Effects of a Third Credit Requirement

of Mathematics

by

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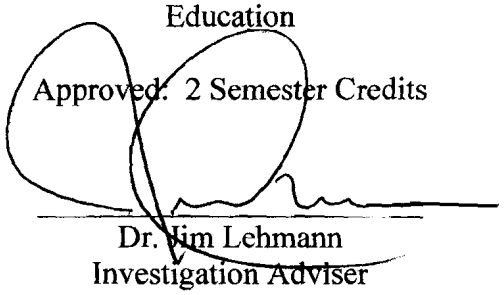

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ABSTRACT

The purpose of this study is to determine if a graduation requirement of three mathematics credits, instead of the current requirement of two credits, would likely change the typical enrollment of the current secondary mathematics department of the Clintonville Public Schools. The study reviewed the records of three graduating classes. The transcripts of students in the graduating classes of 2006, 2007, and the upcoming graduating class of 2008 were gathered and analyzed. The results will indicate how a third credit requirement would affect teacher's schedules and student requirements. The information will be used to improve the mathematics background of students in order to enhance student's future opportunities.

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Chapter I: Introduction

This chapter is an introduction to the study of determining the effects of a third credit requirement of mathematics. The study will evaluate the secondary mathematics department of the Clintonville Public Schools located in Clintonville, Wisconsin. Clintonville is a rural community in central Wisconsin with a population of about five thousand.

Clintonville High School's enrollment is approximately 590 students that include students from outlying smaller communities. Approximately one-fourth of the high school students are eligible for free or reduced lunch. The current graduation requirement is 24 credits. The credits must include: four credits of English, two credits of mathematics, a half credit of communications, two credits of science, one and a half credits of physical education, three credits of social studies, a half credit of living skills, a half credit of health, and ten electives.

The high school mathematics program at Clintonville High School consists of four instructors. The mathematics courses offered include basic mathematics, a one-year, one-credit remedial course for incoming freshman. There are two types of algebra tracks. Algebra 1a and algebra 1b may be completed as a two-year sequence to meet an algebra credit requirement and students have the option of completing algebra 1 as a one-year, one credit course. Geometry, advanced algebra, pre-calculus, and calculus are also offered. Geometry, advanced algebra, pre-calculus, and calculus are each one-year, one-credit courses.

The No Child Left Behind Law and the ongoing national and state discussions about improving the mathematics education of all students have resulted in the Clintonville mathematics department discussing with administration what is the best mathematics curriculum for our students. The Clintonville Public Schools mission statement is:

> The Clintonville Public School District, in partnership with its citizens, will empower those we educate to become lifelong learners who can think independently, critically, and creatively. Further, it is our mission to educate individuals to be successful, contributing members of our society and responsible, caring citizens in a diverse world.

The mathematics department at the secondary level in the Clintonville School District consistently tries to make improvements to provide the best learning environment in order for our students to be successful in their future. Over the last three years, the department goals have discussed the importance of meeting the needs of all of the learners. The department has focused on expanding and updating technology. The department has also completed a district initiative of implementing teaching strategies that focus on improving literacy.

The current governor believes that the students of Wisconsin should be required to successfully complete three credits of mathematics for graduation from a public school. A third credit requirement would provide further mathematics studies for some students and hopefully, provide additional opportunities in their future. This study will discuss the importance of a solid mathematics education in secondary schools. This education includes a meaningful curriculum that meets the needs of individual learners. The study will also discuss what a meaningful curriculum contains and the impacts of a solid mathematics education on the student. This paper will discuss the effects of a third credit requirement of mathematics for the graduation of the students in the Clintonville Public Schools.

Statement of the Problem

The purpose of this study is to determine if a graduation requirement of three mathematics credits, instead of the current requirement of two credits, would likely change the typical enrollment of the current secondary mathematics department of the Clintonville Public Schools.

Limitations of the Study

Three years of data were analyzed to conjecture influences of a third credit requirement of mathematics. The official records are stored in the district program, Skyward. The principal's office acquired transcript data from Skyward. Due to the limitations of the district program, only the two recent graduating classes' data were analyzed. The third year of data was gathered from the schedules of the 2008 graduating class. The 2007-2008 school year student schedules were created in February of 2007. These schedules were reviewed and completed by school counselors and administration in the spring of 2007. Therefore, predictions will be made for the 2008 graduating class assuming that the students will pass there scheduled math course.

Goals

In the spring of 2007, the investigator determined the following program evaluation goals in response to department discussions with administration about the state's proposed requirement of three mathematics credits for secondary graduation. There appears to be hesitation by administration and the school board to adopt this requirement unless it is mandated by the state of Wisconsin.

This program evaluation has three goals that will allow for the collection and analysis of data based on official student transcripts gathered from the principal's office. The three goals will determine the three stages of the evaluation. First, the researcher will collect student mathematics records from the principal's office. Secondly, the mathematics instructors will analyze the data to determine mathematics tracks that were successfully completed by the students in the classes of 2006-2008. Finally, the researcher will analyze the three years of data to predict the effects of a third credit of mathematics requirement for graduation from Clintonville High School.

This evaluation will focus on the following goals:

1. To determine how many of our students have (or may) successfully completed three or more credits of mathematics in the school years of 2006-2008.
2. To use the transcript statistics to determine the "track" that the 2006-2008 students completed.
3. To determine how many additional students would enroll in secondary math courses if the graduation requirement increased from two credits to three credits.

Chapter II: Literature Review

This chapter discusses the importance of a solid mathematics education in secondary schools. This education includes a meaningful curriculum that meets the needs of individual learners. The chapter discusses what a meaningful curriculum contains and the impacts of a solid mathematics education on the learner.

President George W. Bush signed into law the No Child Left Behind (NCLB) Act in January 2002. Bush (n.d.) discussed three problems that needed addressing in the area of mathematics. According to Bush (n.d.), the three problems are "too many teachers teaching out-of-field; too few students taking advanced coursework; and too few schools offering a challenging curriculum and textbooks" (p. 14). On a national level and in a variety of ways, the law has had a large impact on public schools. The United States Department of Education (2004) discussed the principles and strategies proposed by President Bush in the No Child Left Behind Act, they stated:

> These include increased accountability for States, school districts, and schools; greater choice for parents and students, particularly those attending low-performing schools; more flexibility for States and local educational agencies (LEAs) in the use of Federal education dollars; and a stronger emphasis on reading, especially for our youngest children (p. 1).

The National Education Association (n.d.) stated, "For the first time in Elementary and Secondary Education Act of 1965, (ESEA), history, the Bush administration and Congress have set a federal requirement that all students be tested in math and reading – annually in grades 3 through 8 and at least once in grades 9 through 12" (p. 1). Beyond the increased flexibility that the states have with the new law, the decisions about testing and the improvements to educational programs to ensure proficient test results are left up to the States. Goodwin (2002) wrote, "the stated purpose of the No Child Left Behind Act (NCLB) of 2001 is to "ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education" (p. 8). Goodwin discussed that local school boards need to focus on school improvements through effective curriculum programs and not school improvements that focus on the appearance of the educational buildings. According to Learning Point Associates (2005), "To meet the demands of the NCLB Act, high schools must strive during the next decade to increase achievement and graduation rates for all students" (p. 3).

Learning Point Associates is a nonprofit organization whose goal is to provide information to assist educators to make fact-based decisions. Learning Point Associates (2005) suggested a variety of areas of improvement. One recommendation of improvement by Learning Point Associates (2005) is that the programs provide rigorously challenging coursework. This rigor would expect students to work to their potential and challenge themselves to expand their abilities. The instructional programs, designed for students, need to provide students with the support necessary to succeed in courses that the student may find challenging. Among the actions involved in the rigor area were to "develop a rigorous, college-preparatory curriculum and to increase graduation requirements" (p. 7). The Denver Commission on Secondary School Reform (2005) defined mathematical rigor as, "rigor should mean, at a minimum, mastering a

high level of skills in ...measuring, estimating, calculating, observing and problem solving, ... developing critical thinking skills" (p. 41). Marty (2005) stated, "to survive economically, it is imperative that ALL of today's mathematics students know, understand, and are able to do complex mathematical operations" (p. 1). The Mid-continent Research for Education and Learning (2007) agreed and made similar recommendations. Among those listed were implementing a viable curriculum, that provide challenges within the school instruction.

Another action recommended by Learning Point Association is to "align high school graduation requirements, college admission requirements, and workforce prerequisites" (p. 7). Achieve, Inc. (2007), a bipartisan, non-profit organization that helps states raise academic standards, has a goal "to help every state close the expectations gap so that all students graduate ready for success" (n.p.). In his research, Achieve (2007) argued that nationwide many students are entering post-secondary schools and the work force unprepared. Achieve (2007) discussed contributing factors for the expectations gap. First, there is no agreed upon set of standards between parents, educators, and employers. Secondly, secondary courses have different sets of goals and expectations than professors and employers.

The Wisconsin State Superintendent's High School Task Force (2005) recently concluded that it is necessary to promote and enhance partnerships among schools, parents, businesses, and communities in order to connect resources to enhance curriculum. Learning Point Associates (2005) agreed with the Wisconsin task force. Learning Point Associates believed that sufficient planning is necessary in order to develop and implement high school improvement plans at the state and district levels. Among the actions involved in the planning were to "align standards and curricula to postsecondary education and labor market requirements

and to set statewide benchmarks to ensure that students are prepared for a variety of postsecondary educational opportunities" (p. 6).

Achieve (2007) stated, "Fourteen states have enacted college-and work-ready graduation requirements." Among those states are Texas and Arkansas. According to Achieve (2007), these two states "had enacted graduation requirements for all students at the level of rigor that Achieve considers college and work ready, including four years of both rigorous English and mathematics through at least Algebra II" (p. 1). According to Achieve (2007), Michigan created similar standards, "four years of mathematics through at least Algebra II" (p. 1). In the same study by Achieve (2007), California and Massachusetts each required three years of mathematics, including Advanced Algebra. The Denver Commission on Secondary School Reform (2005) discussed graduation requirements that "ensure that they encompass high-level essential skills that are widely understood and shared" between those involved in the education of the youth. Those involved in the education of the youth are parents, teachers, administration, and the community.

In response to the ongoing demands of NCLB, Wisconsin Governor Jim Doyle, in the 2007 state-of-the-state address, discussed public education and proposed an answer to providing a better education for the students of Wisconsin. Governor Doyle (2007) suggested requiring three years of math and three years of science in high school to earn a secondary diploma. With NCLB raising expectations and possible additional testing, the state of Wisconsin's considerations of additional requirements is not unreasonable. In the Wisconsin address, Doyle (2007) stated, "Wisconsin – unlike most other states – requires only two years of math and science in high school. In fact, we're in the bottom 13 states in math and science requirements." A 2002-2003 Wisconsin Department of Public Instruction study showed less than 25 percent of

Wisconsin schools require three years of math. Gates (2007) said, "only about half of our states require students to take three or four years of math to graduate from high school" (p. 3).

Learning Point Associates (2005) also recommended the integration of college and community partnerships into the secondary program that may result in favorable student transitions to future educational programs or real-world working positions. The actions involved in the transitions area included the "creation of freshman academies to ease ninth graders' transition to high school and the creation of more career academies to ease students' transition to the workplace" (p. 12). McCluskey (2005) discussed the results of a national study that concluded "substantial proportions of high school graduates identify gaps in preparation for the skills and abilities expected of them today" (p. 1). McCluskey (2005) said that high school graduates, college professors, and employers want "more rigorous courses and higher expectations in school" (p. 1). Learning Point Associates (2005) also recommended additional "opportunities for high school students to earn college credit through Advanced Placement (AP), distance learning, Tech Prep, dual enrollment, or early college programs, thus easing the transition to college" (p. 12). The Center for American Progress (2007) concluded there are no states with a majority of 4th and 8th graders proficient in math and reading. In addition to that conclusion, there are only eight states that align high school graduation requirements with college and workplace expectations. Goodwin (2002) discussed that No Child Left Behind would, in theory, guarantee that students obtain at a minimum, proficiency on challenging state academic achievement standards and state academic assessments" (p. 8). Honawar (2005) stated, "with the focus on testing in math and now science under the federal No Child Left Behind Act, schools have been forced to pay more attention to those subjects" (p. 2). One possible outcome

of the No Child Left Behind Act, according to Honawar (2005), was "some states have acted to require that students take more years of mathematics in high school" (p. 2).

In his research, Achieve (2007) discussed the importance of real data to make instruction meaningful. In his research, Achieve (2007) stated, "lack the opportunity to take stock of what they could do to improve their teaching and help more students succeed at the next level" (p. 1). Learning Point Associates (2005) also believed that it was crucial to incorporate real data to create meaningful decisions about curriculum and instruction that directly affects students. To increase effectiveness of this process, teachers should be provided with training and support to "enabling them to use data for tracking student progress and developing more effective instructional strategies" (p. 14). Gates (2007) stated, "we also need to use the data we collect to implement change, including personalizing learning to make it more relevant and engaging for students – and thereby truly ensure that no child is left behind" (p. 3). The Association for Supervision and Curriculum Development (2007) stated, "educators can use the data to determine which students are struggling, what strategies are working, and how teachers should adjust their instruction to ensure that each child succeeds" (n.p.).

The Association for Supervision and Curriculum Development (2007) recommended similar improvements to changes in educational programs. Representing the association, Ewing (2007) suggested there are three key elements of high school redesign which are: (a) personalization of learning programs, (b) incorporation of multiple assessments, and (c) professional development initiatives.

According to Ewing (2007), high schools need to personalize the learning programs for students. These programs would recognize that learners are unique and have specific needs. Students would be empowered to make decisions about their learning. Voke (2002) stated,

"engaged students not only attend school more, but are also likely to get more out of their time in school because they approach learning more eagerly, seek greater opportunities, and persist in the face of difficulty" (n.p.). Gates (2007) discussed the relationship of individualized programs and state standards. Gates (2007) said,

> Educational standards have one central purpose-to ensure that students make the most of their abilities. For our country and our young people to be successful, all students should have access to schools and courses that prepare them for college, career and life. Many state standards in place today are unacceptably low (p. 2).

Learning Point Associates (2005) believed that a viable curriculum must include program relevancy. This program relevancy would make curriculum important to student's current and future needs. Marty (2005) stated, "a majority of students will pursue educational endeavors beyond high school" (p. 1). Learning Point Associates (2005) recommended that a program allow students to develop and explore career and technical skills through the engagement of meaningful curriculum. An action recommended in this area is the integration of core academic knowledge with skills that may be applied on in the workforce. Honawar (2005) quoted Michigan Representative Ehlers as saying, "the jobs of the future are going to require the basic understanding of principles of math and science" (p. 1).

The second element that Ewing (2007) suggested was the incorporation of multiple assessments. The multiple assessments would allow a student to showcase their talents and thinking while connecting the subject to their world. These assessments are not solely unit tests or quizzes based on textbook information. Incorporating other forms of assessments would empower students. Laitsch (2005) stated, "performance and portfolio assessments (authentic assessments) allow students to make intentionally demonstrate their competence...their goal is to mirror tasks students might face in real life" (n.p.). Students would be allowed to make decisions

regarding the assessments that may include presentations and portfolios. When a student creates an authentic presentation or portfolio, this empowerment results in a sense of ownership in this personalized student learning. Wiggins (1990) defined authentic assessment as, "assessment is authentic when we directly examine student performance on worthy intellectual tasks" (p. 1). Wiggins (1990) continued with "assessment should primarily support the needs of learners" (p. 2). Wiggins (1990) also said, "students have greater clarity about their obligations (and are asked to master more engaging tasks)" (p. 3). Mueller (2006) compared traditional assessment to authentic assessment. Mueller (2006) described traditional assessment as contrived, based on recall or recognition, and teacher-centered. Mueller (2006) described authentic assessment as real-life, based on real-world applications connecting curriculum to the workforce, and student-centered that personalizes learning. Wiggins (1990) discussed various types of authentic assessments and stated,

> Authentic assessments present the student with the full array of tasks that mirror the priorities and challenges found in the best instructional activities: conducting research; writing, revising and discussing papers...Conventional tests are usually limited to paper-and-pencil, one-answer questions (p. 2).

The National Education Association (n.d.) stated, "pencil and paper tests may not go far enough in measuring the skills of students-skills that will certainly contribute to their ability to compete and succeed in tomorrow's workplace" (p. 2).

The third element that Ewing (2007) suggested was professional development initiatives. The United Stated Department of Education (1995) recommended that professional development "focuses on teachers as central to student learning" and "reflects the best available research and practice in teaching, learning, and leadership" (p. 1). Little (1994) stated that professional development initiatives are becoming focused on a "departure from canonical views of curriculum and from textbook-centered or recitation-style teaching" (n.p.). The Denver

Commission on Secondary School Reform (2005) concluded that, "ongoing training and professional development should focus on improving student achievement" (p. 42). The federal government also has created programs regarding professional development initiatives in public schools. The purpose of the Math and Science Partnership program (n.d.), created in President Bush's administration, is to "bring math and science teachers together with scientists, mathematicians, and engineers to improve their teaching style" (p. 23).

Martinez (2005) addressed the Wisconsin State Superintendent's High School Task Force to discuss the characteristics of schools of the past with schools of the future. Martinez (2005) referred to the schools of the past as obsolete schools and future schools as new vision schools. Martinez (2005) noted that in schools where improvements need to be made there is tracking of students with differentiated curriculum; students are separated by grade level or ability level and provided with structured materials and lessons. In these obsolete schools, assessments are standardized within short and fixed time periods. Students would respond to the same closed-ended questions. Classroom lessons provide information out of context where connections are lacking and the lesson is not connected to the student or connected to the student's future goals. The classroom lessons contain busy work and students work alone. In these schools of the past, there is an isolation of teachers where teachers do not plan lessons and goals. Teachers are not working together to meet the needs of the students. There is also an isolation of the entire institution. Community connections are not encouraged and parents are not involved. DiMartino (2005) also addressed the Wisconsin task force to discuss principles of effective schools that encourage success through meaningful programs. Like Martinez, DiMartino (2005) recommended that learning settings be student-centered where all students, regardless of ability, are expected to be active participants in their learning process. Students are not spending their

learning time listening and passively responding to questions that are not meaningful. The curriculum is instead connected to real-world contexts and community resources. DiMartino (2005) suggested that there be high expectations with academic rigor. In agreement with Martinez is the National Association for Secondary School Principals (2004). The National Association for Secondary School Principals (2004) discussed strategies for high school reform that included recommendations to strengthen core knowledge, building connections between students and adults, and incorporating differentiated curriculum.

According to Martinez (2005), a future school contains no tracking; instead, learning environments are multiage and based on student capability and progress. The North Central Regional Educational Laboratory (n.d.) described the intention of multiage grouping as, "to allow children of various ages and abilities to progress at their own individual rate rather than according to specified objectives for a particular grade level (p. 1). Assessments are ongoing and contain a variety of methods for students to demonstrate progress beyond test taking. Gaustad (1995) discussed the changes that should be made first when implementing a multiage learning setting. Gaustad (1995) stated, "thematic teaching, hands-on math, cooperative learning, assessment using portfolios—any developmentally appropriate approach can be a good place to start" (n.p.) The new vision school structure is based on flexible scheduling that meets the needs of the students and teachers. Students acquire knowledge in contextual settings where the information is connected to the student and to the world. Information builds on prior knowledge and connections are made between past information and future information. Students learn in cooperative settings as they experiment together and create authentic work. Students are not generating answers to questions that have been completed for years. In these future schools there is continuous interaction between students and adults. Teachers, administrators, parents, and

community members are all representatives in the collaboration of creating an educational system that best serves the needs of the children. Kinsey (2001) discussed the effects of a multiage setting. Kinsey (2001) stated,

> Students in multiage classrooms demonstrate more positive attitudes toward school, greater leadership skills, greater self-esteem, and increased pro-social and fewer aggressive behaviors, compared to peers in traditional graded classrooms (McClellan & Kinsey, 1999; Veenman, 1995) (n.p.).

Responsibility is shared and students are not left alone to figure out the answers. These characteristics raise student expectations. In a national survey, McCluskey (2005) discussed that students, professors, and employers wanted higher secondary classroom standards. According to McCluskey (2005) the national report concluded by saying, "recent high school graduates say higher expectations in high school and tougher course requirements and tests prior to graduation would leave them better prepared for the real challenges they are now facing" (p. 2). Checkley (2006) stated,

> Students who completed higher-level mathematics courses in high school were more likely to earn a bachelor's degree. A longitudinal study conducted by Clifford Adelman, a senior research analyst for the U.S. Department of Education, found that 8 percent of high school graduates with Algebra 1 under their belts earned a bachelor's degree by age 30 in contrast, 80 percent of those who completed calculus in high school earned a bachelor's degree by 30 (Adelman, 1999).

Honawar (2005) quoted National Council of Teachers of Mathematics, Seeley, as saying, "We need to invest in basic science and research across the board, an in an education system that's grounded in high expectations for students in math and science" (p. 1). Gates (2007) urged Congress that,

> Educational standards have one central purpose-to ensure that students make the most of their abilities. For our country and our young people to be successful, all students should have access to schools and courses that prepare them for college, career and life. Many state standards in place today are unacceptably low (p. 2).

Chapter III: Methodology

This chapter will discuss the methodology of the program evaluation. The program being evaluated was the secondary mathematics program of the Clintonville Public Schools of Clintonville, Wisconsin. The purpose of the evaluation was to determine if a graduation requirement of three mathematics credits would likely change the usual enrollment numbers of the current mathematics department. There currently are four mathematics instructors in the Clintonville secondary mathematics department. Three of the instructors currently teach five sections of mathematics and one instructor teaches six sections of mathematics.

Goals

The study was a quantitative review of the Clintonville secondary mathematics program. This program evaluation has three goals that will allow for the collection and analysis of data based on official student transcripts gathered from the principal's office. The three goals determined the three stages of the evaluation. First, the researcher will collect student mathematics records from the principal's office. Secondly, the mathematics instructors will analyze the data to determine mathematics tracks that were successfully completed by the students in the classes of 2006-2008. Finally, the researcher will analyze the three years of data to predict the effects of a third credit of mathematics requirement for graduation from Clintonville High School.

The first goal was to determine how many of the students have (or may) successfully completed three or more credits of mathematics in the school years of 2005-2008. Records were retrieved through the high school principal's office and the math courses successfully completed were documented. According to Clintonville's district policy, students receiving a grade other than F (failing) or W (withdrawn) were considered successful.

The second goal of the evaluation was to use the transcript statistics to determine the "track" that the 2005-2008 students completed. Records were retrieved through the high school principal's office to determine what math courses were successfully completed. The three tracks are: (a) Basic Math, Algebra 1a, Algebra 1b; (b) Algebra 1a, Algebra 1b, Geometry; and (c) Algebra 1, Geometry, Advanced Algebra.

The third goal of the evaluation is to determine how many additional students would enroll in secondary mathematics courses if the graduation requirement increased from two credits to three credits. Data was analyzed to compare the number of students with three or more credits with those students earning less than three credits in the 2005-2008 school years to predict possible change in enrollment in the high school mathematics courses. The percent of students with three or more credits, and less than three credits of mathematics was determined.

Role of the Researcher

There were three roles of the researcher in this program evaluation of the secondary mathematics department at Clintonville High School. The roles were to gather data, analyze data, and communicate the data with the stakeholders.

The first role of the researcher was to request data from the principal's office. Due to the limitations of the district's online grading program the type of data collected was different than initially expected. The final data included two years of student records of the number of mathematics credits successfully completed. The third year of data was based on the high school counselor's scheduling data for the upcoming school year.

The second role of the researcher was to communicate with the mathematics department instructors to determine the types of classes that the students have completed to place them into

one of the following tracks: (a) basic mathematics, algebra 1a, algebra 1b; (b) algebra 1a, algebra 1b, geometry; and (c) algebra, geometry, advanced algebra.

Finally, the researcher will communicate the results of the study with the mathematics department instructors and the building administration.

Ethical Issues

There were three ethical issues that were taken into consideration during the program evaluation of the secondary mathematics department at Clintonville High School. The three issues were: confidentiality, availability, and objectivity that the mathematics instructors, counselors, and building principals took in consideration. In regards to confidentiality, during the evaluation process, individual student performance was kept confidential. All student information remained private. The researcher promptly returned the records that were retrieved from the principal's office.

In regards to availability, the counselors and building administration provided information about student performance to the researcher. The two secondary counselors and mathematics instructors will assist students in current and future completion of mathematics courses. The researcher, department instructors, and building administrators were objective about the program analysis and possible recommendations for future change within the structure of the mathematics department. The data gathered was from official records and accurate. The mathematics instructors together analyzed the data to ensure accuracy when determining mathematics tracks. School counselors checked records and answered any questions about the analysis.

Data Collection Procedure

Prior to the data collection, the researcher needed approval by the University of Wisconsin – Stout. The first stage of acquiring approval required the researcher to complete the human subjects training from the University of Wisconsin – Stout. The researcher then needed to submit the Protection of Human□ Subjects in Research Form to Research Services. The research form needed to contain a consent form if applicable. The research form also needed to contain the survey instrument. The researcher was given approval by Research Services to begin the program evaluation in the spring of 2007.

The data collection procedure was completed during the second semester of the 2006-2007 school year. The first step occurred during the second semester of the 2006-2007 school year. At that time, the 2006 graduating student's data and the 2007 graduating student's data was collected from the building principal's office. This data contained information to determine the number of mathematics credits that were successfully completed. Following the collection of the data, the math department determined the mathematics track of the students from the 2006 and 2007 graduating classes.

The third step of the data collection occurred after the spring registration was complied by the guidance personnel. The 2007-2008 graduating class' data was collected at this time to determine the number of mathematics credits that may be successfully completed. Following the collection of the 2007-2008 data, the mathematics department reconvened to determine the mathematics track of these students.

In May of 2007, mathematics instructors compiled all data to determine the percent of students that were currently successfully completing at least three credits of mathematics. The data was also analyzed to determine the percent of students on each track. At the conclusion of

the program evaluation, the data was shared with the mathematics department and building administration.

The validity of the program evaluation is based on two factors. First the data that was gathered by the researcher was retrieved from official records from the principal's office. The researcher believes that neither the principal nor his assistant would alter this data. Secondly, the mathematics instructors determined tracking of students. The instructors reviewed each other's decisions and building counselors confirmed the tracking decisions.

Chapter IV: Results

This chapter will discuss the results of the data that was collected. An analysis of the data is also included. Data was collected from the principal's office and analyzed by the mathematics instructors. The data came from student transcripts regarding the number of mathematics credits earned and the specific mathematics courses completed. Data was reviewed for the 2006 graduating class, the 2007 graduating class, and the upcoming 2008 graduating class. The information for the 2008 graduating class was gathered from course rosters that reflect student selections made in February of 2007.

The first goal of the evaluation was to determine how many of the students had successfully completed three or more credits of mathematics in the school years of 2006-2008. According to Clintonville's school policy, success was defined as a passing grade in the course. A failing grade or a withdrawn were considered not passing. The results are as follows:

Table 1

Students Successfully Completing Three or More Secondary Mathematics Credits Compared to the Total Number of Students in the Graduating Class

Year	Students	Total students	Percent of students
2006	113	139 students	81.3
2007	103	136 students	75.7
2008	104	144 students	72.2

Table 1 shows that during the three-year time period over 72 percent of students successfully completed at least three credits of mathematics.

The second goal of the evaluation was to use the official transcript statistics to determine the "track" that the 2006-2008 students completed. The mathematics instructors determined which track was completed. Table 2 shows the type of track for the student who successfully completed three mathematics credits.

Table 2

Types of Tracks Completed by Secondary Students with Three Credits of Mathematics

Track	Description
1	Basic Math, Algebra 1a, Algebra 1b
2	Algebra 1a, Algebra 1b, Geometry
3	Algebra 1, Geometry, Advanced Algebra

The official records were then analyzed to determine how many students completed each track as described in Table 2. The mathematics instructors made the determinations for the three graduating classes that were reviewed.

Table 3

Number of Students Completing Each of the Described Tracks

Year	Track 1	Track 2	Track 3
2006	5	16	92
2007	5	31	67
2008	9	14	81

Table 3 shows a variety of information. First, the data shows that the vast majority of Clintonville High School students successfully complete algebra, geometry, and advanced algebra. Secondly, the data shows that very few students complete the basic math, algebra 1a, and algebra 1b track. Finally, the data shows that many students that select the two-year, one credit option of algebra 1 also complete geometry.

Those students that successfully completed less than three credits of mathematics completed a variety of course sequences. Depending on the ninth grade mathematics placement and student ability, there are many possibilities. Students that transfer into the school district may have followed a different mathematics sequence. Students that are placed into the alternative education program or students that are at-risk may complete a packet program, PASS. The two credit course options are as follows:

Table 4

Types of Tracks Completed by Secondary Students with Less Than Three Credits of Mathematics

Track	Description
4	Algebra 1a, Algebra 1b
5	Basic, Algebra 1a
6	Algebra, Advanced Algebra
7	Algebra, Geometry
8	Algebra, Geometry, Statistics
9	Special Education Math

10	Basic, PASS
11	Algebra, Alternative Education Program
12	Algebra 1a, PASS

Table 4 shows the multiple options that students have when trying to complete the two-credit mathematics graduation requirement. Table 4 describes these tracks and labels the track by number. Those numbers correspond in the following table to show the number of students that completed the two mathematics course sequence as described by those track numbers.

Table 5

Number of Students with Less Than Three Credits of Math Completing Each of the Described Tracks

Year	Track								
	4	5	6	7	8	9	10	11	12
2006	11	2	1	8	1	3	--	--	--
2007	16	4	1	9	--	2	1	--	--
2008	17	7	--	7	--	7	--	1	1

Table 5 shows a variety of information. First, the majority of students that successfully complete two mathematics credits complete the algebra 1a and algebra 1b sequence. Secondly,

many of these students also successfully complete geometry. Third, Table 5 shows that there are many options for students to acquire the two-credit requirement based on their abilities.

The third goal of the evaluation was to determine how many additional students would enroll in a secondary mathematics course if the graduation requirement increased from two credits to three credits. The data was analyzed for all three graduating classes. The results are as follows:

Table 6

Students Successfully Completing Less Than Three Secondary Mathematics Credits Compared to the Total Number of Students in the Graduating Class

Year	Students	Total students	Percent of Students
2006	26	139 students	18.7
2007	33	136 students	24.3
2008	40	144 students	27.8

Table 6 shows that during the three-year time period less than 28% of students successfully completed only two credits of mathematics.

The data was analyzed to determine how the algebra course, the geometry course, and the advanced algebra course would be affected if students were required to successfully complete three credits of mathematics for graduation. If a third credit of mathematics was required for secondary graduation, the additional students would be distributed as follows:

Table 7

Number of Additional Students in each Course after the Addition of a Third Mathematics Credit Requirement

Year	Algebra 1b	Geometry	Advanced Algebra
2006	1	12	9
2007	4	17	9
2008	7	17	7

Table 7 shows that many of the new students would need to complete geometry. Few of the new enrollments would be placed into the lower level course, algebra 1b. There are a considerable number of new students in advanced algebra, though. Table 7 shows that the distribution is not overwhelmingly placed into one course.

Chapter V: Discussion

This chapter will summarize the purpose of the program evaluation, the review of the literature, and the results of the data collection. Educational implications and limitations will also be discussed. Recommendations for the Clintonville High school mathematics department and administration conclude the chapter.

Summary

The purpose of this study was to determine if a graduation requirement of three mathematics credits, instead of the current requirement of two credits, would likely change the typical enrollment of the current secondary mathematics department of the Clintonville Public Schools. In the literature review, the importance of a solid mathematics education in secondary schools was discussed. Learning Point Associates (2005) and the Mid-continent Research (2007) for Education discussed the need for rigorous curriculum and providing students with challenges within the school instruction. This education should include a meaningful curriculum that meets the needs of individual learners. Achieve (2007) discussed the importance of making instruction meaningful by incorporating real data into improving student's success. The literature clearly discussed what the curriculum should contain. Ewing (2007) believed that personalizing learning programs, using multiple student assessments, and incorporating professional development initiatives for educators would all improve the education of students. Wiggins (1990) and Mueller (2006) discussed the value of authentic assessments. Authentic assessments are a strategy that would allow students to relate the curriculum to their interests and personalize student's learning. Martinez (2005) and DiMartino (2005) discussed the importance of connecting curriculum to real-world contexts and community resources.

The literature review also discussed the impacts of a solid mathematics education on the learner. McCluskey (2005) discussed the results of a national survey that concluded that increased course requirements would prepare students better for their future. Honawar (2005) discussed that states are requiring students to complete additional mathematics requirements due to the demands of the No Child Left Behind Act of 2001. President Bush (n.d.) stated, "too few students are taking advanced coursework (in the area of mathematics)" (p. 14). Marty (2005)

believed that, in the future, many students will complete educational courses after secondary graduation. Honawar (2005) discussed that future jobs will require more mathematics.

This study reviewed the completion of mathematics courses for Clintonville High School students of years 2006-2008. Chapter 3 of the study discussed the methodology of the review that was used to evaluate the effects of a third mathematics credit requirement for graduation at Clintonville High School. The mathematics department analyzed district records from the years of 2006-2008. The results were compiled and the tables were displayed in Chapter 4.

Surprises

The researcher was surprised during the data collection, surprised about the literature review, and surprised by the results of the study. During the data collection, the researcher was surprised by the lack of availability of gathering past data from the district's online grading program. Only skeletal records were available and difficult to retrieve.

The literature clearly discussed the importance of non-traditional methods being implemented by instructors in the classroom. The numerous authors that referred to these methods surprised the researcher. The methods were not surprising; the stress of the value was surprising. The researcher was not surprised that many districts are moving towards increased mathematics graduation requirements. It was surprising that Wisconsin Governor Doyle (2007) stated, "We're in the bottom 13 states in math and science requirements."

Most importantly, the researcher expected the data analysis to show that many of the secondary mathematics students would need an additional mathematics credit, if a third credit of mathematics was required for graduation. This was not the case. It was more surprising that those students would be distributed into algebra 1b, geometry, and advanced algebra. The distribution would not create the need for additional mathematics sections. There are multiple

sections of those classes offered and with any new students class size would increase only slightly. Therefore, monies would not be necessary to teach additional hours of mathematics while these new students are gaining additional mathematics due to the increased requirement.

Conclusions

The data analysis measured the effects of a third mathematics credit requirement in the three mathematics tracks of Clintonville High School. The tracks were (a) basic mathematics, algebra 1a, algebra 1b; (b) algebra 1a, algebra 1b, geometry; and (c) algebra, geometry, advanced algebra. The results show that the students who need a third credit of mathematics would be distributed among all three courses. The results also show that there are a small percent of students that would be placed into algebra 1b, geometry, and advanced algebra. The current section enrollments for algebra 1b, geometry, and advanced algebra have consisted of approximately 25 students. There have been multiple sections offered of these courses. Algebra 1b has typically been offered two hours. Over the years of 2006-2008, geometry and advanced algebra have each been offered for at least five hours. Therefore, there is sufficient room for these additional students. The new students would easily be absorbed into the current schedule. As a result, no additional teaching hours would be necessary and the effect on the school budget would be quite minimal as the teaching loads are distributed among the four mathematics instructors.

Educational Implications

The No Child Left Behind Law of 2001 calls for increased student achievement. The presented literature suggested that a solid, meaningful, and individualized curriculum would enhance a student's learning experience. Incorporating effective teaching strategies that include connecting instruction to a student's interests and utilizing authentic assessment will allow for

improved success within the secondary classroom. This may be accomplished by increasing rigor to properly prepare students for their future. When students are successful in the classroom, they are more likely to be successful after graduation. Effective schools need to provide meaningful educational programs.

The No Child Left Behind Act of 2001 created new challenges for school districts and their educators. The changing world will potentially require student's futures to contain additional education beyond high school. The researcher believes that these two situations strongly encourage the need for additional mathematics requirements in the secondary schools.

Limitations

This program evaluation was based on Clintonville High School students. The limitations of this program evaluation are that the analysis of data showing the effects of a third credit requirement of mathematics is limited to this school district. The literature review discussed the importance of a solid mathematics education in secondary schools and the impacts of a solid mathematics education on the learner. This information is valuable for all school districts.

Recommendations

The recommendation for Clintonville's secondary mathematics department and administration is that a third credit of mathematics as a graduation requirement is important and easily is implemented. The literature shows that curriculum needs to contain rigor and relevancy. Since mathematics is a core subject and applicable to many areas, the more mathematics a student completes in high school, the greater the opportunity for increased future success. With enrollment decreasing and the data showing that no new sections of mathematics would be necessary with a third credit of mathematics requirement, the increased requirement is easily implemented.

References

Association for Supervision and Curriculum Development. (2007). *The ASCD high school reform proposal*. Retrieved July 18, 2007, from http://www.ascd.org

Achieve.org. (2007). *Raise high school graduation requirements*. Retrieved July 6, 2007, from http://www.achieve.org/node/332

Bush, G. (n.d.). *A quality teacher in every classroom: improving teacher quality and enhancing the profession*. Retrieved July 15, 2007, from http://www.whitehouse.gov/news/reports/no-child-left-behind.html#5

Center for American Progress. (2006). *A federal role in closing the education gap*. Retrieved March 26, 2007, from http://www.americanprogress.org/issues/2006/11/graduation_event.html

Center for American Progress. (2007). *Education by the numbers*. Retrieved March 26, 2007, from http://www.americanprogress.org/issues/2007/03/education_numbers.html

Checkley, K. (2006). *The essentials of mathematics, grades 7-12: Effective curriculum instruction, and assessment*. Retrieved July 18, 2007, from http://www.ascd.org

Denver Commission on Secondary School Reform. (2005). *Not a moment to lose! A call to action for transforming Denver's high schools*. Retrieved July 5, 2007, from http://www.dpsk12.org/pdf/secondary_reform.pdf

Ewing, T. (2007). The building blocks of high school redesign. *Association for Supervision and Curriculum Development*. Retrieved June 5, 2007, from http://www.ascd.org

Gates, B. (2007). *U.S. senate committee hearing*. Retrieved July 5, 2007, from http://www.gatesfoundation.org/MediaCenter/Speeches/Co-ChairSpeeches/BillgSpeeches/BGSpeechesHELP-070307.htm

Gaustad, J. (1995). *Implementing the multiage classroom.* (ERIC Document Reproduction No. ED 381869)

Goodwin, B. Arens, S., Barley, Z., & Williams, J., (2002). *Understanding no child left behind: a report of the no child left behind act of 2001 & its implications for schools, communities, & public support for education.* Aurora, CO: Mid-continent Research for Education and Learning. Retrieved June 5, 2007, from http://www.mcrel.org/topics/Assessment/products/150/

Honawar, V. (2005). U.S. leaders fret over students' math and science weaknesses. [Electronic version]. *Education Week.* 25(3), 1.

Kinsey, S. (2001). *Multiage grouping and academic achievement.* (ERIC Document Reproduction No. ED 448935)

Laitsch, D. (2005, July). A policymaker's primer on testing and assessment. [Electronic version]. *Infobrief* #42. Alexandria, VA: Association for Supervision and Curriculum Development.

Learning Point Associates. (2005*). Implementing the no child left behind act: strategies to improve high schools.* Retrieved March 26, 2007, from http://www.ncrel.org/policy/curve/resource.htm#resources

Little, J.W. (1994). *Teachers' professional development in a climate of educational reform.* Retrieved July 15, 2007, from http://www.ed.gov/pubs/EdReformStudies/SysReforms/little1.html

McCluskey, N. (2005). Public high school grads unprepared for college, work. *The Heartland Institute*. Retrieved July 5, 2007, from http://www.heartland.org/PrinterFriendly.cfm?theType=artId&theID=16669

Mid-continent Research for Education and Learning. (2007). *Education hot topics*. Retrieved June 5, 2007, from http://www.mcrel.org/newsroom/hottopicSchoolImprove.asp

Mueller, J. (2006). What is authentic assessment?. *Authentic Assessment Toolbox*. Retrieved July 5, 2007, from http://jonathan.mueller.faculty.noctrl.edu/toolbox/whatisit.htm

National Association for Secondary School Principals. (2004). *Breaking ranks II: strategies for leading high school reform.* Retrieved June 28, 2007, from http://www.nassp.org/s_nassp/sec.asp?CID=563&DID=48223

National Education Association. (n.d.). *Testing and assessments.* Retrieved July 5, 2007, from http://www.nea.org/esea/eseatesting.html?mode=print

North Central Regional Educational Laboratory. (n.d.). *Multiage Grouping*. Retrieved July 18, 2007, from http://www.ncrel.org/sdrs/areas/issues/methods/instrctn/in5lk50.htm

U.S. Department of Education. (1995). *High-quality professional development supports education reform*. Retrieved July 15, 2007, from http://www.ed.gov/pubs/IASA/newsletters/profdev/hqprodev.html

U.S. Department of Education. (2004). *Executive Summary*. Retrieved July 5, 2007, from http://www.ed.gov/nclb/overview/intro/execsumm.html

Wiggins, G. (1990). The case for authentic assessment. *Practical Assessment, Research & Evaluation*, 2(2). Retrieved July 5, 2007, from http://PAREonline.net/getvn.asp?v=2&n=2

Wisconsin Department of Public Instruction. (2006). *State superintendent's high school task force report*. Retrieved March 26, 2007, from http://www.dpi.wi.gov/sprntdnt/hstask.html

Voke, H. (2002, February). Student engagement: Motivating students to learn. [Electronic version]. *Infobrief* #28. Alexandria, VA: Association for supervision and Curriculum Development.

Wisconsin Department of Public Instruction. (2006). *State superintendent's high school task force report*. Retrieved March 26, 2007, from http://www.dpi.wi.gov/sprntdnt/hstask.html

Voke, H. (2002, February). Student engagement: Motivating students to learn. [Electronic version]. *Infobrief* #28. Alexandria, VA: Association for supervision and Curriculum Development.