reform models are abundant for decision makers. The experts touting the viability of their program are easy to find. Educational reform programs are a massive commercial industry. Educators now consider this the “Accountability Era” due to the pressures and the demands of mandatory standardized testing on educators. The implementation of research-based reform is non-negotiable. Self-improvement in this generation is not just a good idea—it is legislated.

Research Questions

To assist the reader, the following three sections will isolate research or literature that specifically relates to the three research questions. The three research questions are:

1. What are the effects, if any, on the mathematics curriculum with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?
2. What are the effects, if any, on graduation rate with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?
3. What are the effects, if any, on enrollment in upper-level mathematics courses such as Algebra II and above, with respect to Illinois Senate Bill 575 requiring

students to successfully complete three years of mathematics in order to graduate?

Curriculum

Through its decision to change the graduation requirements in the state, Illinois decided that the curriculum was going to change, though, it was not decided how schools would comply with the requirements set forth by the state. Every high school already had a mathematics curriculum as well as its own scope and sequence. If schools already had a three-year requirement, the impact would be very small. However, for many schools who observed the state's prior requirement for graduation after completing two years of study in mathematics, things were going to change. How each school decided to address the necessary changes to the curriculum were unique and made independently in each location.

The effect upon the curriculum of schools after graduation rates were raised and how course-taking patterns would be affected was of immediate interest to researchers and educators when the reform boom was the most intense in the mid to late 1980's. One of the first comprehensive look at the effects was done by Clune, White, and Patterson (1989), who conducted over 700 interviews in 32 high schools in 24 school districts in 6 different states. Clune's analysis found that graduation requirement changes had both positive and negative effects. While students did take more academic classes, these courses were not sufficient in adequately preparing students to become post-secondary ready. In essence, the curriculum had been changed on paper, but the impact on students was minimal.

An obvious intention of Illinois' decisions to change its graduation requirements was to alter the course-taking patterns of students. Although some students in districts where a three-year mathematics requirement was already in place may not notice any change in mathematics, there were many districts whose students were impacted. Schiller and Muller (2003) used national longitudinal data to explore the relationship between course-taking patterns and changes in state graduation requirements. Through this research, a "small but statistically significant" effect was found between the course taken by students and state graduation policies.

In 2005, Achieve Inc. produced a review of the graduation requirements of students in all 50 states titled "The Expectations Gap" (Achieve, Inc., 2005). This study produced a bounty of comparative data for policy makers. Their conclusion was that state graduation requirements vary wildly and that it cannot be said with sincerity that all students in the United States learn within environments that require them to gain mastery, knowledge, and skills needed after graduation. In fact, there were still 13 states at that time where only 2 years of mathematics were required to graduate. The publication calls for an explanation as to why these expectation gaps exist and what prohibits a state from requiring students to take the college and work-preparatory curriculum in both mathematics and English, when the benefits of that enhanced curriculum are so well known.

Five years after "The Expectations Gap" was published, Achieve Inc. (2010) followed up their previous work with a related article titled, "State College and Career-Ready High School Graduation Requirements." In the study, it is noted how critical it is

for students to take challenging high school courses such as mathematics and the strong correlation between taking higher-level mathematics courses to post-secondary success. Exposure to mathematics, at least to the level of Algebra II, doubles college completion rates for white, black, and Latino students. They note that a curriculum should not only account for how many classes are taken, but, just as importantly, which courses are taken. Achieve Inc. (2006) suggests that graduation should not be defined by length of time spent within the curriculum and any of the courses required in a certain discipline, but rather requiring students to reach an established “college-ready” standard that will more adequately represent a level of competency needed for college and career. At the time of the publication, 21 of the 50 states had established state graduation requirements that ensured students would have exposure within the high school curriculum to a level necessary to prepare a student for the demands of work and academia past high school graduation.

A term within the research literature that is used in examination of the effects of graduation credits and the curriculum offered is “constrained curriculum.” A constrained curriculum limits remedial classes offered to students and dictates that students take college-preparatory classes, by offering little else other than these most challenging classes. Lee, Smith, and Croninger (1997) discovered, using National Assessment of Educational Progress (NAEP) data, that students within a constrained curriculum experienced greater gains, and the progress was evenly dispersed by race, ethnicity, and socioeconomic status. Research detailing results of measurable gains experienced by

multiple subgroups had policy makers take notice and added credibility to those who propose stiffening graduation requirements.

Despite the overwhelming support for increasing mathematics graduation requirements, there is some evidence from researchers that implementing more stringent graduation requirements and more rigorous courses does not actually improve results by students (Hoffer, 1997; Teitelbaum, 2003). In fact, Allensworth, Nomi, Montgomery, and Lee (2009) conducted a study of increasing the rigor of ninth grade course selection in the Chicago Public Schools and noted that there was not a significant negative effect on graduation rate in instances when ninth graders were not permitted to take remedial classes. The study also concluded that this policy did not affect their likelihood to take higher-level mathematics courses as they approached graduation, once requirements were completed.

Researchers like Hoffer (1997) note that within the mathematics curriculum of schools, there may be a temptation with new graduation requirements to “dilute” the material presented in such traditional classes as Geometry and Algebra II so that the students who may not have been previously enrolled in such courses may be successful. This troubling paradox Hoffer (1997) notes—adding more study of mathematics does not increase achievement—provides an opening for those who argue that state graduation requirements should be based on attainment of skills learned rather than the years in a class identified as mathematics.

The reality is that a state policy has little effect on the “taught curriculum” versus the “intended curriculum.” A watered-down curriculum is not what states had in mind

when graduation rates were increased. This concern is one of the factors driving the standards-based curriculum so quickly into the conversation of American educators. The adoption of the Common Core State Standards is a reality for students in 45 of the 50 states and is entirely based on achievement of identified standards and not quantifying years or semesters successfully completed in a particular course.

High school graduation requirements affect all students, regardless of special program or learning differences. No specific mention of how Illinois' graduation requirement change would affect students with learning disabilities can be found in public records. Just like their classmates without learning disabilities, the appropriateness of classes for a third year was something each school had to address.

Guy, Shin, Lee and Thurlow (1999) and Giacobbe, Livers, Thayer-Smith, and Walther-Thomas (2001) examined the nature of graduation changes and what impact the increases would have on students with disabilities. Their analysis concluded that great care should be given to the curriculum when considering how to appropriately instruct students with disabilities who must also comply to state graduation requirement changes. Although these reports were completed before Illinois' change in 2005, students in Illinois do not have to consider graduation requirements that are accompanied by exit tests or exit documents that ask students to demonstrate certain competencies before being allowed to graduate. These tests are commonly modified for students with disabilities, but in addition to addressing the demands of the courses required for graduation, these exit examinations remain a challenging obstacle for many students. Without a doubt, this is certainly a conundrum for special education administrators who

must first understand what accommodations can be made for students with disabilities in order to show proficiency, and, in addition, accurately demonstrate that students have successfully attained the agreed-upon skills.

Stone, Alfeld, and Pearson (2008) experimental design study results suggests that students who are exposed to a mathematics program integrated with Career and Technical Education (CTE) coursework presents a viable method to enhancing the mathematics curriculum for students in the final years of high school mathematics study. Connecting mathematics to the concept of problem solving and its use as a tool for creating solutions will increase the relevance of the discipline as well as make the explicit curriculum less abstract and more useful for students. The genesis of Stone's concern for his study was legitimate and was based on the statistic that 37% of high school seniors performed at "below basic" level on the NAEP test (Grigg, Donahue, & Dion, 2007). He contends that creating engaging and relevant experiences to discover the usefulness of mathematics is missing for many American students. Simply asking students to take more years of study will not help students to achieve college-ready mathematics aptitude unless the curriculum they experience is both rigorous and relevant.

The vitality and usefulness of a school's curriculum is repeatedly scrutinized. Cavanagh's (2007) article in *Education Week* illustrates the struggle of how to design mathematics curriculum and graduation requirements that will aid students in their future endeavors. The decisions are difficult. Consider that only 22% of workers report using anything more than simple addition, subtraction, multiplication, or division; yet, 84% of top-paid young workers indicate they have completed a mathematics course of Algebra II

or higher. Establishing a mathematics curriculum that is not only relevant, but also a functional tool for graduates is certainly a challenging task; one that requires more consideration than just the number of years of mathematics study.

Graduation Rate

An argument of increased graduation requirements that inevitably arises is over the concern that by raising graduation requirements, a high school's graduation rate could ultimately be negatively impacted. As noted by McCallumore and Sparapani (2010), the graduation rates nationally have suffered with as many as half a million students dropping out of school each year, while the importance of earning a diploma in the technology-driven and competitive global climate has never been more important. This paradox is enough to cause legislators and governing bodies to pause—if our state or district has too demanding a curriculum, graduation rates will fall; however, if demands are too low, then graduates will not be prepared for the challenges that will be presented in the real world. For a governing body in charge of increasing graduation rates to not acknowledge the negative potential would be irresponsible, especially when, as approximated by Laird, DeBell, and Chapman (2006), 4.7% of high school students dropped out during the specific time frame between October 2003 and October 2004. For some legislators, it is easy to see how the pressure to augment the rigor and value to a diploma could come with a significant cost: many more students never made it to the point of earning that diploma.

After the onslaught of state graduation policy changes in the 1980's, multiple researchers looked for the effect of graduation rates after the policy changes took effect.

Clune and White (1992), Hoffer (1997), and Porter (1998) all found no association between drop-out rates and the initiation of a state graduation change. In fact, the national graduation rates during this tumultuous period of graduation changes increased (Teitelbaum, 2003).

Daun-Barnett's and St. John's recent (2012) examination of national data to analyze the effects of graduation requirement changes in mathematics found that, while they did help a greater proportion of students continue on to college, a lower percentage of students graduated after the change was implemented. The authors offer a potential cause for this graduation issue as the lack of proper preparation for the change in previous years of study, suggesting that the drop may subside after students at lower grades are exposed to more effective preparation once the graduation requirements have been in place for a longer period of time.

There are multiple concerns regarding graduation rates and enhanced curriculum expectations. In addition to concern about drop outs, Hoffer (1997) points out a pervasive and insidious problem—that educators may lower both their expectations and standards in order to keep students in school in order to lower failure rates. The assumption is that educators have a tough decision to make: If I raise standards on students, students may not be successful and drop-out, but if I lower my expectations and they are successful, they will not be college-ready. When the graduation requirement reform movement gained momentum in the mid 1980's, there was much discussion about this very topic. Research by Cusick (1983), Powell, Farrar, and Cohen (1985), and McDill, Natriello, and Pallas (1986) suggest that many schools will tolerate less rigorous

instructional demands for acceptable behavior. If stringent instruction and pushing students to an exposure of higher degrees of mathematical complexity was not required, some schools saw this trade-off as an acceptable practice in order to keep students in school. Watered-down courses were not what Illinois had in mind when asking school districts to elevate the standards for their high school students.

Allensworth and colleagues (2009) used Chicago Public School data to analyze the policy requiring students to take a college-preparatory program where no remedial classes were offered. They summarized that there were few benefits discovered from Chicago's experiment. Although dropout rates did not increase, the researchers discovered negative results in failure rates and grades.

Hoffer (1997) explored the variances in schools where two years of mathematics were required versus three years. He used data from over 11,000 students in 1,200 schools and found that students who attended schools where 3 years were required were no more or less likely to graduate than their contemporaries attending schools with just a 2-year requirement.

In Barnett's (2008) dissertation, a complex relationship exists between graduation requirements, exit of course examinations, high school completion, the number of core courses completed, and school funding. Using the Educational Longitudinal Study (ELS:2002), the dissertation reveals that there are mixed results of graduation requirement changes. "Higher state standards for graduation reduce the probability that students will complete high school in four years, but for those that complete, the policy is likely to have a positive impact on the number of courses they complete in the core

subjects.” Barnett adds that the burden upon schools to “pay greater attention to keeping students on the path and preventing them from falling through the cracks” is quite real, and that support should accompany any graduation requirement increase.

Educators have identified the success of a student during the freshman year as a primary factor affecting graduation rates. The concern specifically focuses on freshmen and the pressure to successfully complete core classes (mathematics, English, science, social studies). Many schools have begun to design specific programs such as Freshman Academies that focus on the success of freshmen earning core credits (McCallumore & Sparapani, 2010). The difficulties of transitioning to high school coupled with the essential and immediate demand to successfully earn graduation credits as freshmen drives educators to spend extra attention on freshmen and the interventions necessary to make them successful—especially in the core classes. Graduations are guaranteed to students who successfully earn all available credits as freshmen, but many students delay their four-year graduation by poor performances during their freshman year.

On-line credit recovery programs have become trendy as a potential solution for students who fall behind their peers after failing classes required for graduation. While not universally seen as a beneficial solution primarily due to the wide ranges of intensity of these programs, on-line credit recovery programs are used widely as a method to retrieve lost credit (Watson & Gremin, 2008).

Proponents of on-line credit recovery programs suggest many reasons for why they are effective in helping students toward graduation by offering instruction in a fashion much different than how they were previously unsuccessful. Most on-line credit

recovery programs offer flexible pacing for students, frequent opportunities for feedback and assessment, and engaging technology that students enjoy. Trautman and Lawrence (2004) found that on-line credit recovery may have positive effects on graduation rates, attendance rates, and pass rates on state testing.

Enrollment in Upper-Level Mathematics Courses

State legislators in Illinois had a clear goal in mind when changing the mathematics requirement—they wanted students to be exposed to more demanding levels of mathematics, which would make them better prepared for post-secondary opportunities. The concern about students not taking upper-level mathematics courses preceding *A Nation at Risk* dates back to the 1970's, when it was noted that a lower percentage of students took the upper-level choices such as calculus, trigonometry, and Algebra II (Levesque et al., 1999; Ravitch, 1996). Finn, Gerber, and Wang (2002) exposed the serious nature of the problem, even after many graduation requirements had been changed nationally. Their research uncovered that approximately 60% of high school graduates concluded their study of mathematics without taking a single course that could be considered advanced mathematics. Hoffer (1997) noted that, by studying National Education Longitudinal Study data, students in schools where three years of mathematics are required were more likely to complete Geometry, Algebra II, and trigonometry. Requiring more mathematics study should also benefit those groups who are under-represented in upper-level mathematics courses. Finn et al. also noted that only about 3.0% of low socio-economic students took Advanced Placement (AP) Calculus.

African-American students fared similarly with only 2.7% taking AP Calculus (Finn et al., 2002).

By explicitly designating that students must gain exposure to both algebra and geometry, they were expressing a desire for students to enroll in the mathematics courses seen as the gateway to upper-level mathematics courses. Theoretically, requiring students to take algebra and geometry classes will increase the likelihood that they will matriculate to Algebra II, statistics, and calculus. The intention is understandable and noble, but the aspiration to expose more students to higher levels of mathematics is not a simple fix and not without impact on other aspects of students' academic experiences.

In addition to their findings on course taking patterns, Schiller and Muller (2003) were surprised by the significant effect the policy change had on students taking more advanced mathematics courses. Their findings are consistent with those found by Teitelbaum (2003) in his study where he found a positive connection between schools with a three-year graduation requirement and advanced-course enrollment. By asking all students to take an additional year of mathematics, states have created an "imposed persistence" in mathematics course taking.

The advantages found in this same study extend to students from varied backgrounds as well. African-American students, while more commonly enrolled in lower-level freshman classes, tended to gain more advanced-level credits in mathematics compared to peers in other states where those same graduation requirements were not in place. This is a significant conclusion for all states or districts who are considering the

benefits of increasing graduation requirements; these conclusions are also consistent with those found by Chaney et al. (1997) and Clune and White (1992).

Schiller and Mueller (2003) also made an interesting observation about the opportunity students have in locations where three years of mathematics is required for graduation. They note that if during the matriculation process through high school students have any type of difficulty with a class and fall behind, it makes it nearly impossible to advance to higher-level mathematics courses because students simply run out of time while in high school. For example, if a freshman fails Algebra I and must re-take it as a sophomore and if all goes well, the student will not be able to take any mathematics course beyond the traditional sequences of Algebra I, Geometry, and then Algebra II. The same principle could apply to any student placed in a course below the Algebra I level as a freshman. Placement in a remedial mathematics course, anything pre-algebra or below, will inhibit the student from progressing to any advanced level of mathematics. Students who are “late bloomers” or were placed in remedial courses due to behavioral issues may be restricted from reaching a level in mathematics that would be intellectually appropriate by the time they were upperclassmen.

Another approach to the issue that has gained some popularity is to examine whether it is wiser to require specific courses to be taken as opposed to a required amount of years to be completed, regardless of what is actually learned. When considering the benefits for students, wouldn't it be more prudent to pay attention to the actual courses students take and topics they learn rather than the quantity of courses they take? A centerpiece of the “American Diploma Project” written by Achieve Inc. (2004) was the

idea that states should not create standards based on a number of courses taken, but rather based on the rigor the courses demand. “An Action Agenda for Improving America’s High Schools” (2005) written by Achieve, Inc. expanded on their prior work and became specific in its mathematics recommendations. They suggest that what is needed is a required mathematics curriculum demonstrating competency in Algebra I, Geometry, Algebra II, and data analysis and statistics.

Skeptics such as Achieve, Inc. contend that requiring a certain amount of years of mathematics study without acknowledgement of what courses are taken could be an end-run around the intent of exposing students to higher levels of mathematics. Students could take three full years of low-level mathematics courses and still complete the state’s requirements, yet, be woefully short of what is needed to be ready for college and workforce mathematics skills due to low-rigor classes. Lee (2002) also notes the importance of “quality over quantity” in mathematics course taking patterns in her exploration of the restructuring of the American high school.

Changing graduation requirements to identify courses necessary to graduate instead of just the number of years to be studied could be a positive approach to assisting students toward better post-secondary readiness. After concluding their research, Daun-Bennett and St. John (2012) came to the similar conclusion as ACT and Achieve, Inc. that adding specific levels to the requirements of rigor has favorable results. Although Illinois’ standards include a mention of a class with exposure to geometry, this expectation is hardly to the extent ACT and Achieve, Inc. had in mind when they encouraged policy makers to require students to accompany a list of courses with the

amount of years of study. Most would accept that Illinois' definition of what defines an appropriate measure of mathematics exposure—Algebra I and some geometry—hardly passes muster of what makes a student post-secondary ready by most definitions.

ACT also set a preview of the challenges awaiting schools in nearly every state in the United States in “Courses Count: Preparing Students for Post-Secondary Success” (2005), when it suggested that a rigorous preparatory curriculum should focus on the in-depth content coverage rather than a surface-level knowledge of many topics. The Common Core State Standards (2012) also delineates the mathematical concepts that will be a part of the standards assessed by the 45 states that have adopted the standards, focusing on depth of knowledge and not just exposure. While not explicitly listed in years of study, but rather in conceptual benchmarks, it is nearly inconceivable that a student could achieve mastery of concepts such as statistics and probability with anything less than three years of study with the Common Core State Standards.

It should be noted that one perceived benefit of adding an additional year of mathematics study is to address a documented variance between course-taking patterns of students with racial/ethnic differences. Achievement-level differences are not as evident for black and white students on standardized tests for students who have taken advanced mathematics coursework (Berends, Lucas, & Briggs 2002; Gamoran 1987).

Understanding that achievement differences in racial/ethnic groups is minimized by this exposure makes the decision to require students to take steps closer to a higher level of mathematics quite understandable. Without addressing this issue, Illinois would likely replicate the work of Dalton, Ingles, Downing, and Bozick (2007) using ELS:2002 to

determine that the percentage of students who reach at least Algebra II varies noticeably: 87% of Asian students reach Algebra II, and 79% of white students take Algebra II. In comparison, 75% of black students take Algebra II, and 67% of Hispanic seniors take at least an Algebra II course.

Summary

While graduation policy changes at the state level are not uncommon, examination of the effects of policy change are not that common and it is part of the drive to complete this research. Raphael, Sage, and Ishimaru (2012) examined Oregon's mathematics graduation change and its impact. Oregon enacted a change much like Illinois' graduation change requiring students to take three years of mathematics at or above the Algebra I level, including geometry. For examination of the effects this graduation change would have if implemented immediately, researchers focused on four areas: percentage of affected students deficient on credits, size of school most affected, demographics of students most affected, and deficiency of courses taken with immediate implementation of the new standard. They also examined an issue unique to Oregon: the number of teachers qualified to teach any mathematics course beyond Algebra I. The results indicated that at least 11% of students in grades 9 through 12 would have been off-track to graduate, and there would have been a shortage of qualified teachers in both small schools and schools with high free and reduced lunch populations.

The research of Wilson and Rossman (1993) should also be acknowledged when considering how a massive graduation policy change affects schools in a state. They noted in their comparative study how differently a policy change can affect a school,

depending on how the change was implemented within each school. Each school entered the policy change with a curriculum in place as well as established graduation requirements. How these policies were implemented and to what degree of fidelity the change was heeded should be acknowledged.

Clearly, after looking at the literature, Illinois was certainly not breaking new ground by requiring a third year of mathematics study. In fact, this decision was made 22 years after the National Commission's *A Nation at Risk* was published. With all the available literature as well as so many advocates for the third year of study, it is not surprising that Senate Bill 575 was approved by Illinois' legislators requiring that all Illinois high school graduates must complete three years of mathematics, including Algebra I and a class that contained geometrical concepts. Looking critically at the situation, Illinois had little choice but to expand its graduation requirements.

The Illinois State Board of Education (ISBE) provided some of the rationale for the change in graduation standards, which had not been modified since 1983, in their own description of Illinois' graduation requirements as the "lowest graduation expectations in the country." They also use ACT's analysis of what a recommended "core curriculum" is for students as well as ACT's analysis that students who take their recommended core do better than those who do not meet the elements of their prescribed curriculum.

As alluded to in the study in the state report in Illinois written by Ferratier and Helmich (1983), school leaders were going to be forced to consider independent measures regarding the proper method to address the shortcomings addressed by *A Nation at Risk*. No matter what state requirements would be within each school district

and their individually unique context, recommendations must be considered and resolutions must occur on which proposals had merit and which did not. The implementation of the requirements would have a significant effect on what happens at each school.

Perhaps an idea has merit, but it is financially impractical for the district to implement. Or maybe the idea did not fit the philosophical approach of the district. Personnel may not be in place to implement changes in curriculum or graduation requirements either due to financial constraints or due to the lack of professional development. At the micro level, districts had to conduct a great deal of self-analysis to determine how to approach the problem. Are our curriculum standards too low? Is our content rigorous enough? Are our graduation requirements high enough? At a macro level, these questions were answered in thousands of different ways by policy makers and administrators, and as a result, the constancy of change in the profession of education remains assured nearly 30 years later.

Research is certainly warranted to determine the effects on schools regarding this common external reform method suggested as far back as *A Nation at Risk*. This research will assist educators in examining the impact on their school of adding an additional year of mathematics study to their graduation requirements. For the benefit of other school boards, superintendents, and even state legislators, data analysis should take place on this curriculum change and the effects experienced by the schools that have already made graduation requirement changes. It is likely that there are many states, school boards, or other policy makers considering whether they should add a third year of mathematics;

this study will help them to more comprehensively understand what effect it might have on their respective schools. The analysis of what the most common effects are, as a result of this change, is important data to determine. As soon as this bill was made law in 2005, educational leaders across Illinois had to begin to make decisions about how this additional year would be accomplished. Some schools already required a third year of mathematics, but many did not; therefore, each school's experience varied. The results of those changes will be explained in the following chapters.

CHAPTER 3

METHODOLOGY

Research Statement

The effect of any state policy change at the school level is a consideration of the utmost importance for policy-makers, local school boards, superintendents, or anyone who makes decisions. It is not a snap decision to change graduation requirements for an entire state and the conclusion is reached after much input and research. There are very serious considerations for students, schools, teachers, and administrators to reflect upon when examining whether or not to enhance graduation requirements in any way. This research focused on the ensuing effects of Illinois Senate Bill 575 enacted in 2005 that added a year of mathematics to the previous state minimum of two years of study. All districts who received state funding were required to comply with this new law requiring three years of study and exposure to algebra and geometry. While legislative platitudes and proclamations are necessary regarding policy change, the actual effects of this policy change happened at the school level. Analyzing the effects with empirical data from affected schools to assess the impact this policy change is critical. The data can then lead to discussion regarding whether the outcomes matched the desired effect of a higher quality of education for students in Illinois.

Research Questions

Although there are a myriad of ways that this new law has affected students, teachers, and administrators, three specific aspects of the policy change have been

identified for closer examination. These topics were identified as three of the most commonly discussed issues raised when discussions of enhancing graduation requirements emerge.

The three research questions for this study are:

1. What are the effects, if any, on the mathematics curriculum with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?
2. What are the effects, if any, on graduation rate with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?
3. What are the effects, if any, on enrollment in upper-level mathematics courses such as Algebra II and above, with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?

Participants

The Illinois High School Association (IHSA) governs athletics and activities for the state of Illinois and sponsors events for athletes, officials, fans, and schools. For the 2011-12 school year, the IHSA had 793 member schools. In that membership, 668 were public high schools, which represented the universal sample and the schools affected by Illinois Senate Bill 575. There were an additional 125 private or parochial schools not affected by the state-mandated decision requiring students to complete three years of mathematics in order to graduate, since they are not bound to the Illinois State Board of Education (ISBE) graduation changes. Although public and private schools compete

against one another in IHSA functions, private schools are not bound by the same restrictions that public schools must abide by according to the State of Illinois.

For the purposes of athletics and activities, the IHSA uses classifications to help divide schools for the purpose of achieving competitive balance, with like-sized schools competing against one another. These classifications vary by gender and sport depending on participating schools and the playoff system utilized for that sport. The classifications are adjusted yearly as school enrollments fluctuate. The number of classifications for each sport or activity varies, but in most large sports, there are three or four classifications created that group schools by size and geographic region for the post-season playoff series of each competition. For example, in boys' basketball there are four classifications. Those schools with enrollments between 670 and 1580 students are identified as 3A for the 2011-12 school year. The sample population for this study comes from those Illinois high schools that compete at the 3A level in boys' basketball.

This level of student enrollment was intentionally chosen for this study to minimize the effect that school size had on this graduation policy change. Smaller schools face disproportionate challenges with respect to staffing, curriculum development, and staff development for teachers. Smaller districts may also function without the assistance of district office personnel specifically designated to help the high school, leaving building-level administration to make curriculum decisions independently. Some smaller school districts in Illinois are more dramatically affected by financial constraints than larger districts. Schools and districts with greater enrollments are more equipped to deal with graduation changes due to a greater

abundance of personnel assets and fiscal flexibility. Schools with larger enrollments typically also have the means to implement changes within the district's curriculum. Larger districts may face the challenge of training larger numbers of staff members to accommodate necessary changes such as textbook adoptions for new courses.

Surveying schools of medium size, 670 to 1580, for this study was intended to give a more realistic perspective of how these changes affected schools, as opposed to surveying schools of sizes that may not represent most schools' experiences. Mid-sized schools experienced these changes with awareness of the challenges that both large and small schools faced but, most likely, experienced a more realistic perspective of just how significant this change was for schools.

There were 162 schools in this 3A boys' basketball classification for the 2011-12 school year. Of those 162 schools, 149 were public schools affected by Senate Bill 575 and the policy change. The 149 schools included in the sample represented geographical locations throughout the state and include both high and low-performing schools. The schools within the sample also represent wealthy as well as poor districts from around the state from locations considered urban, suburban, and rural. Like most IHSA classifications, there was a high percentage of Chicago Public Schools (CPS) included in the sample of 3A boys' basketball schools. Fifty-four of the 149 schools in the sample were schools within the CPS system.

Data Collection

Instrumentation

Survey design. Pratt's (2010) work provided a useful model for how to survey schools concerning the effects of a graduation policy change. Pratt created a survey to assess how a massive graduation requirement change enacted in Michigan affected students' ability to take fine arts classes. Pratt's research is similar to this study and provides some parallel lines of questioning. After a live phone conversation a week prior, permission to use Pratt's survey as a guide was acquired on February 14, 2012, through email correspondence. A modification of Pratt's survey instrument was designed (see Appendix A) to evaluate the research questions regarding Illinois' graduation changes targeting the three research questions.

A questionnaire was designed to yield answers to the three research questions and to gather information to assist in identifying changes that have occurred before and after the policy change. Targeting the particular research questions allowed identification of specific variables for effect. The general and demographic questions enhanced the data gathered about the three research questions by narrowing how the effects were different for schools within the sample prior to and after the change. Table 1 identifies the relation between each question as well as the research question it corresponds to in the survey.

Table 1

Survey Question (SQ) Associated With Research Question (RQ)

SQ	RQ
1	Consent
2	1 & 3
3	1
4	1
5	1
6	1
7	1
8	1
9	1
10	1 & 2
11	2
12	2
13	2
14	2
15	2
16	3
17	3
18	3
19	3
20	General Effect
21	General Effect
22	General Effect
23	Demographic
24	Demographic
25	Demographic
26	Demographic
27	Demographic
28	Request for Executive Summary

The survey asked respondents to assess the effects of the graduation requirement changes through different types of questions. To provide a clear picture of the effect of this change, the survey needed more than one type of question to yield the necessary

responses. Similar to Pratt's survey, the use of open-response questions, "yes/no" questions, and multiple choice questions were designed to gather data (see Table 2).

Table 2

Survey Question Type

SQ	Question Type
1	OR
2	OR
3	OR
4	OR
5	OR
6	OR
7	Y/N
8	Y/N
9	Y/N
10	Y/N
11	OR
12	OR
13	OR
14	OR
15	OR
16	OR
17	OR
18	OR
19	OR
20	MC
21	OR
22	OR
23	MC
24	MC
25	MC
26	MC
27	MC
28	OR

Note. OR=Open-response, Y/N =Yes or No, MC=Multiple Choice.

Pilot. A pilot of the survey was conducted in May 2012 to preview the survey questions and the electronic data-gathering tool to determine their effectiveness prior to sending the survey link to the entire sample. Respondents were asked to examine the survey in four ways. First, respondents were asked whether the link worked properly by opening directly to the survey. Second, the survey was examined for ease in clearly understanding the question that was asked. Third, feedback was gathered on the merit of each question to link it to one of the research questions or to compare adequately what happened prior to and after the graduation change.

The initial check was done by sending the Survey Monkey link to four faculty members at Woodstock (IL) High School who have completed their doctoral degree or were in the process of completing that degree at the time of the pilot. All four faculty members replied to the request to attempt to complete the pilot. The responses from the faculty members indicated that the link worked properly and that some questions within the section about graduation rate were unclear. Those questions were corrected and improved for clarity. Additionally, the researcher confirmed that the responses had been properly captured by the computer program so that the data could be analyzed for results.

Furthermore, the pilot of the survey was sent to six high school principals within McHenry County, Illinois, to get their perspective. These respondents were used to determine the length of the survey in order to inform the actual respondents how much time to expect to complete the survey, since the initial respondents to the pilot submitted used fictitious data. The six pilot responses were completed, the link worked properly, and data was compiled for retrieval. The respondents also indicated that there must be

better definition of some terminology within the survey (i.e., ISBE graduation rate, upper-level mathematics courses, and to write out Career/Technical classes rather than using the abbreviation CTE). The range of times for completion of the survey varied from 10 to 25 minutes. Those respondents on the higher range of completion time advised that an explanation of pertinent information to be gathered should be included in the introduction letter to sample participants.

After gathering 10 practice responses in the pilot survey responses and identifying improvements that could be made, the survey was altered and the fictitious data was cleared so that actual data could be analyzed. The pilot was extremely useful and revealed insights into how the survey would be completed, improving the survey sent to the sample.

Collection Procedures

After gaining approval of the Internal Review Board of the University, every school within the sample was mailed a letter on June 25, 2012, via the U.S. Postal Service introducing the study and asking for participation in gathering data (Appendix B). Because it was summer when many building principals were out of the office or taking vacation, the letter was intended to alert the principal that a survey was coming in hopes that the forthcoming email would not be disregarded, as is often the case with requests to complete surveys. A few principals replied to the letter that they were willing to assist, while a few asked why the link to the survey was not included. The principals were advised that the electronic link to the survey would be included in an email that would be sent soon to all potential participants; a few of the eager respondents were provided the

link immediately as a courtesy after their contact to the researcher. This letter also included specific mention that completion of the survey could be delegated to a colleague who may be more equipped to answer the questions on the survey. It was explained in this letter, as well as all following correspondences, that if a principal was new to the position and someone else with more first-hand experience was better equipped to complete the survey, that was perfectly acceptable.

The introductory letter was followed by an email on July 9, 2012, to the principal of each school as well as the principal's administrative assistant (Appendix C). The data base of email addresses used to send this mass email was gathered using the IHSA website, which identifies the name and contact information for all IHSA principals and principal's administrative assistants. This letter included the electronic Survey Monkey link to the survey for responses and repeated much of what was explained in the initial letter in the event that the letter delivered through the postal service didn't arrive or was unopened.

A follow-up email was sent two weeks after the initial email with the link thanking participants who had already replied and encouraging others to complete the survey (Appendix D). The letter was essentially a shorter version of the first email sent and provided the link to the survey.

At this point, there was a very clear pattern that had emerged from respondents. Despite soliciting all 149 3A schools for their help in completing the survey, it became clear that the 54 Chicago Public Schools (CPS) included in the 3A population were not

responding to the survey for unknown reasons. Of the first 32 responses, none came from a CPS school.

The absence of survey results from all 54 CPS Schools in the population raised concerns about reaching a valid quantity of responses. This concern was addressed by deciding to exclude the CPS schools from the study, since none had yet responded. It could also be argued that the experience of schools within CPS is vastly different than schools in smaller districts. After subtracting the 54 CPS Schools from the sample, 95 schools remained from the original sample of 149. A goal was established to obtain responses for over 50% of the remaining schools in the sample, excluding all CPS schools.

At this point, 32 responses had been collected. Beginning on September 27, 2012, individual contacts were made to principals by the researcher to ensure that an adequate sample response was reached. All 62 schools that had not yet responded were called directly. In many instances, a direct conversation with the principal was held asking for help in gathering data and a reminder that this responsibility could be delegated. The direct conversation with principals was typically followed by an email that included the electronic survey link as well as a note of appreciation for assistance provided. Many principals could not be reached directly, and voice mails were left for these principals along with a follow-up email that included the electronic survey link. This process was concluded on December 2, 2012, when all 62 remaining non-CPS schools who had not yet responded had been contacted by the researcher. In the end, 52

of the 95 schools used in the final sample responded using the survey instrument for a 56.8% response rate from non-CPS schools in the 3A classification of boys' basketball.

Data Storage

When the on-line data collection tool was closed as an active link for collection of responses on December 2, 2012, the raw data was stored within Survey Monkey. The researcher purchased a monthly subscription to the service that allowed the data to be stored as long as necessary. Although the link is no longer active for new submissions, all the functions of the website and data analysis are still functional.

Survey Monkey has numerous functions to assist researchers in examining their data. One benefit of using this service is that the collected data can be displayed in multiple formats. In addition to being stored in its raw form in Survey Monkey, the data was saved in a Microsoft Excel™ file as well as in a PDF format. The data in these two formats was stored on the password protected computer of the researcher, a flash drive dedicated to dissertation materials locked in the researcher's office, and a password-protected shared drive available to staff at the school where the researcher works.

Data Analysis

The collected data was entered into two formats, Microsoft Excel™ and PDF, for initial analysis. For multiple choice and "yes/no" questions, the Excel™ format was sufficient for analysis, and no coding was necessary. A total of 10 responses, 12 if you include the consent sign-off that began the survey and the request for the final executive survey, needed no additional coding beyond what was collected from Survey Monkey

and transferred into Excel™. Descriptive data analysis was used to analyze the data for questions identified in Table 2 as multiple choice or “yes/no” responses. The analysis of data was completed emulating a similar research project Pratt (2010) completed studying the Michigan Merit Curriculum’s effect on enrollment in fine arts courses.

The 16 open-response questions in the questionnaire required coding to identify patterns in the answers. These answers were grouped in codes by the researcher to examine results. Because of the unique qualities of each question, the codes used for each answer varied. After coding was completed for each open-response question, the responses were quantified for review using quantitative descriptive methods similar to the multiple choice and “yes/no” questions, then again, placed into an Excel™ document. Table 3 indicates the types of analysis applied to each research question.

The interpretation of each answer and how it was coded was written completely by the researcher and is based on the opinion of the researcher. Other researchers may assess the data differently, therefore creating different codes; however, the codes that were created maintained focus on gathering answers to the three research questions. The collected data, when presented in its final form, identified insights into the three research questions and can be found in Chapter 4.

Table 3

Types of Analysis Used on Survey Questions

Question	[D]escriptive Statistics/ [C]oding	Type
1	Consent	None
2	C	Frequency and percentage of coded responses
3	C	Frequency and percentage of coded responses
4	C	Frequency and percentage of coded responses
5	C	Frequency and percentage of coded responses
6	C	Frequency and percentage of coded responses
7	D	Frequency, mean, median, percent, and standard deviation
8	D	Frequency, mean, median, percent, and standard deviation
9	D	Frequency, mean, median, percent, and standard deviation
10	D	Frequency, mean, median, percent, and standard deviation
11	C	Frequency and percentage of coded responses
12	C	Frequency and percentage of coded responses
13	C	Frequency and percentage of coded responses
14	C	Frequency and percentage of coded responses
15	C	Frequency and percentage of coded responses
16	C	Frequency and percentage of coded responses
17	C	Frequency and percentage of coded responses
18	C	Frequency and percentage of coded responses
19	C	Frequency and percentage of coded responses
20	D	Frequency, mean, median, percent, and standard deviation
21	C	Frequency and percentage of coded responses
22	C	Frequency and percentage of coded responses
23	C	Frequency and percentage of coded responses
24	C	Frequency and percentage of coded responses
25	C	Frequency and percentage of coded responses
26	C	Frequency and percentage of coded responses
27	C	Frequency and percentage of coded responses
28	Request for Executive Summary	None

Description of the Sample

As detailed in Chapter 3, the population targeted in this research included all public high schools that competed in the 3A Boys' Basketball classification in the 2011-12 school year. From the original total of 149 public schools within this classification, the 54 Chicago Public Schools (CPS) included in the population were removed due to the concern that their initial low response rate may alter the quality of the survey data. A goal was established to receive over a 50% response rate from the remaining 95 schools. In the end, 52 respondents completed the survey, achieving the goal of over a 50% response rate.

Survey response rates to individual questions varied. Some survey questions were easy to complete or required little to no research. Other questions required respondents to do some investigation into their school-wide data, taking a bit more effort to locate. Response rates to the questions that included research requiring some historical data collection were lower than those that were opinion-based or easy to identify a response. Not all respondents answered every question. As shown in Table 4, the response rates on the survey ranged from 44% of the 52 respondents up to 77% of the population.

Table 4

Response Rate to Survey Questions

Question	Responses	Total Respondents	Percentage Responding
2	39	52	75%
3	39	52	75%
4	38	52	73%
5	37	52	71%
6	38	52	73%
7	40	52	77%
8	40	52	77%
9	39	52	75%
10	40	52	77%
11*	33	52	64%
12*	33	52	64%
13*	32	52	62%
14*	33	52	64%
15	33	52	64%
16	32	52	62%
17*	30	52	58%
18	30	52	58%
19*	28	52	54%
20*	33	52	64%
21	28	52	54%
22	23	52	44%
23	32	52	62%
24*	31	52	60%
25	31	52	60%
26	32	52	62%
27	32	52	62%

Note. Asterisks indicate survey questions requiring historical research.

It is noticeable that the survey questions requiring respondents to locate pieces of data from their school's records had smaller response rates. It was beneficial that over half of the possible respondents completed the survey because, interestingly, despite the 52 respondents signing the consent, not all respondents answered every question in the

survey. The highest quantity of responses to any question, other than the initial consent, were the 40 responses to survey questions 7, 8, and 10, creating a 42.1% response rate.

The range of enrollments in the 3A Boys' Basketball classification that created the population ranged from 670 to 1580 students. Table 5 demonstrates the distribution within the classification by quartiles. Fewer large schools responded than the three remaining sizes.

Table 5

Enrollments of the Responding Schools (n = 32)

School Enrollment	Frequency	Percent
670-900	10	31.25%
901-1125	13	40.63%
1126-1350	7	21.88%
1351-1580	2	6.25%

School districts in Illinois vary in grade levels served. Some school districts serve students Pre-K through 12th grade, while some districts serve a smaller ranges of grades. Illinois districts who serve students Pre-K through 12 are commonly called “unit school districts.” Some districts serve 9-12 grade students and are referred to as “high school districts.” There are advantages and disadvantages for each type of arrangement, but how a district is arranged certainly affects how it handles a modification such as a graduation requirement change. Unit school districts comprised 58.06% of the respondent schools ($n = 31$).

The sample is a good representation of school districts across Illinois the amount of mathematics required for graduation prior to the Senate Bill 575, which was passed on August 24, 2005. Schools already requiring three years of mathematics to graduate accounted for 53.13% of the schools ($n = 32$) in the sample. These schools would have much different experiences with this law change than the 46.87% who had to add an additional year of study in mathematics. The schools that already required three years of mathematics still had to plan for how to guarantee that students would complete at least Algebra I and, in addition, gain exposure to geometry. This small adjustment is less impactful than those schools that had to plan for an additional year of mathematics for a percentage of their students. The high number of schools that already required three years of mathematics to graduate may also explain why some questions have high percentages of responses indicating “none,” “n/a,” or no response, as it was not an experience they witnessed.

The effect of Senate Bill 575 is clear to see in the response to Survey Question (SQ) 27 that asked how many years of mathematics are now required in their school district. Obviously, all respondents indicated that they require at least three years of mathematics to graduate; so, from 2005 until 2012, the percentage of schools requiring 3 years of mathematics rose from 53.13% to 100%. There are probably a few districts in the state that are not fully compliant with Senate Bill 575, which may have contributed to why they did not respond to the survey. Interestingly, 6.25% of districts ($n = 32$) indicated their district now requires 4 years of mathematics completion to graduate,

which is what many educational research organizations recommend for high school students.

Limitations

The limitations to this study were: the specific range of schools within the sample, the three specific effects of the change that were studied by the research questions were not the only effects of the graduation change, there were no Chicago Public Schools included in the sample, and the graduation requirement change was only examined for mathematics.

CHAPTER 4

RESULTS OF THE DATA ANALYSIS

The intention of this study was to discover what effects the Illinois mathematics graduation requirement change had on mid-sized high schools. Research was conducted to identify ensuing effects on mathematics curriculum, graduation rates, and enrollment in upper-level mathematics courses at mid-sized high schools in Illinois. Chapter 4 reveals the findings of the survey questions.

Research Questions

In this chapter, each research question will be independently summarized, including the results to each research question and individual survey questions. A discussion of the results will follow the presentation of collected data, providing further discussion on each question. Additionally, Appendix F provides research data in its entirety, as collected for each survey question.

The three research questions were designed to examine the specific effects of the graduation requirement since inception of the bill in 2005. As detailed in Table 1, the survey was written to obtain information on the individual research questions. Results are presented for each research question followed by a discussion of each question.

Research Question 1—Effects on the Curriculum

The first research question is “What are the effects, if any, on the mathematics curriculum with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?” Table 6 lists the eight questions used to query the respondents about how their curriculum was affected.

Table 6

Survey Questions Corresponding to Research Question #1

Survey Question #	Question
SQ2	What mathematics courses, if any, were added to the curriculum in order to prepare for added graduation requirements from the Class of 2009?
SQ3	What courses, if any, were deleted from the curriculum in order to prepare for added graduation requirements for the Class of 2009?
SQ4	How did middle schools or junior high schools adjust their instructional sequence to help high school students complete the new three-year sequence?
SQ5	What curricular modifications, if any, were initiated in anticipation for students who, prior to graduation requirement change, may not have been likely candidates to take a third year of mathematics?
SQ6	Please explain any other curricular intervention that has assisted in the transition to three years of required mathematics in order to graduate?
SQ7	Does your school have a two-year (four semester) I course?
SQ8	Does your school have algebra and geometry integrated into one course?
SQ9	Can students in your school earn mathematics credit in a Career/Technical type of course?

Results—changes to curriculum. Results to Survey Question #2 (SQ2) indicated that 21 of the 39 respondents added at least 1 class to the high school curriculum, while 18 respondents indicated they did not add a class at all. In total, respondents reported 30 courses were added to the curriculum at their respective schools. Of these new courses, 18 were upper-level courses: Algebra II or beyond.

The most commonly added course, results from five different schools, was a vocational or applied mathematics course. Algebra II, a two-year algebra sequence, or a

Special Education mathematics were each identified four times by schools. A combined algebra and geometry course, pre-calculus/trigonometry, or statistics were added in three different locations. Appendix G identifies the 30 courses added by responding schools, the frequency in which they were added, and whether or not they were considered high-level or low-level courses.

SQ3 shows what classes were deleted or discontinued during the time of the graduation requirement change. Only 18.0% of survey respondents (7 of 39) indicated that they had removed a course from their curriculum. A total of eight classes were removed by the respondents. Seven of the eight courses that were removed would be classified as low-level mathematics, meaning below Algebra II. The titles, total number, and level of difficulty of the eliminated courses can be found in Appendix H.

Twenty-seven of 38 respondents (71.05%) to SQ4, regarding the coordination of effort between feeding middle schools or junior high schools, indicated that there was no assistance, instructional sequencing/planning, or academic coordination between schools.

The information gathered from SQ5, listed in Appendix I, indicates the most commonly implemented curricular modifications designed to prepare students for success who may otherwise struggle, how many times that intervention was mentioned, and what percentage of respondents used this type of modification. The addition of a lower-level Algebra II course was the most common response. Vocational mathematics was mentioned again in SQ5 as a curricular modification, with three schools indicating that this modification happened at their school. A two-year Algebra I sequence, low-level

geometry, integrating geometry and algebra, and more support were twice indicated as curricular modifications.

When asked in SQ6 for other ideas that assisted in the transition from two years mathematics requirement to three, respondents shared a wide variety of responses. Twenty-four of the 38 respondents noted at least one intervention at their school. The most commonly identified response was to offer tutoring to students during the school day, mentioned by 11 respondents. Credit-recovery programs and school-day tutoring were mentioned by three respondents as additional supports for students. Appendix J shares the complete results to this survey question, citing the wide variety of ideas offered at individual schools.

Also gathered in the survey was data regarding a common curricular modification of completing algebra over the course of two years. SQ7 indicated that 35% of respondents ($n = 40$) offered a two-year (four-semester) sequence to complete algebra at their school.

SQ9 reveals that only six of the 39 respondents (15%) have a course that is vocationally oriented and counts as a graduation requirement in the area of mathematics. Many of these courses were recently added, as evidenced by the data compiled from SQ2.

When examined collectively, there are a few critical pieces of information gained by the results of the survey questions. More schools selected to add a course to their curriculum in preparation for the graduation change than did not, and a majority of the classes that were added were upper-level classes. There were a number of special education classes added as well. Few schools deleted classes from their curriculum, and

nearly all of the deleted classes were lower-level classes. Trends regarding vocationally-based mathematics courses, integrated algebra and geometry classes, and two-year algebra classes are also worth noting. Most schools did not work closely with feeding schools to coordinate the high school mathematics sequence; however, schools implemented many modifications in anticipation of the arrival of this new requirement in order to help students achieve more success.

Discussion of research question #1—changes to curriculum. These survey questions revealed some interesting patterns relating to the curriculum with respect to what was added, what was deleted, and how leaders prepared not only their curriculum, but also their schools for the new requirement. While each school prepared for this change independently, there are some apparent similarities around the state.

Most schools knew that their curriculum, as it stood prior to the graduation change, would not be sufficient to handle the new stress of a greater percentage of students taking a third year of mathematics. Schools envisioned an expanded curriculum as a method to satisfy the need for more students to enroll in that third year of mathematics. There were a wide variety of classes added, with some schools adding more than just one class.

That 66.7% of added courses were upper-level classes is certainly noteworthy. An understandable concern exists; when graduation requirements are raised, the outcome is low-level coursework that is neither rigorous nor designed to make the student successful in earning credit but, in effect, poorly preparing students to actually use

mathematics in real-world situations. This topic is examined in greater detail in the results section of the third research question concerning upper-level enrollments.

Schools where multiple classes were added are also deserving of closer attention and specific mention. There were three schools that indicated that they added more than one course to the curriculum. The three schools followed two basic patterns. First, two schools added more than one class because they split algebra into a two-year (four-semester) process in order to comply with the algebra component of Senate Bill 575. The decision to split algebra into two years can be interpreted in two ways. Some would say that it is a wise move that allows students the chance to be more successful by moving at a slower pace. Opponents of teaching algebra to eighth graders argue that a rush has been created to have students complete algebra too early, before they are cognitively ready; thus, sacrificing a deeper comprehension of the material as well as time for projects that would allow students to understand concepts and their relevance. It has also been argued that extending the completion of algebra over two years inherently precludes students from having a chance to complete any advanced course past Algebra II. Second, the other school that added classes realized that they needed to offer mathematics classes at the other end of the spectrum, adding only upper-level classes of pre-calculus, statistics, AP Statistics, and Mathematics Applications I and II.

Not all the additions, however, were upper-level mathematics, and it is interesting to note that one-third of the lower-level classes added to the curriculum were designed to accommodate the needs of Special Education students in order for them to complete their third year of mathematics. The concept of providing Special Education students an

appropriate and an individualized least restrictive environment (LRE) is the essence of what students identified with a learning disability should be provided. That one-third of the courses added to curriculum are identified as specific to Special Education is telling. Is this an end run around the spirit of LRE, providing students a less challenging environment? Or is this an appropriate solution to a problem that, potentially, could have resulted in inappropriate or unrealistic expectations being offered to students with disabilities.

The lack of deletions from the curriculum are predictable, since the requirement change asked more of Illinois' students to graduate; eliminating options to help students would seem counterproductive. It would seem to follow the trend of adding more rigor to high school curriculums when noted that seven of the eight classes deleted were lower-level mathematics classes.

The need to make mathematics relevant and approachable for students is something educators have talked about for many years in an effort to help students appreciate the benefit of mathematics. Proponents of career and technical education (CTE) will be happy to see that schools found value in providing an opportunity for students to earn mathematics credit in a CTE environment. The most commonly added course as an adaptation to the new graduation requirement was a vocational or CTE-type of class. Integrating mathematics into a class where application of mathematical principles through hands-on experiences has been advocated for many years, but finding the proper course to create this opportunity has been elusive. Programs such as Project

Lead the Way or other STEM initiatives have been brought to many high school campuses in recent years, making the recent addition of CTE courses easy to understand.

The option of providing a two-year algebra course is a topic that has been discussed for many years well beyond the borders of Illinois. High school students who complete a two-year algebra sequence would likely spend a third year in a course that included geometrical concepts in order to complete that part of the graduation requirement. Completing algebra in two years significantly slows down the pace of instruction, theoretically allowing a deeper level of understanding to occur, since the rate at which new items are introduced is slowed down. While one might argue that students are more likely to be successful at this pace, some would argue that being successful at a low-level of mathematics is not an accomplishment connected in any way toward leading a student to post-secondary readiness. That only 35% of schools offer this option would indicate that a majority of schools do not consider this to be a beneficial option for their students.

A topic that is emerging from the introduction of the Common Core State Standards (CCSS) touts the benefits of integrating algebra and geometry. CCSS lists essential skills for students to master, rather than being concerned with identifying it as an algebra or geometry skill. Theoretically, the integration of algebra and geometry allows a school district at least two benefits: first, they can say they have exposed students to geometry while completing a first year of algebra; second, the district has the flexibility to teach the objectives identified in the CCSS without the constriction of the title of the course. Despite the movement toward this type of instructional approach, only

eight of 40 respondents (20%) in SQ8 indicated that an integrated algebra and geometry class is currently offered at their school. Perhaps the initiation of the CCSS will prompt more schools to examine this approach in the future.

There is a perceived benefit to working in a K-12, or unit, district where there can be curriculum coordination from one feeding school to the next, since they are “on the same team.” However, the lack of mention about aligning curriculum and little coordination on curriculum mapping between these levels is surprising given the grandeur and importance of this task.

The interventions and supports obtained from SQ5 are fascinating in their variety and their purpose. The wide variety of responses to what interventions were offered at their school might indicate that solutions may be highly dependent on the context of each location. Most modifications are linked to a specific class, where some difficulty has been seen by prior students in completing a third year of mathematics. The most common modifications are not costly to districts in their implementation. Few districts indicated interventions that would be expensive to implement such as adding staff, more support, and technology. Financial constraints are quite real to many school districts in Illinois, and the lack of interventions that would be costly in equipment or staffing is rather predictable given the state’s financial struggles.

How leaders adapted the curriculum to fit the needs of their students is interesting to assess. For many schools, the addition of a year of mathematics for students to graduate created troubling questions such as, “What will students who would not typically have taken a third year of mathematics take to complete their third year?”

The graduation requirement change forced many schools to re-assess their curriculum and how they would fulfill the additional class, making sure completion of algebra and exposure to geometry were accomplished. Clearly, major changes have occurred within mathematics curriculums across Illinois. Two-thirds of schools determined they must expand their offerings to meet the needs of their students and the demands of the new requirement. Experiments in the benefits to a two-year algebra class, integrated algebra and geometry, vocational offerings, and expanded special education classes are some of the many curricular adaptations experienced in some locations throughout the state

Research Question 2— Effects on Graduation Rates

As mentioned in Chapter 2, a common concern when raising graduation requirements is that there will be a negative impact on graduation rates and the increased demands will deter some students from graduating. The second research question was designed to examine the assumption that graduation requirement changes would negatively impact graduation rates and would determine what happened to graduation rates in Illinois during this transition to more stringent graduation requirements. The data collected regarding the second research question was designed to answer the question, “What are the effects, if any, on graduation rate with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?” Table 7 lists the research questions used to obtain data on the second research question in order to verify what effect this change had on the graduation rates at schools from the sample.

Table 7

Survey Questions Corresponding to Research Question #2

Survey Question #	Question
SQ10	Does your school use a web-based credit-recovery program?
SQ11	What was the ISBE graduation rate at your high school for the Class of 2005--the year prior to the graduation policy change being enacted by Illinois?
SQ12	What was the ISBE graduation rate at your high school for the Class of 2008--the year prior to the law taking affect?
SQ13	What was the ISBE graduation rate at your high school for the Class of 2009--the first year of the graduation policy change?
SQ14	What was the ISBE graduation rate at your high school for the Class of 2012--the most recent graduating class?
SQ15	Please describe any interventions or school-based initiatives that were designed to support struggling students to complete their third year of mathematics and at-risk for on-time graduation?

Results—graduation rates. Table 8 portrays the results of the graduation rate change over the four points of time in the survey for responding schools, as obtained from SQ11, SQ12, SQ13, SQ14. These four graduation years were specifically chosen as meaningful points in time in the timeline of Senate Bill 575's existence. Data from 2005 occurred before Senate Bill 575 was enacted and was unaffected by this legislation. Data from 2008 was the year prior to the point when students would have been asked to complete the requirements. The first year the requirement was enforced was 2009. Finally, the 2012 data would demonstrate the cohort of students whose high school careers never included anything but the three-year mathematics requirement.

Table 8

Historical Graduation Rates

	Mean	Standard Deviation	Median
Class of 2005	88.62	12.98	91.75
Class of 2008	88.14	15.00	92.60
Class of 2009	87.37	14.13	92.30
Class of 2012	84.15	11.55	85.50

In both mean and median, there has been a decline in graduation rate from 2005 to 2012. In fact, other than an increase in graduation rate median from 2005 to 2008, there is not a single gain to be found in the data displaying the trends in graduation rates. By looking at the means and medians on the table, you can see that, within the sample, there has been a drop in graduation rates in the recent years that the graduation requirements were changing. In fact, there has been a 4.47% drop in the mean scores in graduation rates from 2005 to 2012 as well as a 6.25% decline in the median over the same period of time.

Box plot charts of the median graduation rates for 2005, 2008, 2009, and 2012 can be found in Figure 1. The four box plots provide quartile divisions for each graduation year. The box plot also includes the mean for each year indicated by a small diamond as well as circles to represent outliers. Due to the large standard deviations posted in Table 8 and effect of a few outliers to the mean, these box plots provide a useful visual of the change in graduation rates and may, more accurately, represent the results of how graduation rates have changed over time.

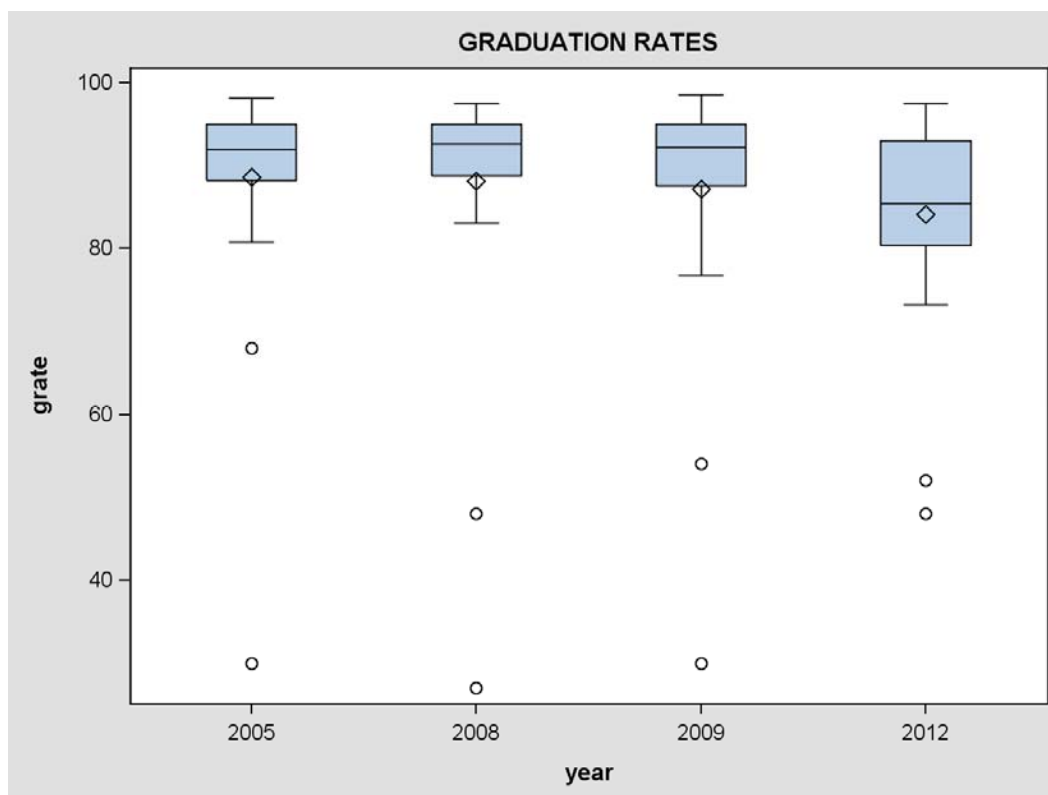


Figure 1. Box Plots of Graduation Rate Medians from 2005, 2008, 2009, and 2012

SQ15 results, provided in full detail in Appendix K, reveal the wide variety of school-based interventions offered to help students complete the third year of mathematics. The two most commonly mentioned ideas were a web-based credit-recovery program and a tutoring program. School-based tutoring provides help for students for classes they are currently taking in the traditional classroom setting. On-line credit recovery generally occurs outside the traditional classroom experience, typically providing instruction in a self-paced fashion, and is often offered to students who have already failed a course.

These credit-recovery programs are designed to moderate the effect of failed classes that are graduation requirements threatening a student's ability to graduation on time. Survey data indicates that 72% of respondents have an on-line, or web-based, credit-recovery program. Only 28% of the 40 respondents to SQ10 answered that their school did not have such a program.

The graduation rate survey questions provide interesting information about the trends that have occurred in Illinois while the graduation requirement changes were instituted. The drops in both mean and median would support the notion that graduation rates may tumble when more is asked of students. Even the presence of on-line credit-recovery programs and tutoring have not been able to stop the decline in graduation rates.

Discussion of research question #2—graduation rates. The anxiety legislators and educators felt about the effect this change would have on graduation rates appears to be well-founded. The anxiety policy makers and administrators felt rests in an assumption that there will be students who lack the academic capacity or personal motivation to handle the increased demands of the new requirement and will simply give up. Given the large population base in Illinois, this data represents staggering numbers of students that are not graduating.

The change in graduation rates indubitably includes other factors, but the change in mathematics was certainly the most significant and noteworthy change within Senate Bill 575. Without question, it should not be inferred that the decline in graduation rates should be attributed solely to the mathematics graduation requirement changes. Within a school district, there are multiple factors and changes that affect the success of students.

Programs change, curriculums change, teachers change, administrations change, demographics change, economies and funding change— most of the time, success in education is not a static measure that can be isolated with dependent and independent variables. Nonetheless, the results shown here should trigger a concerned reaction from all educators.

The mean graduation rate from the sample is similar to the statewide trend in graduation rates for all schools compiled by Kids Count Data Center (2013). Illinois' 5.1% decline in graduation rate average is different from the sample mean by only 0.63%. The Illinois graduation rate averages are shown in Figure 2.

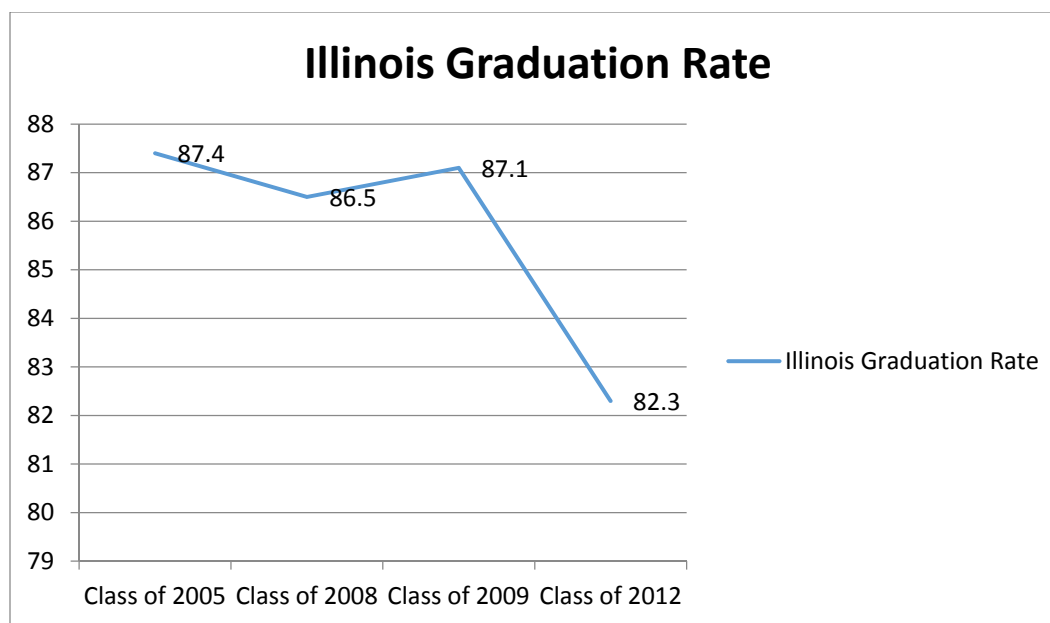


Figure 2. Illinois Graduation Rates from 2005, 2008, 2009, and 2012

The decline in these graduation rate numbers are despite a very healthy percentage of schools who are providing credit-recovery programs along with a strong list of supports that should positively help students. The results indicate that there are other factors involved beyond simply the presence of a few academic supports that may be warranted for students who are struggling.

Finding answers and options for graduation rate concerns is not only challenging, but can also be costly. Seventy-two percent of schools in the sample offer an on-line credit-recovery program. These programs are commonly offered to students who have failed a course at some point and are providing students a chance outside the traditional classroom setting to earn the credit for the failed class. Most programs offer classes in a wide variety of contents, including mathematics. Schools use these programs with hopes they will help with graduation rate progress by allowing students an alternative method to earn credit outside the traditional classroom.

This intent of this research was not to demonstrate causation of the graduation changes upon graduation rates. Certainly, the graduation rate data provides interesting points of discussion for educators to consider. The drop in graduation rates coincided with No Child Left Behind's (NCLB) efforts to raise these percentages, so it could not be argued that schools were unaware or unconcerned about these measurements at that time. In fact, these declines occurred at a time when graduation rates were more scrutinized than any point in years.

Research Question 3— Effects on Enrollment in Upper-level Mathematics

The third research question was “What are the effects, if any, on enrollment in upper-level mathematics courses such as Algebra II and above, with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?”

The survey included seven questions and provided data regarding the effect of the graduation change at each school with respect to the amount of students who reach upper-level mathematics courses. Table 9 lists those questions.

Table 9

Survey Questions Corresponding to Research Question #3

Survey Question #	Question
SQ2	What mathematics courses, if any, were added to the curriculum in order to prepare for added graduation requirements from the Class of 2009?
SQ16	What courses are offered at your school beyond Geometry?
SQ17	Using the titles of your school's upper-level mathematics courses listed in Question #16, please list total enrollment differences (expressed in percentages either positive or negative) between the Class of 2007 and the Class of 2012?
SQ18	What adjustments, if any, have taken place to encourage more students to enroll in upper-level mathematics courses at your school since the graduation requirement policy change?
SQ19	What percentage of seniors from the Class of 2007 were taking a fourth year of mathematics as compared to the seniors from the Class of 2012?

Results—upper-level mathematics enrollment. As seen in the results of the first research question and SQ2, upper-level mathematics courses were a large part of the curricular adaptation that was created as a result of Senate Bill 575. Sixty percent of courses that were added after the bill was passed created options that would be categorized as upper-level mathematics courses.

Appendix L, obtained from SQ16, details the wide variety of upper-level classes offered at responding schools. In total, 18 different upper-level course titles were identified as offerings by the sample. Algebra II, pre-calculus/trigonometry, AP Calculus AB, and statistics are offered at over half of the responding schools. Calculus, Algebra III, AP Statistics, and AP Calculus BC are offered by more than one of three schools in the sample.

SQ17, which asked “Using the titles of your school's upper-level mathematics courses listed in Question #16, please list total enrollment differences (expressed in percentages either positive or negative) between the Class of 2007 and the Class of 2012?” provides critical data to understanding what has happened to upper-level mathematics courses during the transition to the three-year graduation requirement. It is clear that during the period of graduation change implementation, high school student enrollment in upper-level mathematics courses increased. As seen in the results to SQ 17 in Table 10, 23 of the 33 responses (69.7%) reveal that upper-level mathematics enrollment had increased during this period of transition. Only three of the 33 schools indicated their upper-level mathematics enrollments had declined, while seven schools experienced no enrollment changes at all.

Table 10

Compilation of SQ17 Identifying Upper-Level Enrollment Changes (n = 33)

Change	Frequency	% of total responses
Positive	23	69.70%
Neutral	7	21.21%
Negative	3	9.09%

In addition to enrollment changes in upper-level courses, another quality indicator of an increase in upper-level mathematics courses would be seen in an examination of percentage of seniors taking a mathematics course. In SQ19, 13 respondents were able to quantify the difference in senior mathematics enrollment from 2007 to 2012 at their school. The respondents indicated a 7.85% average increase in senior year mathematics enrollment.

SQ18 asked respondents to identify any school-based initiatives that were potentially a part of the change in upper enrollments. Respondents shared types of initiatives that were designed to promote students to enroll in upper-level mathematics courses. The data reveals that schools were very active in promoting the value in upper-level mathematics enrollment to their students. Support from school counselors was the most commonly mentioned type of encouragement provided to students. The intrigue of new and exciting classes, an emphasis on college and career readiness, and ACT benefits were other commonly mentioned responses. Appendix G provides the complete list of

other methods of encouragement that schools offered for students to persevere and make it to the upper-level mathematics classes.

The results of the survey questions examining the third research question about upper-level enrollments uncovered an extensive amount of useful information. The overwhelming increase in upper-level mathematics in Illinois is the most prominent discovery. There are an abundance of classes offered to students to make this increase understandable. Increases in senior mathematics enrollments is also an encouraging discovery for educators who worry about how engaged seniors are academically as they prepare for college. Interesting findings about the importance of the role of the school counselor were also discovered.

Discussion of research question #3—upper-level enrollment. For Illinois legislators who hoped that this graduation change would expose more students to higher levels of mathematics, the fact that nearly 91% of schools statewide increased upper-level enrollments or remained the same would be seen as much needed good news, especially if you subscribe to the belief that enrollment in upper-level mathematics classes help student achievement. The news of such an overwhelming advancement in upper-level mathematics classes is also welcomed by legislators, as they consider how this good news may balance the scale with disappointing graduation rate results.

There is no shortage of upper-level mathematics courses for students. For years, Algebra II and pre-calculus/trigonometry courses have been seen as stalwarts of a mathematics curriculum—their availability in over 90% of Illinois high school mathematics departments would indicate that this tradition continues. These traditional

mathematics courses have dominated the landscape for many years and still provide challenge and substance to today's student. Many schools and students use these two courses as the upper-level mathematics classes for those who want to take four years of mathematics while in high school. A common sequence for a high school student intending to complete four years of mathematics would be Algebra I, Geometry, Algebra II, pre-calculus/trigonometry. That sequence has been a default "college prep" track for years and results would indicate that it will continue to be available to many students in Illinois.

The emergence in popularity of Advanced Placement (AP) courses nationwide, altering the traditional college-prep track that terminates with pre-calculus/trigonometry, is dramatic. Completion of AP courses provides students the opportunity to demonstrate on a nation-wide standardized test that they possess college-level mastery of a given topic. Students receive scores from a low of 1 to a high of 5. Many colleges recognize higher scores on AP tests for college equivalency credits, allowing students to start their fields of study at these colleges or universities at a level beyond "101" or entry-level, creating significant financial savings for families. In addition to the potential for savings in college, AP courses have become known as the gold standard for high school rigor. High schools pride themselves in offering as many AP classes as possible. Educators associate the "AP" label with upper-level course and increase rigor. AP mathematics courses remain very popular in Illinois, with AP Calculus AB (71.88%), AP Calculus BC (34.38%), and AP Statistics (37.50%) demonstrating high popularity in high school curriculums.

Statistics (59.38%) and calculus (43.75%) also remain upper-level mathematics options for many Illinois high school students. These non-AP options remain viable opportunities for high school students who recognize the importance of continuing mathematics for four full years of high school but are wary of the intense rigor and speed of an AP class. Trigonometry is also available at 31.25% of Illinois high schools in this sample, indicating its overall popularity as well.

The survey data for the third research question also creates some interesting conversations about the advance of upper-level classes, while graduation requirements were being raised. Sometimes, upper-level mathematics causes a type of “Which came first, the chicken or the egg?” conversation for educators. Did student demand create the need for these classes or did students enroll in these classes because the school offered them as the next class in their mathematics progression? It is most likely a combination of both factors, but the range of upper-level classes available to students from schools in the sample is quite remarkable in its breadth and variety.

While it should be noted that not all seniors enrolled in mathematics are guaranteed to be placed in an upper-level class, the increased percentage of seniors taking a mathematics class is also an encouraging sign. Much has been made about the “blow-off” senior year; this data suggests that a higher percentage of students are not choosing to go without a mathematics course as seniors. Realistically, with the exception of seniors who are completing a third year of mathematics after one or more failed courses, most seniors are in a mathematics course close to college level work.

Two interesting trends emerge in the upper-level classes offered at the schools of the 32 respondents in SQ16. Perhaps, not as high on the rigor spectrum as some other upper-level courses might be, six schools provide students a “mathematics applications” option, with the varying titles provided in the note to Appendix F. These application courses seem to be oriented around a genuine need to provide students a mathematics opportunity beyond geometry that focuses on relevance and practical use of mathematics. While, perhaps, not recognized by the NCAA Clearinghouse as college-preparatory mathematics courses, it is obvious that courses such as these provide students a necessary connection to mathematics and an answer to the age-old question, “Why do we have to learn this?”

The importance of the role of school counselors in this process can be seen clearly in the results shown in Appendix G as well. In many cases, students spend more time discussing what classes they should take in high school with their counselor, rather than with their parents or guardians. The encouragement and advice provided to students by counselors is meaningful and commonly provided. If school counselors serve as “gate-keepers” rather than encouraging students to persist in mathematics, the likelihood that students reach higher levels of mathematics will be greatly diminished.

Also seen in the results to SQ18 is the value in offering courses interesting and relevant to students. Principals indicated the addition of new courses as the second most motivational factor for students to take an upper-level class. These principals have seen the value that these new classes have in meeting the needs of the varied academic

interests of their students and in being a significant factor leading to a greater degree of retention, as students matriculate through the mathematics curriculum.

Upper-level mathematics availability and enrollment would seem to be a success story in Illinois. There are an abundance of upper-level courses available to students, including healthy AP offerings in many locations. With fewer seniors forgoing mathematics, the upper-level enrollments are surging, which would presumably be a positive sign for more students being college and career ready. Whether seniors are taking college-level mathematics or application-based courses and applying the algebra and geometry they learned as freshmen and sophomores, one fact is clear, school counselors are enrolling more seniors in mathematics.

CHAPTER 5

CONCLUSIONS

The State of Illinois' mathematics graduation requirement change would certainly appear on a short list of most common topics debated and scrutinized by principals and mathematics teachers consistently over the last 10 years. State legislators were looking for something that would be a “game changer” for students in Illinois to propel them to greater success. This research would support that the game has changed; however, not all of that change would be considered positive.

The intention of this research study was to examine whether or not the efforts on the part of those implementing the state mathematics graduation requirements saw any benefit. There has been a great deal of discussion about raising the rigor for the American student, but documented results of what happens when rigor is elevated are inconclusive. For those “in the trenches,” this graduation requirement change has been a challenge. From determining what courses students would be able to take, to how to match instruction with the needs of students, to counseling students through the added demands of an additional year of instruction—this change has affected the professional life of thousands of educators.

A secondary intention of this research was to provide tangible data on the effects of adding mathematics graduation requirements for Illinois school districts. Knowing what happened as these changes occurred in Illinois and offering some prediction of potential issues will hopefully provide benefit to other educators.

Conclusions to Research Questions

Regardless of what angle the individual school board, legislating body, or administrative leadership team use to examine this topic, it seems that there is a growing body of research that would indicate a school could expect upper-level mathematics gains and graduation decline if a mathematics graduation change is enacted.

Question #1— What are the effects, if any, on the mathematics curriculum with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?

The results indicate that in order to accommodate the needs of students to complete a third year of mathematics, schools may have to add courses to their curriculum. Simply put, for most schools, what is in the curriculum guide may not be enough to meet the demands of all students to complete the third year of mathematics study. Adding options for the wide diversity of student learners who attend traditional high schools should be planned and purposeful. Many schools noted how they adapted their curriculum by adding courses that were designed largely for students who may not have chosen to take a third year of mathematics without a little nudge from the state.

The upside of the call to augment the scope of the curriculum is that these enhancements will likely occur at the upper levels. While the needs of Special Education students should not be excluded from this planning, it is obvious that consciously planning for classes that will extend students' exposure to mathematics is very possible. Having the liberty to design classes that are engaging and challenging for students is a

desirable position to be in for curriculum directors and those vested in the curriculum change process.

Vocationally-oriented mathematics can provide great benefit to schools that consider how to face the challenges of an additional year of mathematics. As the data indicates, many schools decided that adding a vocationally-related or STEM type of mathematics course would provide an alternative to students to maintain their interest in mathematics. Respondents mentioned the value of vocational classes in the questions related to how the curriculum was expanded and improved. Vocational mathematics courses were also mentioned in response to what were the one or two most significant adjustments the school made during this transition. Obviously the value of these course offerings to these schools was significant enough that respondents picked this option above other elements to the change.

Vocational mathematics and STEM classes tend to attract students who are very interested in a hands-on learning experience and find classes of this sort engaging and less abstract than traditional mathematics classes. There are more opportunities for application of concepts in classes, which is particularly useful when considering a class beyond geometry if students do not think that a second year of algebra will be any more enjoyable than their first class was. Groups such as High Schools That Work who have consistently promoted the value of vocationally-oriented classes will feel validated that this option was of great benefit to Illinois high schools during this transition period.

Guidance has a big role in the process. Respondents mentioned the value of school counselors in multiple locations on the questionnaire. An endeavor of this

magnitude involves a commitment from teachers, curriculum directors, and administrators. But the research responses wisely pointed out that the role of the school counselor is just as important as any of the other stakeholders.

During this transition to three years of mathematics to graduate, counselors held key responsibilities. They had to determine what would be best to empower students to be successful and more likely to graduate. If new courses were created, they had to learn details of how that class would fit with the academic aptitudes of the students, all the while keeping in mind the pressure to promote students to the highest degree of rigor they could handle. The multiple demands placed upon the counselors are an important realization of respondents.

Question #2— What are the effects, if any, on graduation rate with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?

Graduation rates were affected noticeably during this time of transition. Unquestionably, the most concerning element of this research is the relationship between the graduation requirement change and graduation rate decline in Illinois. There are multiple factors involved with examining graduation rates, and this research project was not narrowly focused on what caused a graduation rate decline; this study wanted to explore whether or not something happened. Something did happen to the state-wide graduation rate both within the sample as well as throughout Illinois' school districts.

Clune and White (1992), Hoffer (1997), and Porter (1998) all concluded through their research that there was no association with graduation rate decline and state

graduation requirement changes. Their work isolated graduation rates, while this study did not, so that work should not be diminished. However, it would be foolish to disregard what has happened in Illinois as an anomaly and something that couldn't happen anywhere else.

This research would follow the more recent findings of Daun-Barnett and St. Johns's (2012) that indicated that there is an expected decline to graduation rates when a change is implemented. Hopefully, their hypothesis that the effect of the graduation change will be diminished over time as instructors at preceding levels select better strategies leading to higher graduation rates for Illinois students.

Question #3— What are the effects, if any, on enrollment in upper-level mathematics courses such as Algebra II and above, with respect to Illinois Senate Bill 575 requiring students to successfully complete three years of mathematics in order to graduate?

The data is very conclusive that during this transition from two to three years of mathematics to graduate, student enrollment in upper-level mathematics classes increased. This work supports the research done by Schiller and Muller (2003) and Teitelbaum (2003) who found a connection from the mandatory third year to upper-level enrollment increases. Schools in Illinois did not respond to the call to ask more of its students by offering a lower starting level and not allowing exposure to upper-level mathematics to occur. The fact that 60% of the courses that were added to the curriculums of the responding schools were past geometry is not trivial information. Schools reacted to the expected needs of students completing the graduation requirements

with offering classes that predominantly could not be considered “dumbing down” the curriculum.

The evidence that more seniors are taking a mathematics course at all supports the assumption that adding a third year of mathematics will help students consider mathematics even beyond the required third year. Acknowledging that seniors have increased their presence in mathematics classes validates that this initiative helps students to remain plugged into the mathematics department beyond the bare minimum asked of them.

The timing of the graduation requirement change coincided with increasing intensity of those like Willard Daggett, ACT, and Achieve, Inc. advocating higher expectations, rigor, and demand of the American student. It is quite conceivable that this campaign would have prompted many schools to enhance their curricular offerings at the upper-level, but the graduation requirement change pushed the concept from good idea to a necessity. Certainly the support that these reformers provided made the change easier to support.

It is important to provide some context as to why the changes to upper-level mathematics enrollment in Illinois is so momentous. Upper-level enrollments are higher than they were before the change despite occurring during an era of unprecedented budget cuts in many places across the state. Illinois was among many states during this time affected by a very weak economy, which caused state governments and local taxing bodies to have fewer resources. Many state budgets for education were cut severely during this recession—Illinois was certainly affected, possessing the most seriously

financially-stressed state government in the nation. So, for classes to be added to the curriculum at the upper-level is encouraging and perhaps even a little unexpected overall, given the intense economic constraints many districts have experienced.

Recommendations for Practice

As educators, there is a lot to glean from this “experiment” Illinois provides the rest of the nation. The experiences of educators in Illinois preparing for this change and the compilation of what was done provides some ideas for others considering such changes.

Primarily, those who would make a decision to increase the graduation requirements would be wise to look at the literature and results from Illinois and ask themselves this very important question—Do the gains in upper-level mathematics offset the graduation rate decline? The data collected in this survey seems to support the notion that a graduation mathematics change can positively alter the likelihood that students enroll in upper-level mathematics courses, but are less likely to graduate. So, what should educators do with this information? Should a school design multiple interventions for those students who may be at-risk of not graduating? Should schools shy away from pushing more students into mathematics courses because it could then hinder their progress toward graduation?

After looking at the data from Illinois and considering related professional literature, there are some pieces of advice one might follow when preparing for a third year of mathematics.

First, expect graduation problems associated with the new requirements. When people worry about the effect of a graduation change on students who struggle, it turns out they most certainly are on to something. Individual locations responded with a wide variety of efforts to support students who were going to struggle in mathematics. The supports mentioned are unique to that location and vary depending on a wide variety of contextual issues such as staffing, budget, success of feeding-grade mathematics programs, and general devotion to the concept that all children can learn and should be learning in this school. If educators could walk into this change with an expectancy of graduation challenges associated to this task, it may help their urgency to design the necessary supports and interventions for their students.

Secondly, design academic supports beyond just tutoring and credit-recovery programs. Many schools tout their credit-recovery program as the answer to the problems some have regarding graduation completion concerns. The logic goes, “We have a credit-recovery program; therefore, students who fail a class can resolve their issue there.” Offering on-line credit is not a guarantee to solve all students’ graduation credit issues. During the time of this graduation decline, 72% of schools offered a credit-recovery program of some fashion. Reliance on an on-line credit-recovery program is not enough and should only be seen as one of the measures in place to support students who are having trouble earning credit in the traditional mathematics classroom.

Third, school counselors will be critical in the process of helping students with the demands of a changed list of graduation requirements. A school’s effective use of advisement and support from the school counseling office can make a dramatic

difference. An effective school counselor can have a profound influence on a student's ability to graduate. Placing students in the proper classes that provide appropriate challenge and intellectual engagement is crucial to their continued success for three years. Involving counselors in the adaptation any school makes will be critical for a school's success.

Fourth, don't forget STEM and vocational options. One surprising element to the survey results were the repeated mention of the usefulness that CTE and vocational classes provided schools when considering what was missing. Schools concluded that something a little different than the traditional mathematics experience is needed for those students who may be ready for a deviation from the common first and second year mathematics courses: algebra and geometry.

Similarly, don't forget Special Education students' needs. The most commonly added course that was not clearly defined as upper-level was a special education class. Asking all students to complete algebra and gain an exposure to geometry may be extremely challenging for some students. Considering how students can most appropriately obtain this exposure while not holding them back from taking the most rigorous class appropriate is a challenge schools should consider carefully.

Recommendation for Further Research

There are a number of associated issues worthy of future research.

What has happened to student achievement over the same period of time? Left unexplored in this research and its conclusion is the important matter of student achievement. Now that more students are taking a third year of mathematics, has

academic achievement been affected? It would seem to make good sense that, since students are being exposed to more complicated mathematical concepts, a student could score higher on an ACT test—one used by Illinois as part of its state testing.

Determining whether there is some type of connection between providing and achieving more is vitally important. More students are taking upper-level classes—does it translate to higher achievement?

What are the specific causes of the graduation rate decline in Illinois? Are those causes directly related to the graduation change? A sharp researcher would see the results uncovered in this study and be curious as to how one could isolate the specific areas where students experience the trouble that most threatens their ability to graduate. The educational paradox and good intentions of a graduation requirement change such as this, where students are more likely to enroll in upper-level mathematics classes while being more likely not to graduate, leaves an educator wondering where the problem truly lies. Is the trouble gaining mathematics credits more common at entry levels of mathematics or at the upper-levels attaining the third and final year?

A researcher could attempt to isolate where students in schools with new graduation requirements encounter the problems that increase their likelihood not to graduate. If educators knew where the problem originated with a greater degree of certainty, then there could be supports put in place to better solve the problem. As it works right now, there is an uncertain effort to support students at all levels, since schools don't accurately know whether their help should be aimed at students in upper- or lower-level classes.

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APPENDIX A

PERMISSION FROM PRATT

Hello,

Permission is hereby granted to use my dissertation and all its methodology, including survey design and analysis, as a basis for structuring your own survey and dissertation. Good luck to you. If I can be of further assistance to you or help you in any way please do not hesitate to ask.

Dr. Michael Pratt
1015 Bent Oak #4
Adrian, MI 49221
(517)263-5583

APPENDIX B
QUESTIONNAIRE

Corey Tafoya
EdD Candidate
University of Northern Iowa

Evaluating the Effects of Increasing Mathematics Graduation Requirements: A Survey of
the Effect of State Policy Change in Illinois

Questionnaire

The questionnaire is anonymous and will be treated confidentially and may not be disclosed, unless required by law. Questionnaire data will be stored in a locked file cabinet and then destroyed upon completion of the dissertation research. No one else has permission to use or access to the electronic survey instrument. Results will be used and disseminated only in aggregate form and no schools will be identified in any way using this research data.

Demographic Information

1. What is the current enrollment of your school?
2. What was the enrollment of your school when the law first was passed in September 6, 2005?
3. Does your school have students in grades 9-12? Yes/no
4. Is your school a unit school district? (Grades PreK-12) Yes/no
5. Are you the only school in your school district with students in grades 9-12?
Yes/No

Effect on Curriculum

1. Did your school already require three years of mathematics to graduate prior to Senate Bill 575 which was passed on August 24, 2005?
2. Were any courses added to the curriculum to prepare for added graduation requirements for the Class of 2009? Yes/No
If yes, what was the name of the new course?
3. Were any courses deleted from the curriculum to prepare for added graduation requirements for the Class of 2009? Yes/no
If yes, what was the name of the dropped course?
4. Did the feeding middle schools or junior highs adjust their instructional sequence in any way to help high school students complete the new three year sequence in any way?
If yes, how was the sequence altered?
5. Does your school have a two-year (four semester) Algebra course?

6. Does your school have a course that integrates Algebra and Geometry that meets the state's expectation of exposure to Geometry?

Effect on Graduation Rate

1. What was the graduation rate for the Class of 2005—the year prior to the graduation policy change being enacted by Illinois?
2. What was the graduation rate for the Class of 2008—the year prior to the law taking effect?
3. What was the graduation rate for the Class of 2009—the first year of the graduation requirement policy change?
4. What was the graduation rate for the Class of 2011—the most recent graduating class?
5. Please describe any interventions or school-based initiatives designed to support students struggling to complete their third year of mathematics?
6. Does your school use web-based credit recovery programs for mathematics?
7. Have class sizes for students in mathematics courses changed due to this added year of study?

Effect on Upper-Level Mathematics Courses (Using Anything beyond Geometry)

1. What courses are offered at your school beyond Geometry?
2. Using the titles of your school's upper-level mathematics courses listed previously, can differences (expressed in percentages) in enrollments be found in each upper-level course from the Class of 2007 to the Class of 2011?
3. Were any upper-level mathematics classes altered to assist your school? Yes/no
4. If yes, how were these upper-level classes altered?
5. Are any of your upper-level mathematics courses combined with vocational or CTE courses?
6. What percentage of seniors are taking a fourth year of mathematics from the Class of 2007 compared to the Class of 2011?

General Effects (Self-Analysis)

1. What do you feel were the one or two biggest adjustments for your school during this period of transition from two years to three years of mathematics required to graduate?
2. Are there any other effects worth noting about this graduation change at your school?

Dissemination of Results

1. A copy of this research will be provided to your school if requested. Please leave the name of your school and contact information if you would like to receive the results of this research.

APPENDIX C

INTRODUCTORY LETTER

June 25, 2012

Dear (XXX),

Greetings! My name is Corey Tafoya. I am the principal at Woodstock High School in Woodstock, Illinois. I am currently working on my Ed.D. from the University of Northern Iowa. I am completing my dissertation on the effects of the State of Illinois' policy change requiring all public high school students to complete three years of mathematics in order to graduate. I plan to examine the effects on schools with enrollments between 670-1580, which are the schools that participate in the 3A classification for boys' basketball. My specific focus is on the effects of this change on graduation rate, the curriculum, and the amount of students taking higher-level mathematics courses. Your school is one of the 149 schools within my sample. My target is to receive at least half of that sample size, so your participation is very important to me. With your help, I hope to determine whether the change in mathematics graduation requirements in Illinois has had our schools. This research will be very interesting to all of us who worked through this change in our schools.

It may be that you, as the principal, feel that someone else within your school or your district is more qualified to answer these questions on the survey about changes that occurred from 2005 and 2010. Perhaps someone in your district was more closely involved in this change process. If you would like to ask for help or to delegate this responsibility to someone else, that is perfectly understandable; however, I hope to get one response from each school. Use your local knowledge as best you can to create as reliable responses as possible in regard to the questionnaire.

Now what? Here is your link to access the survey. It should take you about 20-30 minutes to complete and may require you to dig into your historical data a little in order to find some of the answers. You may want to print the survey and collect the answers before officially responding to save time as well.

Link : www.surveymonkey.com (The exact link has not been created yet.) I hope to close the survey by August 1st, so I appreciate your quick response. You will also receive an email from me in the next few days with an electronic link to the survey.

Information obtained during this study that may identify a school or district will be kept confidential. The results of this survey will be kept in a password-protected account. The summarized findings, with no identifying information about any school or school district, may be published in an academic journal or presented at a scholarly conference. As a reminder, no participant will receive any kind of direct benefit or compensation for this

study. Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all; by doing so, you will not be penalized or lose benefits to which you are otherwise entitled.

If you have questions about the study or desire information in the future regarding your participation or the study, you may contact me at 815-276-3928 or the project investigator's faculty advisor Robert Decker at the Department of Educational Leadership, Counseling, and Postsecondary Education, University of Northern Iowa 319-273-2605. You can also contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148, for answers to questions about rights of research participants and the participant review process.

Consent to participate in this research will be obtained electronically as the first page of the survey and must be finished in order to complete the survey. Thanks for your help and best wishes on a great school year!

Sincerely,

A handwritten signature in black ink, appearing to read "Corey Tafoya". The signature is written in a cursive, somewhat stylized font.

Corey Tafoya

APPENDIX D

INTRODUCTORY EMAIL

Greetings! My name is Corey Tafoya. Recently in the mail I hope you received a letter from me regarding a research study I am conducting through the University of Northern Iowa. I am the principal at Woodstock High School in Woodstock, Illinois. I am currently working on my Ed.D. from the University of Northern Iowa. I am completing my dissertation on the effects of the State of Illinois' policy change requiring all public high school students to complete three years of mathematics in order to graduate. I plan to examine the effects on schools with enrollments between 670-1580, which are the schools that participate in the 3A classification for boys' basketball. My specific focus is on the effects of this change on graduation rate, the curriculum, and the amount of students taking higher-level mathematics courses. Your school is one of the 149 schools within my sample. My target is to receive at least half of that sample size, so your participation is very important to me. With your help, I hope to determine whether the change in mathematics graduation requirements in Illinois has had our schools. This research will be very interesting to all of us who worked through this change in our schools.

It may be that you, as the principal, feel that someone else within your school or your district is more qualified to answer these questions on the survey about changes that occurred from 2005 and 2010. Perhaps someone in your district was more closely involved in this change process. If you would like to ask for help or to delegate this responsibility to someone else, that is perfectly understandable; however, I hope to get one response from each school.

Here is your link to access the survey. Link:
<https://www.surveymonkey.com/s/B2CS3VK> It should take you about 20-30 minutes to complete and may require you to dig into your historical data a little in order to find some of the answers. You may want to print the survey and collect the answers before officially responding to save time as well.

I hope to close the survey by August 10th, so I appreciate your quick response.

Information obtained during this study that may identify a school or district will be kept confidential. The results of this survey will be kept in a password-protected account. The summarized findings, with no identifying information about any school or school district, may be published in an academic journal or presented at a scholarly conference. As a reminder, no participant will receive any kind of direct benefit or compensation for this study. Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all; by doing so, you will not be penalized or lose benefits to which you are otherwise entitled.

If you have questions about the study or desire information in the future regarding your participation or the study, you may contact me at 815-276-3928 or the project investigator's faculty advisor Robert Decker at the Department of Educational Leadership, Counseling, and Postsecondary Education, University of Northern Iowa 319-273-2605. You can also contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148, for answers to questions about rights of research participants and the participant review process.

Consent to participate in this research will be obtained electronically as the first page of the survey and must be finished in order to complete the survey. Thanks for you help and best wishes on a great school year!

Sincerely,

A handwritten signature in black ink, appearing to read 'Corey Tafoya'.

Corey Tafoya

APPENDIX E

REMINDER EMAIL

August 21, 2012

Dear administrator,

Hello! My name is Corey Tafoya. I am a doctoral student at the University of Northern Iowa and currently serve as the principal at Woodstock High School in Woodstock, IL. In mid-July, I sent you a letter alerting you to my doctoral research study as well as an email including a link to the survey itself. Your school is one of the sample schools included in the survey and the information you provide will help me determine the effects on our mid-sized high schools of the state's recent graduation change in mathematics to three years.

To those of you who have already completed the survey, I sincerely thank you. I have 17 responses so far and I am looking for 70, so I have a ways to go and need your help. For those of you who have not yet had that chance here again is the electronic link to the survey. Link : <https://www.surveymonkey.com/s/B2CS3VK> Clicking on the link will take you directly to the survey. If you feel someone other than you would more accurately respond to the questionnaire, feel free to share this email and link with that person so that I can get representation from your school. Keep in mind that the results of the questionnaire will be completely anonymous.

The survey will take 15-20 minutes to complete and may require you to dig into your historical data a little in order to find some of the answers. You may want to print the survey and collect the answers before officially responding to save time.

The final question on the survey asks if you'd like to receive an executive summary of the dissertation when it's completed. I chose this topic because I thought it would be both useful and interesting, so if you'd like to see the results of the study you helped create, please complete the survey and respond affirmatively to the final question.

Thank you very much for your help!

Sincerely,



Corey Tafoya

APPENDIX F

QUESTIONNAIRE RESULTS

Evaluating the Effects of Increasing Mathematics Graduation Requirements

UNIVERSITY OF NORTHERN IOWA HUMAN PARTICIPANTS REVIEW INFORMED CONSENT --ELECTRONIC Project Title: Evaluating the Effects of Increasing Mathematics Graduation Requirements: A Survey of the Effects of State Policy Change in Illinois Name of Investigator(s): Corey Tafoya Invitation to Participate: You are invited to participate in a research project conducted through the University of Northern Iowa. The University requires that participants provide authorization to participate in this project. The following information is provided to help you make an informed decision about whether or not to participate. Nature and Purpose: In 2005 the Illinois Legislature mandated that any student who graduates from a public high school must have three years of mathematics, including one year of Algebra and one year of Geometry, in order to graduate. The intention of this law was to increase the level of proficiency in mathematics by requiring more exposure to mathematics at higher levels. The purpose of this study is to examine the effects of this policy change on the graduation rate, curriculum, and enrollment in higher level mathematics courses in the affected schools. Explanation of Procedures: The researcher is responsible for collecting this data from schools. After contacting each school introducing the survey via letter, the link to the survey will be distributed via email. The researcher will send the survey to principals of the selected schools to determine who is best suited to answer these questions based on tenure in the district, experience with curriculum in relation to the changes that occurred at both the district and school level. The survey should take no longer than thirty minutes to complete. The survey results will not include identification of individual school districts or schools because the objective of the research is to study the aggregate state-wide effects on schools. All responses will remain confidential with the researcher. Once the study is completed, the investigator, upon request, will provide each participating district or school a copy of the major findings of the study. Discomfort and Risks: Risks to participation are minimal; you will be one of 149 schools to be interviewed for this study. Risks to participation are similar to those experienced in day-to-day life. There are no foreseeable risks to participation. Benefits and Compensation: No participant will receive any kind of direct benefit or compensation for this study. Confidentiality: Information obtained during this study that could identify you will be kept confidential. The results of this survey will be kept in a password-protected account. The summarized findings, with no identifying information about any school or school district, may be published in an academic journal or presented at a scholarly conference. Right to Refuse or Withdraw: Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all; by doing so, you will not be penalized or lose benefits to which you are otherwise entitled. Questions: If you have questions about the study or desire information in the future regarding your participation or the study, you may contact Corey Tafoya at 815-276-3928 or the project investigator's faculty advisor Dr. Robert Decker,

University of Northern Iowa 319-273-2605. You may also contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148, for answers to questions about rights of research participants and the participant review process. Agreement: I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older. Please sign the comment box to authorize participation.

Answer Options	Response Count
	51
<i>answered question</i>	51
<i>skipped question</i>	1

Number	Response Text
1	Vicki L Dunphy
2	Amy Jo Mascal
3	rw
4	Nick McGurk
5	Tim Carlson
6	Ryan Wamser
7	Diane K. Hutchins
8	Jori Bowen
9	Roy Van Meter
10	Mike McGiles
11	Richard Eiler
12	Mike Haugse
13	wiiliam J. Sanderson
14	Brenda Berg
15	Todd Leden
16	Jill A. Farrell
17	Jill M. Warren
18	rodney winslow
19	Bethany Hall
20	John S. Kohl
21	Sharon Gonzalez
	Jeff Dobbertin

Athletic Director/Assistant Principal

22	Belvidere High School
23	J.R. Boudouris
24	Jill Farrell
25	Travis Mackey
26	Jim Jennings

27	Jennifer L. Kirmes
28	George Charnley
29	Kim Davis
30	Robert F. Zielinski
31	Scott Tonsor - AD
32	P. Joseph Powers
33	bob richardson
34	Kelly J. Hussey
35	John Byrne
36	Jason Wind
37	Chuck Bumbales
38	Michele Sinclair
39	Monica Schmitt
40	Daniel Klett
41	Greg Bradley
42	Eric Gallagher
43	Chuck nagel
44	Kevin Shelton
	Robin R. Tonkin
45	Canton High School
46	Marc Eckmann
47	Jill M. Warren
48	Dee Roberts on behalf of John Bolger
49	Marjorie Johnson
50	Terry Ryker
51	Scott Shepard

Question #2--What mathematics courses, if any, were added to the curriculum in order to prepare for added graduation requirements for the Class of 2009?

Answer Options	Response Count
----------------	----------------

39

<i>answered question</i>	39
<i>skipped question</i>	13

Number	Response Text
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1	Nothing was added to the regular ed sequence. We did need to expand our self-contained classes to meet the 3-year requirement. We also added courses for a 4th year of math. When 3 years were required,
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- many of our students started to take 4 years. We then added more Alg3/Trig classes and AP statistics, expanded the number of AP Calculus classes and added Stats in Sports as an alternative
- 2 0
- Algebra 1A and Algebra 1B was initially created and lasted for 7 years. However, this has been dropped and we are moving back to
- 3 traditional Algebra in 1 year
- 4 Business Math & Trig
- 5 College Algebra
- 6 None
- 7 None
- 8 None
- Pre-Calculus, Statistics, AP Statistics, Math Applications 1, Math
- 9 Applications 2
- We got rid of our two year Algebra. Now students take one year of algebra, then they take a plane geometry, and for year three,
- 10 transitional algebra.
- 11 none
- 12 Integrated Algebra/Geometry
- 13 None
- 14 Algebra II Essentials
- 15 None.
- Algebra was split into 2 years...Algebra 1A and Algebra 1B...However, this was eliminated last school year with a modified Algebra single year course that all students take their freshman year. This Algebra course has increased support for students who
- 16 traditionally took the 2 year sequence.
- Foundations of Algebra (Part 1 of old Algebra I)
- Algebra I (Part 2 of old Algebra I)
- Algebra was turned into a two year course. Most students complete Foundations in 8th grade and Algebra I in 9th grade. Students who
- 17 failed or struggle repeated Foundations of Algebra 9th grade
- Algebra I Extended
- 18 Algebra II Essentials
- 19 Calc BC
- 20 None
- 21 No courses were added
- We have had a 3 year math requirement for several years. We did add Functions and Statistics. We also added a Mathematics lab class that
- 22 provided additional help and time on task.
- Two year algebra sequence (Alg 1A and Alg 1B) with integrated
- 23 geometry as a third year vs. plane geometry
- 24 Additional algebra classes
- 25 None

- 26 Integrated Math as a 3rd year completion course.
 27 calculus & trigonometry
 28 two instructional special education courses
 29 None
 Applied Algebra and geometry
 30 Agricultural math
 31 Stat and Finite Math
 32 none
 33 None
 34 None
 35 None
 No courses were added. Our district already required three years of
 36 math.
 37 We added a course called Algebra with Career Applications.
 Technical math added for juniors or seniors in CTE courses who
 38 struggled with Algebra II
 39 None

Question #3--What courses, if any, were deleted from the curriculum in order to prepare for added graduation requirements for the Class of 2009?

Answer Options	Response Count
	39
<i>answered question</i>	39
<i>skipped question</i>	13

Number	Response Text
1	Nothing was deleted
2	0
3	Consumer Math
4	Intro Alg 1 & Intro Alg 2
5	NA
6	None
7	None
8	None
9	none
10	Algebra I B
11	none
12	None
13	None
14	None
15	None

16	Survey of Math and Pre-Algebra Algebra I (1 year course), Pre-Algebra and Modified
17	Algebra
18	None as of yet
19	Algebra 1 Part 1
20	None
21	No courses were deleted
22	None
23	Basic math for freshmen
24	None
25	None
26	None
27	none
28	None
29	NOne
30	None
31	no
32	none
33	None
34	None
35	None
36	None
37	None
38	none
39	None

Question #4--How did middle schools or junior high schools adjust their instructional sequence to help high school students complete the new three-year sequence?

Answer	Response Count
Options	

38

<i>answered</i>	
<i>question</i>	38
<i>skipped</i>	
<i>question</i>	14

Number	Response Text
1	Nothing was changed. However, another section of Algebra 1 was added due to the inclusion of the AVID Program
2	Didn't
3	There is more of a pre-algebra and algebra push at the 7th/8th grade level

4 They didn't, this is an ongoing issue
5 NA
6 No changes
-Stronger articulation regarding our placement into HS math
7 -Algebra 1 became more aligned despite not being a unit district
The sequence was not really adjusted but we were already taking a
serious look at alignment at that time anyway. Our efforts at that time
were to make sure the courses offered at our JH aligned to and
8 prepared students for our HS courses
9 none
We have always had a few sections of Algebra for advanced 8th
10 graders.
11 N/A
12 ??
13 We are a high school district.
14 I don't know
We are not a unit district. We have eight feeder grade schools that feed
into our high school. We conduct articulation meetings but I do not
know how the feeder schools have adjusted their instructional math
15 sequence.
16 Pre-Algebra and Algebra 1 are being taught at MS level
17 See above. 1st part of high school Algebra started in 8th grade year.
18 I am not sure
19 they didn't need to
20 No adjustment was made
We have done a lot of articulation with our feeder schools so that the
21 majority of the students are ready for Algebra 1 as a freshmen
22 No adjustments were made.
addition of Alg 1A causing adjustments of which students have pre alg,
23 alg 1A and Algebra 1
24 moved to common core and added minutes to their day for math
25 Unknown
26 Only changes as we enter common core standards implementation.
27 don't know
Unknown - We are a single building high school district with no
28 "control" over feeder districts curriculum
29 They did not
30 we didn't make any changes at that level
31 none
32 no change
33 It did not
34 No change
35 No adjustment

- We are a single high school district and each of our seven feeder grade schools are single unit districts. They all basically do their own thing.
- 36 There is very little articulation or collaboration.
- 37 We have one feeder school...they did not adjust their curriculum.
- 38 did not

Question #5--What curricular modifications, if any, were initiated in anticipation for students who, prior to the graduation requirement change, may not have been likely candidates to take a third year of mathematics?

Answer
Options

Response Count

37

answered
question 37
skipped
question 15

Number	Response Text
1	None. Our students were already taking 3 years. Curricular modifications are a result of the alignment to the CCSSM not the requirement of three years of math.
2	None
3	2 years of Algebra (Algebra 1A all year represents the 1st semester of Algebra) (Algebra 1B all year represents the 2nd semester of Algebra)
4	We offered loser track math courses we titled as Alg a/b, Geometry a/b The additional class in part was created for those students that would not "fit" into currently offered class.
5	No changes, our district already had a 3 yr. requirement
6	Business Math used to be taught by a business teacher. It is now taught by a math teacher for math credit.
7	no curricular modifications were made
8	Math Applications 1, Math Applications 2
9	No changes recently, but a few years back we adopted a math class based upon our local community college basic math class. It is called Transitional Algebra and it is many of our non-four year college bound kids third year of math.
10	none
11	Applied Geometry
12	None
13	We created an Algebra II Essentials which is a modified Algebra II course
14	We offered a course called "Integrated Math" at the freshman level. Last year we eliminated that course and now all freshman must take Algebra. We offer three levels--enriched, standard, and basic.
15	More support in Homeroom with Algebra help
16	None. All students expected to complete 3 years of math during high school.
17	

18	Course above were added.
19	none
20	None
21	None. We have had a 3 year math requirement for several years. We did add Functions and Statistics. We also added a Mathematics lab class that provided additional
22	help and time on task.
23	business math offered to seniors
24	moving to a fully digital curriculum
25	None
26	same
27	none
28	None We analyzed the Algebra 2/Trig curriculum since that is the class these students
29	had to pass with the new requirement.
30	nA
31	Had to increase sections of third year of math.
32	none
33	None A two year Algebra I course was created several years prior to the 3 year
34	requirement. To meet the needs of our basic student, we added "Integrated Math" at the
35	freshman level. All students are required to take Algebra and Geometry.
36	Just the addition of the Algebra with Career Applications.
37	We already had a three year requirement

Question #6--Please explain any other curricular intervention that has assisted in the transition to three years of required mathematics in order to graduate?

Answer	Response Count
Options	
<i>answered</i>	38
<i>question</i>	38
<i>skipped</i>	
<i>question</i>	14

Number	Response Text
1	Due to RtI and the use of the EPAS to monitor benchmarks, we added a math intervention, College Readiness Math. This course incorporates computer-based instruction, Carnegie Learning-Cognitive Tutor, to help eliminate gaps for students to show career and college readiness.
2	Math Resource
3	Math Homework homerooms and Math RtI homerooms for students in Algebra

- 4 Added a math interventionist and double block math.
Increased RTI services during the school day. We offer 30 minute RTI classes
5 for students needing math interventions.
- 6 none
- 7 None - we already had a 3 year math requirement.
we closely monitored the students in that 3rd year of mat - especially those
identified as maybe not likely candidates for a third year of math - we worked
with them individually with student tutors and then funneled them into our
8 existing interventions if necessary
- 9 Double Block Algebra 1, Double Block Algebra 2
We have added an academic assistance period between periods 3-4 in our school
10 day to help teach math skills needed that students need to be successful.
- 11 N/A
We changed to a 3 year math requirement approximately 20 years ago. The
changes in 2006 had basically no impact since it was already in place at our
12 school.
- 13 None
- 14 None
We began NWEA MAP testing in the 09-10 school year. Last year we began
placing students in the correct level math class (enriched, standard, basic)based
15 on their NWEA MAP math scores.
- 16 RtI support at the math level during the Freshman Year
Skills Lab for semester failures to reteach skills missed. After school tutoring
17 with transportation offered to stuggling students.
- 18 We are currently exploring other options of courses to add
- 19 All our kids are required to take three years of math.
- 20 We required 3 years of mathematics prior to the state mandate
We did begin teaching Algebra 1 in an 87 minute class to help the borderline
21 students be successful
- 22 None
- 23 more math tutoring offered
- 24 none
Jones students were already required to take three credit of math; most graduate
25 with four.
- 26 ALEKS,
- 27 none
- 28 none
Remedial math tutoring required for all students who fail first semester math
29 course
- We added a "math lab" during the advisory periods for students who need
additional help in their class. Generally, those who attend the math lab are
30 enrolled in algebra, geometry and algebra2/trig.
- 31 We just added the additional classes
- 32 More sections

- 33 none
 34 None
 35 A credit recovery option was added for students that failed a semester of a math course.
 36 This year we eliminated Integrated Math and are requiring all freshmen to take Algebra.
 37 We now offer a math study hall with a certified math teacher to help those students who may struggle.
 38 Numeracy Lab - math study hall offered all 7 periods of the day - supervised by math teachers
 Algebra I Block class - double period of Algebra everyday - taught differently

Question #7--Does your school have a two-year (four semester) Algebra I course?

Answer Options	Response Percent	Response Count
Yes	35.0%	14
No	65.0%	26
	<i>answered question</i>	40
	<i>skipped question</i>	12

Question #8--Does your school have Algebra and Geometry integrated into one course?

Answer Options	Response Percent	Response Count
Yes	20.0%	8
No	80.0%	32
	<i>answered question</i>	40
	<i>skipped question</i>	12

Question #9--Can students in your school earn mathematics credit in a Career/Technical type of course?

Answer Options	Response Percent	Response Count
Yes	15.4%	6
No	84.6%	33
	<i>answered question</i>	39
	<i>skipped question</i>	13

Question #10--Does your school use a web-based credit-recovery program?

Answer Options	Response Percent	Response Count
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Yes	72.5%	29
No	27.5%	11
	<i>answered question</i>	40
	<i>skipped question</i>	12

Question #11--What was the ISBE graduation rate at your high school for the Class of 2005—the year prior to the graduation policy change being enacted by Illinois?

Answer
Options

Response Count

33

*answered
question* 33
*skipped
question* 19

Number Response Text

- | | |
|----|---|
| 1 | 80.8 |
| 2 | 2 years of math |
| 3 | 96.9% |
| 4 | 96.6 |
| 5 | 87.3 |
| 6 | Our school opened in the fall of 2004 with freshmen and sophomores. We did not have a graduating class in 2005. |
| 7 | 93.2 |
| 8 | 91.5 |
| 9 | over 90% |
| 10 | 93% |
| 11 | 89.3 |
| 12 | 88.2 |
| 13 | I don't know |
| 14 | 90.9 |
| 15 | 2 units of math. |
| 16 | N/A First graduation class was Class of 2011. |
| 17 | Unsure |
| 18 | 95% |
| 19 | 92.9 |
| 20 | approximately 95% |
| 21 | 97.6 |
| 22 | 2 years |
| 23 | 30% |
| 24 | 90.7 |
| 25 | n/a We are a new school |
| 26 | 88% |

27	92
28	68%
29	85.0 - this rate did not count GED students as dropouts
30	90.9
31	98.2
32	94.5
33	upper 90"s

Question #12--What was the ISBE graduation rate at your high school for the Class of 2008—the year prior to the law taking affect?

Answer	Response Count
Options	

33

answered
question 33
skipped
question 19

Number	Response Text
1	83.1
2	3 years of math (1 of algebra, 1 of geometry)
3	87.5%
4	95.2%
5	88.8
6	96.8%
7	96.1
8	91.1
9	over 90%
10	92%
11	96.6
12	95.3
13	I don't know
14	93.3
15	2 units of math.
16	N/A
17	Unsure
18	95%
19	91.5
20	approximately 95%
21	90.1
22	3 years
23	27%

24	90.1
25	n/a
26	87.1%
27	94.4
28	48%
	87.5 - this rate did not count GED students as
29	dropouts
30	93.3
31	94.1
32	92.7
33	Upper 90"s

Question #13--What was the ISBE graduation rate at your high school for the Class of 2009—the first year of the graduation requirement policy change?

Answer

Response Count

Options

32

answered
question 32
skipped
question 20

Number	Response Text
1	82.2
2	same...3 years of math (1 of algebra, 1 of geometry)
3	88.9%
4	87.6%
5	88
6	95.3%
7	96
8	85.8
9	over 90%
	89% but this was impacted based on the way the calculates the graduation rate
10	affective 2011
11	94
12	92.3
13	I don't know
14	3 units of math, 1 being Algebra, 1 being Geometry
15	N/A
16	Unsure
17	96%
18	95.3
19	approximately 95%

20	92.6
21	2 years
22	30%
23	90.8
24	n/a
25	82,6%
26	98.6
27	54%
28	76.8
29	94.7
30	91.5
31	92.3
32	Upper 90's

Question #14--What was the ISBE graduation rate at your high school for the Class of 2012—the most recent graduating class?

Answer

Response Count

Options

33

answered
question 33
skipped
question 19

Number	Response Text
1	80.4
2	same...3 years of math (1 of algebra, 1 of geometry)
3	93.8%
4	85%
5	87.6
6	95%
7	83.7
8	82
9	91.3%
10	83%
11	83
12	78.5
13	I don't know
14	89.8%
15	93%
16	Unsure
17	97%
18	88.1

19	85%
20	73.2%
21	don't have it yet
22	3 years
23	48%
24	not in yet
25	This is our second graduating class. The math requirement has not been the ONLY course to have a student not graduate.
26	86%
27	92.2
28	52%
29	78.4 - this rate counted GED student as dropouts 76.8--keep in mind ISBE changed the formula for calculating the graduation rate. They used the NCLB formula.
30	
31	93.3
32	94.3
33	Upper 90's

Question #15--Please describe any interventions or school-based initiatives that were designed to support students struggling to complete their third year of mathematics and at-risk for on-time graduation?

Answer	Response Count
Options	

33

answered
question 33
skipped
question 19

Number	Response Text
1	We do offer summer school, night school, and an alternative program for credit recovery through Nova Net, a web-based program.
2	Credit Recovery & Math Resource
3	math RtI homerooms and Math homework homerooms Business Math, double block math, a/b courses, credit recovery and math interventionist
4	
5	na
6	No new interventions, we already had 3 yr. requirement in place
7	Math Tutorial was implemented -- drop in tutoring for students
8	none were designed specifically for that purpose
9	Double Block Algebra 1, Double Block Algebra 2
10	Academic assistance period between periods 3-4. It is twenty four minutes long.

- 11 mandatory after-school program 2 days a week for all students with an F for the
week.
- 12 Credit recovery program after school and during June.
- 13 None
- 14 We have a check and connect program that pairs up students in trouble of
graduating with teachers who are interested in helping.
Algebra RtI Homeroom for freshman students in Algebra. Math Tutoring labs
15 during homerooms.
Academy of Changes computer based credit recovery. ISBE Virtual High School
16 and peer tutoring program.
Students are monitored and meetings with at-risk families are held to discuss the
17 options
- 18 We have a learning center and team teaching to help.
Summer school.
- 19 Supported academic study during the school day
We have a academic learning center where students go instead of a normal study
hall if they are having trouble in their math class. There are tutors available in the
20 center and students are strongly encouraged to seek out the help they need.
21 co-taught classes, APEX credit recovery for low income
the implementation of an RtI math section which students are assigned to during
there current first year of math based on test scores and/or teacher
22 recommendation.
- 23 freshman on track programs
Alternative classroom assignment
Credit recovery assignment
Remedial math assignment
- 24 Math tutoring
The teachers of these courses work diligently to help the students learn the
25 material--a.m. and p.m. tutoring, math lab, and in some cases, online courses.
26 PST process, After school tutorial, credit recovery
27 Added a tutorial program.
double block classes
- 28 Math lab
- 29 Credit Recovery courses were offered.
We have had a math lab tutor for the past two years. This year we will have a
30 homeroom period to allow for interventions and tutoring.
We have a math study hall with a certified math teacher. We also use APEX
credit recovery and have a peer tutor program in place. We also have an after
31 school study association where students can get help from certified teachers.
- 32 RTI for math starting with freshmen year in the 2011/12 school year
- 33 Numeracy Lab

Question #16--What courses are offered at your school beyond Geometry?

Answer Options	Response Count
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32

<i>answered question</i>	32
<i>skipped question</i>	20

Number	Response Text
1	Algebra 2, Algebra3/Trig, Pre-Calculus, AP Calculus, AP Statistics, and Stats in Sports
2	Trig, Pre-calc, Calc, Kishwaukee College pre-Engineering program
3	Advanced Algebra, Algebra II, PreCalc/Trigonometry, Calculus, AP Calc Advanced Algebra/Trigonometry and Honors Technical Advanced Algebra Algebra IV/Pre-Calculus and Honors Honors Calculus AP Calculus AB/BC
4	AP Statistics College Algebra Intermediate Algebra Pre-Calc/Trig
5	AP CALC
6	Intermediate Algebra, Algebra 2, Honors Algebra 2, Trig, Pre-Calculus, Calculus, AP Calculus, Finite Math, Probability & Statistics Algebra 2 Essentials, Algebra 2, Algebra 2 Honors Precalculus, Precalculus Honors Probability & Statistics AP Statistics AP Calculus AB
7	AP Calculus BC
8	Alg II, Trig, Calculus, Prob & Stats Math Applications 1, Math Applications 2, Trig, Pre-Calculus, AP
9	Calculus AB, AP Calculus BC, Statistics, AP Statistics Transitional Algebra, AlgebraII, Pre-Cal, Trig & Stats, AP calculus
10	AB, and AP calculus BC.
11	Alg 2/Trig., stats, calc, AP Alg2, Honors Alg 2, Trig, Honors PreCalc, PreCalc, Contemporary
12	Math, Probability & Statistics Alg II Pre-Calc
13	AP Stats

- Calc AB
Calc BC
- 14 Algebra II, Algebra II Essentials, Precalculus, AP Calculus, Probability & Statistics, AP Stats, Technical Algebra II
- 15 Algebra II, Honors Algebra II
Pre-Calc, Calc, AP Calc, AP Stats
Algebra II, Algebra II and Trig for Manufacturing Careers, Finite Math, Visual Basi, Java, Pre-Calc Trig, Intro Stats, AP Stats, AP Calc
- 16 A/B, AP Calc B/C
Algebra II, Precalculus, AP Stats, Probability & Statistics, AP Calc
- 17 AB, AP Clac BC
Algebra 2, Stats, Quality Core Pre-Calc, Regular Pre-Calc, Calc AB,
- 18 Calc BC, Statistics, Math 081 and Math 090
Algebra II, Pre-Calc for reg track
- 19 Core Plus III, IV, AP stats and AP Calc for honors
Algebra 2, College Algebra/Trig, Honors Alg 2, Pre Calculus, AP
- 20 Calculus.
Algebra II, Honors Alg II, Pre-Calculus, Calculus, Statistics
- 21 Alg 2, Adv Alg and Trig, Pre-Calc, AP Calculus
- 22 calculus & trigonometry
- 23 Advanced Algebra, Pre-Calculus, Calculus, Algebra 3, Trig, Statistics
- 24 Advanced algebra, algebra 2/trig, pre-calc/trig, math analysis, trig, finite, AP stats, AP calc AB, AP calc BC, stats
- 25 Topics Math, Alg II, Stats, Finite Math, Pre-Calc, Honors Pre-Calc,
- 26 Calc, Calc AB, Calc BC
Algebra 2
Pre Calculus
Calculus
- 27 Statistics (Elective, but after geometry)
- 28 Algebra II, Precalculus, Advanced Algebra, Calculus
Algebra 2, Algebra 3 (for the basic student only), Pre-Calculus, Dual
- 29 Credit Trig/Pre-Calc, AP Calculus, Prob/Stats
Algebra with Career Applications, Algebra II, Algebra II-
Trigonometry, Discrete Mathematics, Trigonometry-Standard, Pre-
- 30 Calculus, AP Calculus
Trigonometry, Intro to Calculus, Pre Calculus,
- 31 Calculus AB, Calculus BC, Algebra II, Algebra III
- 32 Alg II, Alg III, Pre Cal, Stats and Calculus

Question #17--Using the titles of your school's upper-level mathematics courses listed in Question #15, please list total enrollment differences (expressed in percentages either positive or negative) between the Class of 2007 and the Class of 2012?

Answer Options	Response Count
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30

answered question 30
skipped question 22

Number	Response Text
1	information not available
2	They have increased by about 5%
3	No change Advanced Algebra/Trigonometry and Honors (+28%) Technical Advanced Algebra - New Course since 2007 Algebra IV/Pre-Calculus and Honors (-35%) Honors Calculus- New Course since 2007 AP Calculus AB/BC - (+15%)
4	AP Statistics - (+104%)
5	na
6	Info Unavailable ** Disclaimer: Our enrollment has increased significantly from 288 to 350 seniors. Algebra 2 Essentials (not offered in 2007) Algebra 2 +55% Algebra 2 Honors +0% (no seniors in this class) Precalculus +88% Precalculus Honors +292% Statistics +222% AP Statistics +93% AP Calculus AB +22%
7	AP Calculus BC +267% ALG II +12% Trig +4% Calculus +1.5%
8	Prob & Stats -7%
9	I'm not sure what you are looking for?
10	N/A
11	similar percentages AP Stats--+12 Calc AB--0 Calc BC--+5 Pre Calc--+21
12	Alg. II--23

13	I wasn't here until 2010 so I don't know.
14	do not have these data figures
15	N/A No data to compare.
16	Unsure
17	increase 6%
18	+ 75%
19	Enrollment has increased in all of these courses in the past 5 years.
20	data not readily available
21	less than 5% more in 2012.
22	not applicable
23	n/a
24	Increases but not totals available.
25	Insignificant changes
26	No change
27	0% difference
28	We have changed Student Management systems twice since 2007, so I do not have access to that information.
29	not much difference
30	Not sure, Alg III has been a great class for average math students wanting a 4th year

Question #18--What adjustments, if any, have taken place to encourage more students to enroll in upper-level mathematics courses at your school since the graduation requirement policy change?

Answer	Response Count
Options	

30

answered
question 30
skipped
question 22

Number	Response Text
1	The inclusion of the AVID Program increases students' enrollment in rigorous classes. Also counselors are very active with college preparatory discussions with all students. We have also added alternative classes: AP Statistics and Stats in Sports, based on student interest.
2	Have been moving the top 5% of students in traditional math courses into honors or pre-Ap courses
3	None
4	We have added technical advanced algebra to encourage the lower level student to take math beyond Algebra and Geometry. We have also added a Honors Calculus and AP Calc. BC course.

5 na
6 none, this is not a problem
Algebra 2 Essentials was introduced.
Probability & Statistics was merged into one class deleting the semester Statistics
and semester Finite.
This year, we are looking to offer Game Theory and a summer Calculus Bridge
7 class.
none other than informing parents and students of the graduation requirements, as
8 well as the college and career requirements
9 guidance
10 None
11 N/A
12 Continued encouragement during scheduling
13 Free summer school for lower level Explore score students
14 Counselors are encouraging students
we make students aware of the college readiness requirements as well as moving
15 back to the 1st year of Algebra being a single year instead of split in two.
Guidance office has work with the Math department to better identify and assist in
16 the completion of the math sequence.
Guidance counselors are advocating for students to take more math to help them
17 prepare for their future
Our students want high ACT scores. They take higher level courses to increase
18 their skills.
19 A push on rigor and college entrance requirements. It is a school wide initiative
20 None
21 Incentives to meet/exceed on PSAE which is more likely with upper level classes
22 more guidance in career directed requirements
We have added three dual credit courses since 2005
23 Word of mouth to encourage more students
24 The higher level students continue to be pushed higher.
Greater push from staff. Increased math staffing to lower class sizes for lower
25 levels.
Summer programs for students to take Geometry summer between Freshmen and
26 Sophomore year, so they could take Algebra 2 in their Sophomore year.
There has been no significant change at Canton High School because of the
27 change. 80% of our students were already taking 3 years of math.
FY13 will see the addition of a Probability and Statistics course. FY13 we added
Algebra 3 to meet the needs of the basic student who wants a fourth year of math.
Dual credit with Illinois Central Junior College was added five years ago to
28 encourage students to take upper-level math.
Encouragement from counselors to individual students during the course signup
29 process.
We have always encouraged students to take at least three years of math and
30 preferably 4

Question #19--What percentage of seniors from the Class of 2007 were taking a fourth year of mathematics as compared to the seniors from the Class of 2012?

Answer

Response Count

Options

28

answered

question 28

skipped

question 24

Number	Response Text
1	information not available
2	40% in 2007 & 55% in 2012
3	75% then, 80% now
4	2007 - 50% taking a 4th year of math
5	2012 - 76% taking a 4th year of math
6	Info Unavailable
7	2007 - 59% of seniors taking a math class
8	2012 - 91% of seniors taking a math class
9	+4%
10	74% in 2012 - In 2007, I am not sure, but we have always been between 66-75% of students that take 4 years of math.
11	maybe 2% difference?
12	Both were approximately 75%
13	81% compared to 84%
14	We do not believe that the extra year of math as a requirement led to an increase or decrease in any of the figures but rather trying to move students to Alg II by Jr. year to fair better on the PSAE.
15	I wasn't here until 2010 so I don't know.
16	do not have these data figures.
17	N/A
18	Unsure
19	increase 6%
20	50%
21	I don't know that the percentage has increased but the students are taking a higher level class in their senior year now than they did in 2007.
22	data not readily available
23	around 60% in both cases
24	do not know
25	n/a
26	no
27	NA

- 25 25-30% of our students take a fourth year of Math. That has not changed for more than 10 years.
- 26 5% more students were taking four years of math in 2012 than in 2007. Again...I don't have access to the Class of 2007, but we have a high achieving high school with a community that supports and expects our students to do well. We offer 4 sections of pre-calculus and 2 sections of calculus, which are almost always full. I do not think the percentages for these two classes would be significantly different.
- 27 significantly different.
- 28 60%

Question #20--What effect has Senate Bill 575, requiring students to successfully complete three years of mathematics, had on mathematics class sizes since its inception for the Class of 2009?

Answer Options	Response Percent	Response Count
Decrease of 2.0 or more students per section	0.0%	0
Decrease of 0.1-1.9 students per section	0.0%	0
No effect	75.8%	25
Increase of 0.1-1.9 students per section	6.1%	2
Increase of 2.0 or more students per section	18.2%	6
	<i>answered question</i>	33
	<i>skipped question</i>	19

Question #21--What do you feel were the one or two most significant adjustments for your school during this period of transition from two years to three years of mathematics requirement in order to graduate?

Answer Options	Response Count
	28
<i>answered question</i>	28
<i>skipped question</i>	24

Number	Response Text
1	The teaching schedule needed to be adjusted to offer more sections of 3rd and 4th-year math courses. We also needed to include more options for a 4th year of math, due to need and student interest.
2	Adjusting Curriculum offering to meet students at their level (adding courses).
3	Transition to Algebra 1A and Algebra 1B
4	None
5	Our increase in overall student enrollment
6	effect on elective courses

- 7 course selection by students, number of course offerings
- 8 Making sure Transitional Algebra is well articulated with Black Hawk College.
- 9 N/A
- 10 This was 20 years ago. We started an Applied Geometry class to coordinate with a
2 year Algebra 1 series.
- 11 There was no significant adjustment.
- 12 I don't know
- 13 In looking at splitting the Algebra course into 2 years, we found that many
students were not ready for college level math and were taking co-credit review
courses prior to their college experience. As a result, we shifted to change our
requirements so that at minimum students are being exposed to Algebra II topics
after the geometry year in Technical Algebra II.
- 14 The number of electives the students were taking was reduced. Class sizes in
elective areas went down due to the increased work load in math.
- 15 None
- 16 We already had three
- 17 None, our adjustments occurred prior to the retirement. Adding an additional
math teacher and reducing the elective offerings
- 18 Our district has had a 3 year math requirement for at least 10 years.
- 19 reduction in graduation rate
- 20 move away from a block schedule, and increase professional development for
teachers.
- 21 Getting struggling students through Advanced Algebra
- 22 Instructional special education courses for appropriate sped students
- 23 Addition of the math lab and raising the bar for all students
- 24 More staffing to math, Plus 2 or three.
- 25 Although I was not here at the time, the thought was that changes had already been
made in order to prepare for this.
- 26 The addition of a two year Alg I course
- 27 None. We already required three years of math.
- 28 The biggest adjustment would have been adding the additional Algebra with
Career Applications class. We didn't have it before, and now we offer two
sections every semester. The other adjustment was making sure we had supports
in place for those students who would not have taken a third year of math had the
requirements not changed.

**Question #22--Are there any other effects worth noting about this graduation
requirement change in regard to mathematics at your school?**

Answer
Options

Response Count

23

*answered
question* 23

skipped
question 29

Number	Response Text
1	* More students wanted a 4th year of math.
2	Over all I believe it was a good change that in the long run benefits students. We have taken a look at the amount of students taking 000 level courses out of HS at the college level and we attribute it to students not getting a fourth year of math. Though it isn't a requirement, we introduced Technical Advanced Algebra and went back to offering traditional Algebra in one year with heavy RtI supports at the freshman year. In this course, students are able to take up to 4 assessments again if they follow the pre-requisites for taking the assessment. This is our initial pilot year and the goal is to provide more students the opportunity to get to a
3	higher math earlier on in their HS career.
4	No
5	Our district already had a 3 year math requirement prior to the implementation of this state requirement.
6	none
7	no
8	none
9	no
10	Please see #22.
11	I don't know
12	No
13	More seniors were taking a 4th year since they finished the 3rd year due to college placement tests.
14	None
15	None
16	no
17	reduction in numbers in elective career courses due to double or triple enrollment in math courses
18	none
19	I don't think this has been an bad change at all. More students have been pushed to work harder and learn more. It's not so easy to take an "easy" way out toward graduation.
20	Huge increase in state testing scores.
21	No
22	Overall, the effect of the changes in requirements did not affect us to a huge degree. A majority of our students were already taking at least 3 years of high school math before the change. Offering another class to help those students who weren't high achievers was helpful and seems to have worked well. Part of the differences in our graduation rate was a difference in the calculations done by those reporting the rate rather than significant changes in the actual rate itself.

Most of our students who do not graduate are experiencing multiple issues, not just an inability to complete three years of math.

23 no

Question #23--What is the current enrollment of your school?

Answer Options	Response Percent	Response Count
670-900	31.3%	10
901-1125	40.6%	13
1126-1350	21.9%	7
1351-1580	6.3%	2
	<i>answered question</i>	32
	<i>skipped question</i>	20

Question #24--What was the enrollment of your school when the law was first passed in September 6, 2005?

Answer Options	Response Percent	Response Count
0-900	19.4%	6
901-1125	54.8%	17
1126-1350	16.1%	5
1351 or higher	9.7%	3
	<i>answered question</i>	31
	<i>skipped question</i>	21

Question #25--Is your school a unit school district? (Grades PreK-12)

Answer Options	Response Percent	Response Count
Yes	58.1%	18
No	41.9%	13
	<i>answered question</i>	31
	<i>skipped question</i>	21

Question #26--How many years of mathematics did your school district require prior to Senate Bill 575, which was passed on August 24, 2005?

Answer Options	Response Percent	Response Count
2	46.9%	15
2.5	0.0%	0
3	53.1%	17
3.5	0.0%	0

4	0.0%	0
	<i>answered question</i>	32
	<i>skipped question</i>	20

Question #27--How many years of mathematics does your school district require today?

Answer Options	Response Percent	Response Count
3	93.8%	30
3.5	0.0%	0
4	6.3%	2
	<i>answered question</i>	32
	<i>skipped question</i>	20

Question #28--A copy of this research will be provided to your school if requested. Please insert the name of your school and contact information if you would like to receive the results of this research.

Answer Options	Response Count
	15
<i>answered question</i>	15
<i>skipped question</i>	37

Number	Response Text
1	Vicki Dunphy Sterling High School vdunphy@sterlingschools.org
2	Sycamore High School Tim Carlson 555 Spartan Trail Sycamore Illinois 60178
3	Triad High School, rodney.winslow@triadunit2.org and jason.henderson@triadunit2.org
4	Lakes Community High School Jori Bowen 1600 Eagle Way Lake Villa, IL 60046
5	bsanderson@evergreenpark.org
6	Virginia Appuhn Carbondale High School

- 7 1301 E. Walnut Street
Carbondale, Il 62901
Triad High School
rodney.winslow@triadunit2.org
John Kohl
- 8 Woodstock North HS
Geneseo High School
- 9 tmackey@dist228.org
Kim Davis
Jersey Community High School
801 N. State ST.
10 Jerseyville, IL 62052
- 11 Kelly Hussey
Monica Schmitt
Lincoln-Way West High School
21701 S. Gougar Road
- 12 New Lenox, IL 60451
Eric Gallagher
13 egallagher@d187.org
Marjorie Johnson, Principal
Morton High School
350 N. Illinois Avenue
Morton, IL 61550
- 14 Marjorie.Johnson@morton709.org
Marengo Community High School
Scott Shepard, Principal
110 Franks Rd
- 15 Marengo, IL 60152

APPENDIX G

NAMES AND LEVELS OF ADDED COURSES

Names and Levels of Added Courses Obtained from SQ2 (n =30)

Title of Added Course	Total	Upper-Level (Y or N)
Vocational/Applied Mathematics	5	Y
Algebra II	4	Y
Algebra IA/1B (2yr.)	4	N
General Special Ed. Mathematics	4	N
Algebra I/Geometry	3	N
Pre-Calculus/Trigonometry	3	Y
Statistics	3	Y
Algebra I	1	N
AP Statistics	1	Y
AP Calculus AB	1	Y
Finite Mathematics	1	Y

APPENDIX H

NAMES AND LEVELS OF DELETED COURSES

Names and Levels of Deleted Courses (n =39)

Title of Added Course	Total	Upper-Level (Y or N)
Pre-Algebra	4	N
Single-Year Algebra	3	N
Vocational Mathematics	1	Y

APPENDIX I

MOST COMMON CURRICULAR MODIFICATIONS

Compilation of SQ5 most common curricular modifications (n =20)

Curricular Modification	Frequency	% of total responses.
Low-level Algebra II	6	30.00%
Adding Vocational Mathematics	3	15.00%
Two-Year Algebra sequence	2	10.00%
Low-level Geometry	2	10.00%
Integrate Geometry/Algebra	2	10.00%
More support	2	10.00%
More staffing	1	5.00%
Adding Functions/Statistics	1	5.00%
Adding technology	1	5.00%

APPENDIX J

ADDITIONAL CURRICULAR SUPPORTS

Compilation of SQ6 identifying additional beneficial supports (n =24)

Additional Support	Frequency
School-Day Tutoring	11
Credit Recovery Program	3
Double Block Math	3
New classes	1
After School Tutoring	1
Improved Placement Practices	1
Math Interventionist	1
More sections of mathematics	1
Discontinue low-level classes	1
Establish Special Ed. class	1

APPENDIX K

ADDITIONAL SCHOOL-BASED SUPPORTS

Compilation of SQ15 identifying additional beneficial supports (n =29)

Additional Support	Frequency
Tutoring	19
Credit Recovery Program	10
Double Block Mathematics Class	3
More Summer School	2
Co-Taught Classes	1
Counselor Monitoring	1
Focus on Freshmen Success	1
Vocational Mathematics Class	1

APPENDIX L

LIST OF UPPER-LEVEL MATHEMATICS COURSES

Compilation of SQ16 identifying upper-level mathematics courses (n =32)

Upper-Level Course	Frequency	% of schools offering the class
Algebra II	29	90.63%
Pre-Calculus/Trig	29	90.63%
AP Calculus AB	23	71.87%
Statistics	19	59.38%
Calculus	14	43.75%
Algebra III	12	37.50%
AP Statistics	12	37.50%
AP Calculus BC	11	34.38%
Trigonometry	10	31.25%
Mathematics Applications*	6	18.75%
Technical/Voc. Mathematics	5	15.63%
Finite Mathematics	4	12.50%
Algebra II/Trigonometry	3	9.38%
College-Entry Mathematics	2	6.25%
Algebra IV	2	6.25 %
Visual Basic	1	3.13%
Java	1	3.13%
Discrete Mathematics	1	3.13%

Note. Mathematics Applications titles include, Mathematics Analysis, Contemporary Mathematics, Statistics in Sports, Mathematics Applications I, Mathematics Applications II, Topics in Mathematics

APPENDIX M

UPPER-LEVEL ENROLLMENT ENCOURAGEMENT

Compilation of SQ18 regarding upper-level encouragement (n =25)

Form of Encouragement	Frequency
Guidance Support & Advice	10
New Courses	5
College/Career Readiness Focus	3
ACT Test Benefits Awareness	3
Summer School	2
Increased Staffing	1
Targeting Capable Students	1