AN ANALYSIS OF ACCELERATION AND ADVANCEMENT CRITERIA IN MIDDLE SCHOOL MATHEMATICS

By
Robert A. Rappole

A Master's Project
Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science in Education
Mathematics (7-12)
Department of Mathematical Sciences
State University of New York at Fredonia
Fredonia, New York

November 2016

State University of New York at Fredonia

Department of Mathematical Sciences

CERTIFICATION OF PROJECT WORK

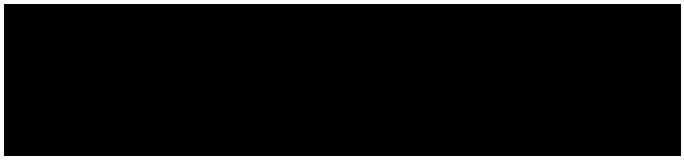
We, the undersigned, certify that this project entitled FINDING THE RIGHT FIT: A STUDY OF EARLY ACCELERATION PRACTICES IN MATHEMATICS by Robert A. Rappole, Candidate for the Degree of Master of Science in Education, Mathematics Education, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.

Teodora Cox, Ph.D.
Department of Mathematical Sciences

Date

H. Joseph Straight, Ph.D.
Department of Mathematical Science

Date



Graduate Studies & Research

Date

Abstract

This research explores the criteria associated with various accelerated middle school mathematics programs currently employed by New York, North Carolina and other states across the United States. In addition, a longitudinal study of a single accelerated cohort of 25, 2016 graduates was investigated, so as to discern possible gaps in their original accelerated design. It was hypothesized that school districts make use of limited mathematics acceleration criteria, often focusing solely on either teacher recommendations or standardized assessments. Also, it was expected that the majority of district policies did not offer/include provisions for students to easily transfer into the accelerated mathematics program if students exhibit qualifying mathematical talent later in their secondary school career. First and foremost the survey research showed that teacher recommendation was used by 68.75% of schools, testing was addressed in 90.63% of schools and grades were a factor for 75%, making up the primary criteria for advancing students. Other data collected revealed that only about 60% of schools give the option to join the program at a later date, approximately 40% gave parents the right to override the school's placement decision, and roughly 20% of all schools surveyed had a set number or percent of students allowed into the program each year. When examining the longitudinal study, the 12 ‘additional’ students faired almost identically to the 13 ‘primarily placed’ students, each had approximately 33% of their group drop out of advanced placement and both groups had 6 students successfully complete Calculus I or higher. Half of the students in the additional group took Calculus or more advanced courses their senior year of high school. Based on the original criteria, none of these students would have had access to the advanced/college level mathematics coursework. In a class of only 60 students to miss 6 students is to miss 10% of the class.

Implications from this study were that all policies should have opt-in or opt-out options for students, a scoring rubric, parental override procedure, a balance between and use of multiple criteria, no population limit or percentile cut-off and schools should compact classes, meaning combining 6th and 7th grade mathematics, not just skip grades.

Table of Contents

Introduction

This research explores the criteria associated with various accelerated mathematics programs currently employed by school districts in New York, North Carolina and other states across the United States. In addition, a longitudinal study of a single accelerated cohort of 2016 graduates is investigated, so as to discern possible gaps in their original accelerated design.

My interest in this topic was generated from the high school I graduated from. After years of running their accelerated mathematics program the same way, they finally decided it was time for a change. When I heard they were looking for ideas on how to revamp the program, it was so exciting to think of how this research could help them. Thus, I began work on this labor of love, in order to give something back to a school that gave me so many good memories.

I began the research to look into what is crucial for mathematic success in school and is this something that can be decided consistently across all programs. Taking algebra by the 8th grade is crucial to success. Some literature calls algebra a gateway to bigger and better things in life. The question is not should students take algebra in 8th grade, it is can all students handle algebra in 8th grade? What should the cut off line be, if in fact everybody is not ready by 8th grade? These questions and more led to the hypothesis statement of this research:

It is hypothesized that school districts make use of limited mathematics acceleration criteria, often focusing solely on either teacher recommendations or standardized assessments. Also, it is expected that the majority of district policies do not offer provisions for students to easily transfer into the accelerated mathematics program if students exhibit qualifying mathematical talent later in their secondary school career.

This hypothesis was tested by comparing accelerated mathematics programs from thirty-two schools throughout the country. It was also grounded in extensive literature review. Finally, the hypothesis was tracked by following a cohort over 6 years. Due to parental concern, the school was forced to allow 12 extra students to enter the advanced mathematics track. These additional students brought the total number enrolled in the program up from 13 to 25. This is a significant difference and potentially a sign that many students who were ready for 8th grade algebra, had been excluded over the many years of the program. The significant difference in participants in a small school made officials consider how other schools decide on their participants in accelerated programs and is there a research based protocol that guides the process for choosing students for acceleration.

Literature Review

The purpose of this literature review was to gather information on accelerated mathematics programs and, more specifically, how students are selected as participants. This review of the literature offers insight into past practices and current methods of selection. International policies related to acceleration of advanced mathematics students and how they compare to United States' are also examined. Finally, the review addresses the backlashes and consequences of these methods across various populations.

History of Gifted & Talented Programs

There have been several attempts to produce an ideal program for talented/gifted students in mathematics. All varying greatly in aspects from when, how and who participates in such a program (Braddock & Dawkins, 1993; Colangelo, Assouline & Gross, 2004; Heller & Hany, 2004; Holland, Paek & Suppes, 1999; Kettler & Curliss, 2003; Ma, 2005a; Ma, 2005b; Raudenbush, Fotiu & Cheong, 1998; Rayneri, Gerber & Wiley, 2006; Rotigel & Fello, 2004;

Slavin, Lake & Groff, 1990; Useem, 1998; VanTassel-Baska, 2005; Wimberly & Noeth, 2005). Research shows, without exception, that learning algebra is beneficial to all students, but when this should occur is still up for debate.

Historically, according to Braddock and Dawkins (1993), the method of tracking has been extremely biased. Researchers state that the tracking system typically gives the standard or remedial track classrooms the less experienced teachers. While the education system does need to address the advanced students, it might actually be more beneficial to reverse these sanctions. Advanced students would be able to work with and handle learning from a less experienced teacher due to their advanced ability to fill in the gaps. Meanwhile, lower track students need far more attention and experienced teachers, if they hope to ever make it through the programs. Another problem of past tracking has been the lack of representation by minorities such as African Americans and Hispanic students. Tracking wasn't the only issue of past programs.

Literature by Colangelo et al. (2004) definitively proclaim acceleration is beneficial to strong students. In the past, the problems with advancement stemmed in great part due to lack of familiarity with programs, skepticism, moral debate, age gaps, fear of making the wrong decision for a student and thinking it is bad to push our youth. All of these have been debunked through research. It is widely believed that strong students do better when placed into advanced classes. Age gaps do not harm the student, based on studies that showed these students are more mature and tend to gravitate toward older peers anyhow. A student who is not challenged, often will get lazy and lose their spark for knowledge. Making the decision to stay still and be "safe," is not likely the best decision, possibly leading to that student never reaching his/her full potential. The moral conundrum is that there is seemingly no definitive way to ensure all

students that can handle advanced math are included. Students who are borderline qualifying for the advanced track are being forced to go at a slower rate due to others who cannot keep up.

Further research by Colangelo et al. (2004) also note that the United States makes available several programs for their talented/gifted youth. Some students start in kindergarten, others skipped grades, or were placed in accelerated programs in Mathematics, English, Science, etc. Others graduated early and went off to college. Colangelo notes that the U.S. should not be implementing just one of these strategies, rather they should be using all of them and noticing that a child who starts kindergarten early may also need to skip a grade later on, be put in algebra in "8th Grade" and graduate at 15, or maybe even 12. Only one issue needs to be addressed in this radical idea, does the student want to participate? "If a child is academically far ahead but does not want to skip, he probably shouldn't skip. It's the students who are craving a challenge and are thirsting to run ahead who need acceleration" (p. 20). This should be taken into consideration.

The accurate identification of students for advanced mathematics has been a challenge for many years. The past creation of the Stanford Education Program for Gifted Youth Mathematical Aptitude Test (SEMAT) was due in part to flaws in older identifiers of academically talented youth (Holland, Paek & Suppes, 1999). The researchers' paper goes into some depth discussing failures of other commonly used accelerator tests. Standardized achievement tests, intelligence tests, the Wechsler Intelligence Scale for Children, the Stanford-Binet Intelligence Scale and the commonly used SAT scores have been administered to 6th, 7th, or 8th graders as a means to identify how advanced each student was. However, all of these measures were claimed to be too restrictive and limiting. The SAT especially was ruled out as a good indicator, due in part to the fact that it is not geared for that age range and the only way one

could expect to do extremely well on it is if they had encountered the mathematics previously. Also the timed aspect of most of these exams was considered harmful to finding extreme talent in mathematics that may lack quick reading skills. The SEMAT was thus designed as an untimed test that typically took anywhere between 15 minutes to 2 hours to complete. Divided into 3 parts consisting of arithmetic, geometry and logic, the test allowed for the indication of strengths and weaknesses in important sectors of mathematics.

Elizabeth Useem (1998) wanted to do away with sorting and place more emphasis on "talent development" (pg.iii). She followed the Center for Research on the Education of Students Placed at Risk (CRESPAR). CRESPAR in turn used The Talent Development Middle School, who wished to increase everybody's academic ability, especially in schools with high failure probability. The expectations started not on students but on making sure teachers truly were masters of their mathematics content. This entailed workshops, which helped the teachers develop lessons for their own classrooms. Next they went into the schedule, sharing where certain lessons should go. This received mixed reviews from teachers, some of whom believed there was too much of a gap between what students learned in previous years and what was being taught in this new curriculum. Other teachers merely adjusted/inserted lessons to fill in the gaps. Sadly, even though teachers had high hopes, some instructors had to concede defeat when over 75% of their students could not meet the standards of the curriculum.

The practices used in the United States all have potential. Some ideas may need to be adjusted to better fit different school sizes and districts, but all have merit. It would be curious to see how these methods compare to other policies around the world. Are they similar, or vastly different?

Global Acceleration Programs

Politicians are often concerned that the United States falls behind in mathematics achievement, among several of our closest allies including, Japan, England, France, Germany, Sweden, etc. (Beaton, Mullis, Martin, Gonzalez, Kelly & Smith, 1996; Burris, Heubert & Levin, 2004; Horn & Nunez, 2000). Some of the questions that arise are: What are they doing differently? Why is the U.S. struggling and falling behind the curve? Is this an easy copycat fix, or does the United States have to come up with a new way to keep up? One way to find out might be looking at what other countries have come up with.

Beaton et al.'s (1996) international study compared countries standings academically. The United States ranked 28th in eighth grade algebra ability with large differences in three major categories. First, most of the countries ranked ahead of the U.S.A. had most, if not all, of their students taking algebra by 8th grade (if not earlier). Second, a great many of these same countries utilized a centralized education curriculum. This means that the entire country's school curriculum is governed by a single board and all parties are using the same plan. Third, sadly, teacher pay in the great United States is much lower compared to what some of the top countries pay their teachers.

All students in England and across Europe take algebra in 8th grade, if not earlier. Most of Japanese students take algebra by 8th grade. What is the problem with America doing the same thing? Some research supports acceleration for all and shuns backward tracking systems (Burris, Heubert & Levin, 2004; Gamoran & Hannigan, 2000; Horn & Nunez, 2000) Other studies reveal a negative effect on lower achieving students entered into algebra in the 8th grade, or just deny it as a sound idea (Loveless, 2008; Spielhagen, 2006).

According to Burris et al. (2004) tracking stunts and hinders low-achieving students, and accelerating low-achievers helps them build more knowledge than they would have

otherwise. Heterogeneous advanced classrooms helped not only the low-achievers but the high-achievers as well. Stating with confidence that advancing everybody showed benefits for low, medium and high achievers in further enrollment in advanced classes. It also eliminated low-income student exclusion and the omission of minorities. Why then does not every school district jump on the bandwagon?

Loveless (2008) has almost completely opposite findings as Burris, Heubert & Levin. Finding low-achievers taking advanced math in 8th grade, scored on average worse than 4th graders taking the similar content. Furthermore, statistics show a great drop in completing Algebra I before 10th grade, for many of these struggling students. Teachers surveyed explained that many of their students were ill equipped for Algebra I, struggling with rational numbers and word problems. This can bring into question how the acceleration occurred with these students and was there a better way to help them be prepared for the course work.

Modern Approaches to Acceleration

Given the history of acceleration in the United States, it would seem that it is time for change. However, the methods the country chooses to use remain quite constant. More and more research is done every year, each study arguing over what is the best policy. Strategies often include tracking, non-tracking, using test scores, skipping grades, 8th grade algebra for all, summer programs, after school gifted programs, etc. (Colangelo, Assouline & Marron, 2010; Dougherty, Goodman, Hill, Litke & Page, 2015; Spielhagen, 2015; Williams, Haertel, Kirst, Rosin & Perry, 2011). All of these approaches have been used with varying degrees of success. The question is does new research offer any clue for the correct course of action?

Colangelo et al. (2010), reiterates that acceleration benefits students and does not harm them socially or emotionally. One modern method is called content-based acceleration (also

known as single-subject acceleration). The student(s) studies at a higher grade level, but remains in his/her current grade. They may go to another teacher for one or two courses, but return to their normal grade level for the remainder of the day. *Curriculum compacting*, measures if a student has met the requirements of the current grade subject. If so, the student would work on more advanced topics in that subject or work more on other areas of study. One can opt out of a current grade in mathematics, using another form of content-based acceleration, this one called *credit by examination* or *prior experience* (pg.185). This is as it sounds, one simply takes a test, and if they pass then the student is advanced to the next grade level in that subject.

Grade-based acceleration is also a new term for old ideas. The forms include early entrance to school, whole-grade acceleration and early entrance to college. One form that is slightly newer, is called *grade telescoping* (pg.186). In grade telescoping, an entire group of special students get 3 or 4 years of instruction compressed into just 2 or 3 years. Both grade and content acceleration are effective for gifted/talented students. To have a truly beneficial program though, one must start by writing up a truly beneficial policy.

Major Approaches to Acceleration	
Acceleration for all	All students, regardless of past performance are placed into algebra by the 8th grade
Single-subject acceleration	Student takes high level content, while remaining in current grade
Curriculum compacting	If student has mastered current subject at that grade level, the student can study that subject at a higher level, or decide to focus on other topics
Credit by examination or prior experience	Student takes an exam on current grade level for a subject, if they pass they are advanced to next grade level in that subject
Early entrance to school	A student is permitted to enter Kindergarten at a younger age than typically allowed
Whole grade acceleration	A student skips an entire grade, in all subjects
Early entrance to college	A student is permitted to enter Freshman year of college at a younger age than typically allowed
Grade telescoping	A group of students will have 3 or 4 years of school compacted into 2 or 3 years
Tracking	Students are placed into accelerated programs based on how they tested or performed in previous years

Figure 1: Major Approaches to Acceleration

With all of these possibilities for acceleration, there are plenty of options for advancing student responsibly. In order to advance students properly, a strong policy needs to be in place.

Acceleration/Advancement Policies

When writing a policy, it must be done responsibly. Students who struggle in one area, such as English, still might be served best by acceleration in mathematics. All school districts should have a written acceleration policy outlining beneficial effects on academically strong students. The National Work Group on Acceleration believes that early admittance into kindergarten is the first acceleration for extremely gifted children. All students should be able to be referred for acceleration, even if the student him/herself is the referrer. Teams should make

decisions on a child being accelerated or not, not one individual. These teams should consist of the current and receiving teacher, administrator, parent/guardian and counselor at the very least, and should not discuss the student, while he/she is present. No child should miss out on being on a sports team because of advanced placement (students do not lose high school eligibility, just because of early admittance to college). The policy should be checked often, searching for impact and successfulness. Possibly the most important thing to consider before accelerating a student is "If, after a clear explanation of the advantages and disadvantages of acceleration, the student expresses that he or she is not interested in acceleration, then the process should not proceed further" (p. 195).

Advanced Placement Policy Beliefs	
Written	The advanced placement policy should be written and outline benefits for prepared students
Admittance	Early admittance into kindergarten is considered by The National Work Group on Acceleration, to be the first acceleration for extremely gifted children
Open	Anybody should be able to refer a student for advanced placement, even the student him/herself
Team	Not one person but a team of people should decide if a student gets into advanced placement
Sports Eligibility	High school sports eligibility should not be lost due to a student receiving early admittance into college
Review	Policy should be checked often for impact and successfulness
Options	If student expresses they are not interested in acceleration, the advanced placement process should halt

Figure 2: Advanced Placement Policy Beliefs

Wake County Public School System (WCPSS) uses their North Carolina End-of-Course (EOC) exam to judge readiness for advanced placement (Dougherty, Goodman, Hill, Litke & Page, 2015). However, grades received on this exam are not the indicator for advancement. The

Education Value-Added Assessment System (EVAAS) predicts success on the EOC as a means of placing students. The measures of this system are believed to remove bias from selection and hopefully increase numbers of students not left behind, while also doing a better job correctly avoiding wrong advancements. EVAAS more than doubled the number of low-income students in accelerated programs and effectively doubled African American and Hispanic student enrollment. Their study revealed yet again that better quality teachers are placed in accelerated classrooms with students that need them less.

Gateway or Brick Wall and the Consequences of Acceleration

Even with the knowledge that learning algebra benefits everybody, many studies show it might not be for everybody at the same time. Factors such as maturity, preparedness and ability are often cited as limiting factors (Clotfelter, Ladd & Vigdor, 2012; Colangelo, Assouline & Gross, 2004; Loveless, 2008; Ma, 2005c; Siegle & Powell, 2004; Starko, 1990). Does the problem lie within the concept that everybody can learn algebra in 8th grade, or at all? Perhaps the problem stems not from the concept, but instead from the attitude and failures of previous mathematics course work.

There is a significant correlation between those who take algebra in 8th grade and those who do not, and their success later in life (Clotfelter, Ladd & Vigdor, 2012). In one case, a school offered algebra to most students early, but their test scores dropped dramatically and student enrollment in further college-preparatory mathematics courses plummeted. This school reverted back to their previous policy within two years. The decision to call algebra the "gateway" to a better, more successful future, could all be circumstantial. Maybe those powerful, successful, wealthy adults took algebra early because they were just as driven as children. Certainly there are adults who took and excelled in Algebra I in 8th grade, who did not

turn out successful. Examining both sides of the argument, Ma (2005a; 2005b) whose research showed that regular students benefitted most from acceleration and felt that all students would benefit by being accelerated; and Loveless (2008) who believes acceleration should only be for the overachievers and that early acceleration is to blame for poor performance, when all students were accelerated early. Upon concluding their research, Ma and Loveless found a significant decrease in test scores for all those non-advanced students who took algebra in 8th grade. They conclude that Algebra I in 8th grade is more a "brick wall" than a "gateway," due to less pre-algebra and preparatory time.

Ma (2005c) places more emphasis on taking algebra and less focus on 8th grade. Algebra certainly is a "gateway," but only if taken at the correct developmental stage in a child's life. Both sides of the coin are expressed; opening the "gateway" sooner provides students with more opportunities to get ahead in mathematics and science. When students are placed into algebra too early it becomes an insurmountable "brick wall" that frustrates, humiliates and depresses the less mathematically gifted. The middle ground being, what if the students do great with early acceleration but become burnt out on it and lose interest by their 11th or 12th grade? It is unlikely a student who is not accelerated by 8th grade will take calculus in high school. It was extremely unlikely students would take pre-calculus if not extremely gifted. Moderate and advanced students were far more likely to take calculus in high school if advanced into algebra by 8th grade.

When Ma (2005a,b) explained that gifted students saw minimal benefit, from being advanced early in mathematics, it was shocking to say the least. Then there were the gaps in ethnic and economic background that grew within the ranks of gifted students after being advanced. The research started to point toward acceleration being a wash, especially with honors

students also showing only minor improvements compared to gifted students. Then came the average students, who showed how much they belonged in advanced mathematics! Average students demonstrated without a shadow of a doubt that acceleration was for them. By 12th grade the students were showing increased mathematical abilities across all areas of mathematics over their non-accelerated counterparts. One of the biggest gains by average students was in algebra. These average students also closed the gap on honors students who were accelerated and surpassed the non-accelerated honors students. On top of all of this, the gap between different ethnicities, economic backgrounds and genders nearly vanished.

A final note when looking back at Loveless's research, he lumps all non-advanced students together. Ma separates the average learner out from the low achievers. Both Loveless and Ma's studies could work hand-in-hand to help solve the puzzle of acceleration.

Most of this research focuses on who succeeds and who fails, is one policy better than another one, and how the U.S.A. compares with other countries, but very little research explores the consequences of potentially not accelerating students who should have been. Admittedly, it is hard to gather and report on these students since it is difficult for a researcher to know if a student was left out. It does not happen very often that a school is forced to accelerate a group of students that do not meet the requirements to enter their program. It is especially rare that a school would almost double the size of their gifted program, by letting in students who did not meet their criteria. This research explores precisely this scenario while also examining policies from a diverse set of school districts.

Experimental Design

The hypothesis was tested by examining data from 32 different schools. These schools were located in California, Connecticut, Maryland, New Jersey, New York, North Carolina,

South Carolina, Texas, Virginia, Washington and Wisconsin. The data gathered included an outline of how the acceleration process at each school was administered, as well as an average number of students enrolled. Second, a longitudinal study was also done on a cohort of students over a 6-year span to investigate if students who initially did not qualify for the program succeeded.

Collection Process of Acceleration Programs

Thirty-two schools provided outlines of their accelerated mathematics programs. These schools are in urban, suburban and rural areas.

Source of Information	Data Collected
Online Via Email Phone	Location, Size, Demographic, Ethnicity, ESL, LEP, Socioeconomic (percent free/reduced lunch), approach, criteria, pathway (when acceleration starts), parental override, fall back (if a student can drop back), jump up/in (if a student can be advanced later on), unique characteristics

Figure 3: Sources and Data Collected

The purpose of these schools' involvement was to obtain insights into the methods used as of spring 2016. Outlines were gathered online, via email and over the phone. General Google searches were used to find mathematics acceleration programs online. Some schools had posted email addresses for their guidance counselors which were then used to gather some of the policies. The phone policies were gathered by calling schools directly and asking for guidance, these policies were then either emailed back or dictated over the phone.

Longitudinal Study of a Cohort

After sitting down with a cohort and working out which information would be available, data was gathered on all 25 students who were tracked during the 6 year process. Each student was given a rating, based on their success. The rating was on a scale of 0 - 20. After rating each

student, the 13 original students enrolled in the program, were separated from the 12 students who were let in late due to parental concern.

Process
1. A teacher and 2 students were interviewed
2. Asked them to fill out survey (in Appendix D)
3. Information gathered included original students, the added students, highest math completed, approximate class rank, ACT/SAT scores, career goals, top college choices and what happened to those students not graduating with the class

Figure 4: Cohort Information Gathering Process

These 12 students were compared and contrasted against the original 13 to see if the 12 benefitted more or less, from being placed in the accelerated mathematics classroom, in 7th grade.

Methods of Data Analysis

Organization and Synthesizing Strategy

The information on accelerated mathematics programs was gathered from schools across the country. Some were submitted by schools, others collected online. This data was then reorganized into tables which can be found in Appendix A. On the chart, submitted sources were labeled as submitted but those found online were marked with the link to the site. City and state were marked in school location, school size was either entire middle school, or 7th and 8th grade when no middle school existed. Schools were classified as urban, suburban, rural, or all. Other categories were demographic, ESL, socioeconomic, general approach, principal criteria, pathway, parental override, fall back, jump up/in, and any unique characteristics.

Part 1: Survey of Advanced/Accelerated Criteria and Protocols in Middle School Mathematics

For the data gathered and displayed in Appendix A, a scoring rubric was designed in order to attempt to fairly judge each school's criteria for getting into their version of accelerated mathematics. This was a difficult issue, as who is one person to decide what has merit and what does not? That being said, certain categories were fairly easy to score. Limiting the number of students admitted into the program each year was worth -2 points. The reason for this being, if one year you had a class of 40 students who were all incredibly gifted, scoring perfect scores on their assessments, 99% or higher in class, show a great work ethic and an understanding of abstract concepts; then all of those students should be in the advanced mathematics class, not just 20 or 22. Skipping was graded as 0 and Compacting was given a +1; this was done in accordance with Common Core guidelines that compacting is preferred to skipping grades.

Teacher recommendation is tricky to evaluate, because accepting students based solely on one or two teacher recommendations leaves a great bit of space for bias and favoritism. On the other hand, to completely ignore a teacher's opinion regarding a student would not be right either. After all, the teacher spent more time with these children than almost anybody. This led to a percentage scoring, 76-100% teacher recommendation was worth -2, 51-75% was worth -1, 26-50% was worth +1, 10-25% worth +2, 0-10% worth -1. If a school was going to have criteria for admittance into the program, more data seemed better than less. This led to scoring the number of criteria as 4 or more criteria being worth +3, 3 criteria being worth +2, 2 criteria worth +1 and 1 criteria worth 0. It was regarded as a good thing for parents to have options. An appeal process for parents to be able to either enroll their child in or remove them from the accelerated program was considered sound practice and is clear all voices were being heard.

Advanced Placement Criteria Scoring	
-2	Limiting number allowed to enroll
0	Skipping
+1	Compacting
-2	76-100% teacher recommendation
-1	51-75% teacher recommendation
+1	26-50% teacher recommendation
+2	11-25% teacher recommendation
-1	0-10% teacher recommendation
+3	4 or more criteria
+2	3 criteria
+1	2 criteria
0	1 criteria
+2	Parental override to enroll and remove
+1	Parental override to only enroll or only remove but not both
0	No parental override
+1	Able to drop back
+1	Able to jump in
+1	Scoring rubric
+2	Open enrollment for all, without criteria

Figure 5: Advanced Placement Criteria Scoring

Giving parents both options to remove or enroll got +2, giving one of the options got +1, and no option, 0. Being able to drop back was scored as +1, and allowing someone to jump in later on was also scored as +1, this was because nobody deserves to be trapped in a situation that is not right for them. The final criteria/categories which were scored included having a scoring rubric to weigh and show where students fell short was worth +1 and allowing anybody to apply without criteria was worth +2 (this did not mean Algebra for all, but instead meant anybody who

thought they could handle the workload was welcome to try). Sometimes having an option is all a student needs to succeed. All scores were broken down in the figure below. The figure above gives an easy way to view all considered items and the corresponding scores for each.

Part 2: Case Study: A Longitudinal Analysis of and Advanced Middle School Cohort from Algebra to Calculus

The longitudinal study of the cohort gave pseudo names to all students. These students in the cohort were rated for success. Success was valued on a 1 to 20 scale. Two categories came into play, first was what math level was completed by graduation, second was overall class rank. Completing Calculus 2 was worth 10 points, Calculus 1 was worth 8, PreCalculus 6, Trigonometry 4, other 2, or dropping out before finishing Algebra 0. Class rank gave 10 points for being 1st, 9 for 2nd, 8 for 3rd, 7 for 4th, 6 for 5th, 5 for 6-10th, 4 for 11-15th, 3 for 16-20th, 2 for 21-30th, and 1 for >30th.

<table>
<tr><th>Distinguishing Students</th><th colspan="7">Scoring</th></tr>
<tr><td>Names were exchanged for a letter A - Y</td><td rowspan="2">Class Rank Gave A Score 1 - 10pts</td><td colspan="2">1st
10pts</td><td colspan="2">2nd
9pts</td><td>3rd
8pts</td><td>4th
7pts</td></tr>
<tr><td>Original Students marked with an O</td><td>5th
6pts</td><td>6th-10th
5pts</td><td>11th-15th
4pts</td><td>16th-20th
3pts</td><td>21st-30th
2pts</td><td>>30th
1pt</td></tr>
<tr><td>Added Students marked with an A</td><td>Highest Math Completed gave a score 0 - 10pts</td><td>Calculus 2
10pts</td><td>Calculus 1
8pts</td><td>Pre-Calculus
6th</td><td>Trigonometry
4pts</td><td>Other
2pts</td><td>Dropping
0pts</td></tr>
</table>

Figure 6: Distinguishing Students and Scoring

So, a score of 1 meant the student dropped out before completing algebra and ended with a class rank above 30th. On the other hand, a score of 20 represented a student who was ranked 1st in the grade and completed Calculus 2. Students in the cohort were either given an O for originally

enrolled or an A for added. If a student moved away, ended up getting home schooled or graduated early, the student was given an extra 10 points to account for information that was unavailable. Other information that was gathered when available was ACT/SAT scores, career goals, and top college choices. All of this information can be seen in Appendix B.

Results

Results Component 1: Surveyed Schools

The results of the surveyed schools provided interesting information. Data gathered included the percent of the time schools used certain criteria in their policies. Also, there was additional data on schools economic and ethnic diversity. Major talking points for this information are outlined below.

- *Teacher recommendation, tests and grades made up the majority of criteria used*
- *59.38% of schools provided opt-in options*
- *43.75% of schools allowed parental override*
- *20% of schools had a student percent ceiling*

1. Teacher recommendation, tests and grades

Of the 32 schools participating in the survey most used multiple criteria for advancement. Test scores were used by 90.63% and made up on average 56.76% of the criteria weight. Teacher recommendation was involved in 68.75% and had an average weight of 21.45%. Grades were the last big criteria used by 75% of the schools; weight is unclear due to teacher recommendations often taking grades into account.

a. Teacher Recommendation

Teachers have always been the most important part of education. They teach the classes, provide advice, and are important role models to students. Their opinions matter and should be

heard, but at what point does a single teacher's opinion become too much? It was hypothesized that teacher recommendation might play too much of a role in selection for accelerated mathematics programs. Although there was a school with as much as 66% of its criteria being teacher recommendation and a few others making up 50%, of the 32 school criteria analyzed in this study, the average weight of teacher recommendation was only 21.45%. This seems rather reasonable in the grand scheme of things, but committees made up of some of these same teachers who gave the recommendation were often in charge of reviewing all the data, prior to a final decision being made. Of the 32 schools over 20 of them have review committees such as these. This would raise teacher involvement in the procedure considerably, but none of the criteria outlined how much say the teachers had in the committees.

b. Standardized Tests

Standardized testing made up a substantial amount of the criteria for entrance into advanced placement mathematics. Six of the 32 schools relied solely on standardized tests of some sort. On average the percent of criteria relying on these exams was 56.76%. This means that over half of a student's chance of getting into advanced placement is based on how they perform on 1 to 3 written exams. For students who suffer from test anxiety and being only 5th or 6th graders with little practice taking such exams, this is a really solid brick wall. When a student is required to be in the 95^{th} percentile to qualify for advanced placement, even a 90% might not place them in the advanced program.

c. Grades

As explained earlier, the criteria used did focus a great deal on teacher recommendation and standardized tests. When combined, these two criteria made up 78.21% of the entire process on average. This meant only about 21.79% was some other representation. One school gave all

students a chance, another was an online school program which took teachers and standardized tests out of the equation. When those 2 outliers were taken out, the average teacher recommendation increased to 22.88% and standardized tests went up to 60.54% for a combined impact of 83.42%. The only other factor considered was grades. Some schools focused only on math, while others thought English Language Art Skills were very important for advanced math courses. This makes grades look like they only make up 16.58% of the weighted criteria. It is impossible to tell, however, how much weight each teacher gave student class average, when deciding whether or not to recommend a student for advanced placement.

2. 59.38% of schools provided opt in options

The majority of surveyed schools allowed students to opt into the advanced mathematics program later in their high school careers, if they showed strength in mathematics. Even though these schools allowed later admittance into the program, not all of these schools provided the necessary means to do so. Two schools allowed students to catch up at any point by taking summer sessions. One of these schools outlined the process in their procedures but were mum as to whether or not there would be a cost for said course. The other school allowed a student to do so, but they had to take the course at the local community colleges and pay for it themselves. This meant that unless a student's family could afford to pay for college summer courses, there was no way to catch up. There was also one school that offered compacted courses later in high school in order to still allow students to participate in AP Calculus. Other schools gave students the option to reapply each year, but did not give an explanation as to how those students would be integrate into the program. The rest simply said yes they could get in at a later date but this only extended up until the end of their 7th or 8th grade year.

3. ***43.75% allowed parental override***

Parental override was allowed at 50% of schools surveyed. Of these schools two only allowed the parents to opt out of the program. After removing these two that percent drops down to 43.75%.

4. ***18.75% of schools had a student percent ceiling***

About 6% of schools include a mandatory cut off for the number of students admitted each year to the program. About 1/8 of schools required students to be in some percentile of their class.

Average School Size	**% Compacting**	**% Skipping**	**% Not Given**	**% Scoring Rubric**
725.43	53.13	40.63	6.25	21.88
% Using Teacher Recommendation	**% Teacher Recommendation Weight**	**% Using Test Scores**	**% Test Score Weight**	**% Using Grades**
68.75	21.45	90.63	56.76	75
% Allow Parental Override	**% Allow Falling Back**	**% Allow Jumping In Later On**	**% With Quantity Cut Offs**	
50	65.63	59.38	18.75	

Figure 7: Surveyed School Data

This leads to 18.75% of all schools surveyed limiting admission into advanced classes based on population and not actual ability.

Results Component 2: Longitudinal Study

- *The two groups had almost identical performance*
- *6 of 12 students would not have been afforded the opportunity*

1. Almost Identical Performance

In the cohort study, 4 of the 25 students, two students from each group could not be accounted for due to early graduation, moving, or switching to home school. When these 4 students were removed, the district only successfully advanced 57.14% based on reaching and completing Calculus 1. Of the originally advanced students, 54.55% were successfully advanced and 60% of the "added" students advanced successfully.

Of the 10 remaining "additional" advanced students (after removing the early graduate and the student who moved) 10% completed Calculus 1 and went no further. Half of the "additional" advanced students ended up going beyond Calculus 1 and finishing Calculus 2. Note that these "additional" advanced students would have no means of completing the course work had they not been advanced initially.

The cohort revealed an inside look at a unique situation. Each year students were selected for the advanced program based on testing and teacher recommendation and about 10 to 15 students would be selected. Due to involvement by a concerned parent, 12 additional students were admitted into the mathematics program at this school. This almost doubled the original number of students in the program, and brought the total number that year up to 25 students in 2010.

There were 13 original students. 4 of them ended up being extra advanced and completed Calculus 2. There were two more students who completed Calculus 1. Five of the original 13 (over ⅓) dropped back to the regular group and finished Pre-Calculus. The last two students either moved away or finished up being home schooled, but both at least completed Trigonometry.

Completed Calculus 2	Completed Calculus 1	Completed Pre-Calculus	Moved	Switched to Home Schooled
4	2	5	1	1
Class Ranks				
1st, 2nd, 5th, 7th, 8th, 9th, 10th, 14th, 15th, 17th and 1 in the 21st-30th Range				

Figure 8: Original Student Data

Their overall class rank was also included in deciding success which were 1st, 2nd, 5th, 7th, 8th, 9th, 10th, 14th, 15th, 17th, one in the 21st-30th range, and 2 left the school. The average success score for the original group (excluding the 2 not applicable) was 13.

Completed Calculus 2	Completed Calculus 1	Completed Pre-Calculus	Moved	Graduated Early
5	1	4	1	1
Class Ranks				
4th, 6th, 11th, 12th, 13th, 16th, 18th, 19th, 20th and 1 in the 21st-30th Range				

Figure 9: Added Student Data

Four of the additional students dropped back down and completed Pre-Calculus. Of the final two students, one moved away and the other graduated early, but both at least completed Trigonometry. The overall class ranks for the added group were 4th, 6th, 11th, 12th, 13th, 16th, 18th, 19th, 20th, one in the 21st-30th range, and 2 not applicable. The average success score for the added group (excluding the 2 not applicable) was 12. The added students were thus very similar to the original students in success score, ending up only 1 point below.

Names	O(original) or A(added)	Highest Math Completed	Approximate Class Rank	ACT/SAT Scores	Career Goals	Top College Choices	Other	Score	Score Without Class Rank
A	O	Calc2	5th	N/A	Nurse	N/A	N/A	16	10
B	A	Calc1	18th	N/A	Therapy	D'Youville	N/A	11	8
C	O	Pre-Calc	17th	N/A	N/A	N/A	N/A	9	6
D	O	Calc2	2nd	36/2260	N/A	Washington and Lee, Hamilton, Colgate	N/A	19	10
E	O	Calc2	9th	27	Physics Professor	Wells, Houghton, Fredonia	N/A	15	10
F	O	Calc1	8th	28	Financial Advisor	Dayton	N/A	13	8
G	O	Pre-Calc	20<X<30	27	Dentist	N/A	N/A	8	6
H	A	Calc2	16th	N/A	Finance	Geneseo	N/A	13	10
I	A	Calc2	12th	N/A	Engineer	University of Buffalo	N/A	14	10
J	O	Pre-Calc	15th	N/A	Economics	Kent State	N/A	9	6
K	O	Calc2	1st	N/A	Aerospace Engineer	Michigan	N/A	20	10
L	A	Calc2	6th	N/A	Piolet	Emory Riddle	N/A	15	10
M	A	Calc2	13th	N/A	Engineer	N/A	N/A	14	10
N	O	Trig	N/A	N/A	Musician	N/A	Home-school Finish	Not Scored	Not Scored
O	O	Trig	N/A	N/A	N/A	N/A	Moved	Not Scored	Not Scored
P	A	Calc2	4th	N/A	N/A	N/A	N/A	17	10
Q	A	Pre-Calc	20th	N/A	Teacher(Special Ed)	Grove City	N/A	9	6
R	A	Pre-Calc	11th	N/A	Journalist	N/A	N/A	10	6
S	A	Trig	N/A	N/A	N/A	N/A	Early Grad	Not Scored	Not Scored
T	O	Pre-Calc	7th	N/A	N/A	N/A	N/A	11	6
U	A	Trig	N/A	N/A	N/A	N/A	Moved	Not Scored	Not Scored
V	O	Calc1	14th	N/A	N/A	N/A	N/A	12	8
W	O	Pre-Calc	10th	N/A	N/A	N/A	N/A	11	6
X	A	Pre-Calc	20<X<30	N/A	N/A	N/A	N/A	8	6
Y	A	Pre-Calc	19th	N/A	N/A	N/A	N/A	9	6
Average O								**13**	**7.82**
Average A								**12**	**8.2**

Figure10: Longitudinal Cohort Data

When looking at the 2 groups, 3 things really stood out. First and most important is that 6 of each group ended up going the distance and finishing at least Calculus 1. The second is that both groups combined made up all but one of the top 20 class ranks (3rd was a transfer who also was accelerated). The third thing was the additional groups' success rates, which were also fairly even with the original group.

2. 6 of 12 Not Afforded the Opportunity

The main focus of this study was the 12 added students. Of these 12 students 5 ended up being 'extra advanced' and went on to complete Calculus 2. One of them completed Calculus 1. The six additional students that succeeded caused the most concern since those students would never have been in the program without outside interference. If the selection process took the right factors into consideration, then 6 students in a class of about 60 would not have been missed. Similarly the additional group should not have done equally as well as the original group as far as mathematical success, if the criteria needed to enter the program fairly judges a student's ability. If a school's criteria is leaving out even 1% of students that should be advanced, that is bad enough, but 10% shows a need for serious revision. The fact that the added students only scored on average 1 success point less than the original group, should say something in itself. When class rank was removed from the consideration and only mathematics course completion was scored, the added students averaged 8.20 while original students averaged 7.82 (excluding those that moved, graduated early, or switched to home school). To find these numbers, class rank points were subtracted from all the students' scores and the average was taken (these scores can be seen in Figure 10 above). These results showed that the added students were actually more successful than the original students, when it came to math alone. Though

this is one unique situation in a small school, it brings forward some very important considerations as schools move forward with their math acceleration process.

Other Topics of Interest

School locations and sizes varied from 70 to 1,385 students, from small rural schools in western New York to big urban schools in California. Whether it was Maryland, Washington, Pennsylvania, Texas, South Carolina, Connecticut, Virginia or New York similar criteria were required across the states. Ethnic/socio economic differences, ethnicity, LEP (Limited English Proficiency) or ESL (English as a Second Language) percentages did not appear to impact requirements much either. No accommodations were ever mentioned for those who might not be able to understand the exams. Some schools had as much as 84% Free or Reduced Lunches, others as low as 2.1%. The school with a 2.1% Free or Reduced Lunch has a college attendance rate of 98%.

No matter the size, location, etc. the general approach was either skipping or compacting, with only one or two outliers. One was the all online school which let all students move at their own pace thus giving the option to work through the summer to get ahead, or just move through lessons faster. The other being 1 of the 2 schools that had algebra for all (which still compacted earlier courses to get all students there by 8th grade). It should go on record that this algebra-for-all school had 1,154 drop-outs in the 2014-2015 school year, and of these 29.38% were due to achievement problems. The other algebra for all school took pre-algebra, algebra, then took algebra 1B if more practice was needed.

Seven of the schools actually broke their criteria into a scoring rubric, showing exactly how much each part weighed in the selection of advanced students. Three of these were in New York, scoring class averages (2 out of 3), standardized test scores, and teacher

recommendation. Three were in South Carolina, scoring achievement tests, classroom achievement, and teacher recommendation. The other was in Texas, scoring math grade average, and 3 exam scores (each exam and the math grade average were worth 5 points apiece). Students needed 17 points in the Texas school out of a possible 20 points.

Half the schools either did not give parents any say, or did not include any information on parental involvement. Another 2 only gave the option to opt out of the program. One school required parents to reapply each year, two allowed them to nominate their child for extra testing if the student was not selected, or to take a challenge exam to skip grades. Only one permitted total appeal rights, but a counsel would review the appeal and then the counsel or the principal would still have final say on the matter. All other schools gave the guardians the right to opt in or out of the program, but gave no extra information on the topic.

Most schools felt it was acceptable to drop out of the program if the student was struggling with the material. With 21 allowing students to drop down and 5 schools not even addressing the concept, only 5 schools would not allow students who were not achieving adequately to fall back into a better fit. Similarly, (as addressed above) the majority of schools left an option for students to jump in at a later date (even if vague on how), if students showed ability later on in their education. Four of the five schools that would not let students drop out also did not leave an option to jump in.

Whether the school submitted its data or it was found on the web, most of the information was the same. The big difference was no online school actually disclosed how many students dropped out of the programs each year, but some of the submitted programs did. Where two out of three South Carolina school's added students to their advanced classes between 7^{th} and 8^{th} grade, New York schools either all continued or saw drops such as Southwestern, who typically

lose a third of their accelerated students by 8th grade. In general though, whether submitted or found online, schools seemed to have similar criteria. The schools across the country use a variety of approaches for deciding which students are selected for math advancement. The challenging part will be deciding the best practice for creating a successful math acceleration program.

Implications for Program Design

Policy Criteria Must Haves

When designing an advanced placement policy there are certain criteria recommendations. These recommendations are meant to be helpful for both students and schools. From everything that was gathered and all the research completed, 6 abiding principles were deemed must haves as criteria for entering accelerated mathematics:

- *School district advancement process must provide reasonable and transparent opt-in and opt-out provisions*
- *There should be a clear, outlined scoring rubric justifying all decisions to advance or not advance a student*
- *There is a need for balance and multiple criteria*
- *There should not be a population limit or percentile cut-off*
- *There should be parental override*
- *Schools should use compacting not skipping*

1. ***School District Advancement Process must provide reasonable and transparent Opt-in and Opt-out provisions***

Options to get in when the student knows they have it in them, or out when they know they do not. Some kids are late bloomers and should still have the ability to get into accelerated

classes even after 8th grade. Some schools gave exams, or allowed doubling up on math classes, others offered summer catch up programs. Whatever the provision, there should always be at least one. A school should consider that a great deal of students cannot afford a college summer course to catch-up, and thus this is not an acceptable provision. Catch-up programs should be available for all students regardless of their ability to pay.

As the study showed, students are not always selected initially. The need for provisions, to help and allow students to enroll in advanced classes later on are important. Six students that had every right to be in advanced placement would have had no options, had it not been for one concerned parent. This should not be left to chance on any other student. To miss even one student is to harm that student for the rest of their life. Teachers know they impact students' lives, and proper placement is one of the ways they can make an impact.

2. There should be a clear, outlined Scoring Rubric justifying all decisions to advance or not advance a student

All criteria scored should be marked and the entirety of the data should be sent to the parents. This shows parents exactly where their child fell short if the student is not placed in the program. Also, it should cut down on teacher bias, as it would be bold of a teacher to block out a child with perfect test scores and math grades, by giving a 0 on teacher reviewed criteria. This call for clear, scored criteria also protects schools from potential law suits and parental backlash. With defined criteria that is available to the public, parents can see what is expected of their children in order to get into advanced courses.

3. Balance and Multiple Criteria are needed

Some students do not test well, some do not stand out and get teacher recognition, others are late bloomers, and even more just do not know the program exists. Weighing any criteria too

heavily could be detrimental to a program. Standardized test scores, math grades, teacher recommendation, parental recommendation, and student recommendation should be reviewed for all students. The multiple criteria also protects the school, just like with the scoring rubric. The more information that is reviewed, the harder it is for a parent to find fault with the school for not placing their child in an advanced program.

4. There Should Not be a Population Limit or Percentile Cut-off

No school should limit the number of students allowed in their program. If the student has the ability to succeed within that class, then the student should be allowed to take the class. Criteria scores should be the cut off and the score to get into the program should remain constant. There is a problem when students are required to be in a certain percentile of their class. A percentile cut off is bias toward any gifted youth, unfortunate enough to be in the same grade as a more gifted group of students. The course does not change each year, however a top pick in 2013, could be completely omitted in 2014.

5. Parental Override

No parent should be left out of decisions that will affect the rest of their child's life. If a parent believes their child should be advanced one of two things should happen.

School district advancement process must provide reasonable and transparent opt-in and opt-out provisions
There should be a clear, outlined scoring rubric justifying all decisions to advance or not advance a student
Balance and multiple criteria are needed
There should not be a population limit or percentile cut-off
Parental override
Compacting not skipping

Figure 11: 6 Criteria Musts

One is that an appeal process should be included in the school policy, allowing for students or their guardians to present a case for why the student should be in the program. Second is that the student should just be placed into the program, but if the child does not maintain a certain grade level in the class, he/she will be dropped back down to their original, non-advanced mathematics class. There is never any harm to a school's reputation when they open doors for their student body. The schools that get the worst attention from media and parents are the ones that close the doors. If a parent or student pushes to be in an advanced class, they should simply be advanced.

6. Compacting not Skipping

Besides being the Common Core preferred method of advancing students, there is another reason to compact rather than skip grades. When a student skips a grade completely there are bound to be gaps and since each level of mathematics builds-on from the previous level, skipping weakens the foundation of student's mathematical education. A person cannot be

expected to learn how to count to ten if nobody teaches them the numbers 7 and 8 first. The concepts learned in 7th grade are far more advanced, and to completely skip them would put students at a far bigger disadvantage.

Back To Survey Results

Of all of the school policies submitted or taken off the web, Irvine Unified School District got the highest score on their criteria (scoring 10 of a possible 11). 5 of the 6 criteria were used by this school district. There was a clear process, balanced with multiple criteria, no cut-off based on population, parental override and used compacting. After scoring this school more research was done to see if the output of the school was comparable to the criteria score. Several of their schools have received national recognition and have students performing "well-above" state and national levels. All 4 of their high schools have been recognized at some point since 1986 for the California Distinguished School designation (won 61 times by the school district in that time period). They have 15 Blue Ribbon schools since 1983. This school district was consistently top 10 for highest SAT scores in Orange County. Twenty-three schools in the district were rated a 10, four with 9, two got an 8 and only one received a 7 (rated 1-10, 10 being highest), by zillow's school rating system. This school district is a prime example of advanced placement policies done right.

Research Limitations and Expansions

If undertaken again more specifics would have been requested of submitting programs. These details include but are not limited to percentage of students planning to go on to college after graduation, student opinions, parental concerns and more detail on the courses considered advanced by the programs. For the schools found online it would have been good to

call and get clarification on information that was vague or missing from the website. Another possibility is to find other school rating sites to get more than one source on a school.

To expand on this research, the first thing that would be done is to call every school where web information was the primary source. From these calls, clarification on certain points that were less solid or missing altogether would be requested. In addition to this more policies would be gathered from submitted sources and extra information on how many students actually make it in the program until graduation. The percentage of students who plan on going onto further education would also be helpful in judging strength of a school's program.

References

Accelerated Programs. Retrieved from http://www.lwsd.org/Parents/Accelerated-Programs/Pages/default.aspx

Beaton, A. E., Mullis, I. V. S., Martin, M. O., Gonzalez, E. J., Kelly, D. L., & Smith T. A. (1996). Mathematics achievement in the middle school years: IEA's third international mathematics and science study (TIMSS). *International Association For The Evaluation Of Educational Achievement.*

Braddock, J. H., Dawkins, M. P. (1993). Ability grouping, aspirations, and attainments: Evidence from the national educational longitudinal study of 1988. *Journal of Negro Education, 62*(3), 324-336.

Burris, C. C., Heubert, J. P., & Levin, H. M. (2004). Math acceleration for all. *Educational Leadership, 61*(5), 68-71.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2012). The aftermath of accelerating algebra: Evidence from a district policy initiative. *National Center For Analysis Of Longitudinal Data In Education Research.*

Colangelo, N., Assouline, S. G., & Gross, M. U. (2004). A nation deceived: How schools hold back america's brightest students. *Connie Belin & Jacqueline N. Blank International Center For Gifted Education and Talent Development (NJ1).*

Colangelo, N., Assouline, S. G., & Marron, M. A. (2010). Guidelines for developing an academic acceleration policy. *Journal of Advanced Academics, 21*(2), 180-203.

Dougherty, S. M., Goodman, J. S., Hill, D. V., Litke, E. G., & Page, L. C. (2015). Middle school math acceleration and equitable access to eighth-grade algebra: Evidence from the wake county public school system. *Educational Evaluation and Policy Analysis, 37*(1), 80-101.

Gamoran, A., & Hannigan E. C. (2000). Algebra for everyone? Benefits of college-preparatory mathematics for students with diverse abilities in early secondary school. *Educational Evaluation and Policy Analysis, 22*(3), 241-254.

Heller, K. A., & Hany, E. (2004). Identification of gifted and talented students. *Psychology Science, 46*(3), 302-323.

Hertzog, N. B. (2003). Impact of gifted programs from the students' perspectives. *Gifted Child Quarterly 47*(2) 131-143.

High School Mathematics Courses and Pathways. Retrieved from http://www.hcpss.org/academics/mathematics/courses-and-pathways/

Holland, P. W., Paek, P., & Suppes, P. (1999). Development and analysis of a mathematics aptitude test for gifted elementary school students. *School Science and Mathematics, 99*(6), 338.

Horn, L., & Nunez, A. M. (2000). *Mapping the road to college: First-Generation Students' Math Track, Planning Strategies and Context of Support* (NCES 2000-153). Washington, DC: U.S. Department of Education.

Kettler, T., & Curliss, M. (2003). Mathematical acceleration in a mixed-ability classroom: Applying a tiered objectives model. *Gifted Child Today, 26*(1), 52-55.

Loveless, T. (2008). *The Misplaced Math Student Lost In Eighth-Grade Algebra*. Brown Center Report on American Education.

Ma, X. (2005a). A longitudinal assessment of early acceleration of students in mathematics on growth in mathematics achievement. *Developmental Review, 25*(1), 104-131.

Ma, X. (2005b). Early acceleration of students in mathematics: Does it promote growth and stability of growth in achievement across mathematical areas? *Contemporary Educational Psychology 30*(4), 439–460.

Ma, X. (2005c). *Effects of Early Acceleration of Students In Mathematics On Mathematics Coursework.* International Statistical Institute, 55th Session.

Math Placement Information for Students. Retrieved from http://wake-ms-math.weebly.com/

Math Placement Process for 2014-15. Retrieved from https://hamilton.madison.k12.wi.us/node/1363

Math Placement Process. Retrieved from https://www.sandiegounified.org/schools/muirlands/math-placement-process

Math Placements for Incoming 7th Graders. Retrieved from http://cascadeview.sno.wednet.edu/Domain/1751

Mathematics. Retrieved from http://cty.jhu.edu/ctyonline/courses/mathematics/

Middle School Advanced Programs. Retrieved from http://www.leanderisd.org/default.aspx?name=AP.middle

Middle School Math Curriculum. Retrieved from http://www.issaquah.wednet.edu/academics/core/math/middle

Middle School Math Placement Policy. Retrieved from http://www.mka.org/page.cfm?p=842

Middle School Math Placement Policy. Retrieved from http://web.lancastercountryday.org/forms/Middle%20School/5th%20-%206th%20grade%20transition%20breakfast%202014/MiddleSchoolMathPlacementPolicy02.14.pdf

Middle School Math Placement Policy 2014-2015. Retrieved from http://goms.rocklinusd.org/documents/counseling/rusd_ms-math-policy_2014-15_class-names.pdf

Middle School Math Placement. Retrieved from http://evergreenps.org/Article-View/middle-school-math-placement

Raudenbush, S. W., Fotiu, R. P., & Cheong Y. F. (1998). Inequality of access to educational resources: A national report card for eighth-grade Math. *Educational Evaluation and Policy Analysis, 20*(4), 253-267.

Rayneri, L. J., Gerber, B. L., & Wiley, L. P. (2006). The relationship between classroom environment and the learning style preferences of gifted middle school students and the impact on levels of performance. *Gifted Child Quarterly, 50(2), 104-118.*

Rotigel, J. V., & Fello, S. (2004). Mathematically gifted students: How can we meet their needs? *Gifted Child Today, 27*(4), 46-51.

School Ratings. Retrieved from https://www.zillow.com

Secondary Math Pathways. Retrieved from http://www.iusd.org/education_services/math-pathways/

Siegle, D., & Powell, T. (2004). Exploring teacher biases when nominating students for gifted programs. *Gifted Child Quarterly, 48*(1), 21-29.

Silva, C. M., Moses, R. P., Rivers, J., & Johnson, P. (1990). The Algebra Project: Making middle school mathematics count. *Journal of Negro Education, 59*(3), 375-391.

Slavin, R. E., Lake, C., & Groff, C. (2009). Effective programs in middle and high school mathematics: A best-evidence synthesis. *Review of Educational Research.*

Spielhagen, F. R. (2015). Closing the achievement gap in math: The long-term effects of eighth-grade algebra. *Journal of Advanced Academics, 18*(1), 59-92.

Spielhagen, F. R. (2006). Closing the achievement gap in math: Considering eighth grade algebra for all students. *American Secondary Education, 34(3), 29-42*.

Starko, A. J. (1990). Life and death of a gifted program: Lessons not yet learned. *Roeper Review, 13*(1), 33.

Useem, E. (1998). Teachers' appraisals of talent development middle school training, materials, and student progress. *Center For Research On The Education of Students.*

VanTassel-Baska, J. (2005). Gifted programs and services: What are the nonnegotiables? *Theory Into Practice, 44*(2), 90-97.

Williams, T., Haertel, E., Kirst, M. W., Rosin, M., & Perry, M. (2011). Preparation, placement, proficiency: Improving middle grades math performance. Policy and practice brief. *Edsource,* 20.

Wimberly, G. L., & Noeth, R. J. (2005). College readiness begins in middle school. ACT policy report. *American College Testing ACT Inc.*

Appendix A

School	School Size	Demographic	Ethnic	ESL/LEP
A	1272	Suburban	95% White 2% Black 1% Hispanic 2% Other	0% ESL
B	679	Suburban	75% White 8.4% Hispanic 1.9% Black 14.7% Other	N/A
C	1260	All	40.4% White 10.2% Black 24.6% Hispanic 24.7% Other	15.4% ESL
D	631	Suburban	40.8% White 22.5% Black 9.9% Hispanic 26.8% Other	<5.0% LEP
E	650	Urban	32.3% White 3.0% Black 10.8% Hispanic 53.9% Other	39% ESL 17% LEP
F	1197	Suburban	47.6% White 1.9% Black 10.3 Hispanic 40.2% Other (33.5% Asian)	7.5% ESL
G	961	All	48% White 26% Black 15% Hispanic 11% Other	1.8% ESL 5% LEP (limited English proficient)
H	857	Suburban	43.3% White 39% Black 8.7% Hispanic 9% Other	7.1% LEP
I	821	Suburban	27% White 31% Black 34% Hispanic 8% Other	35.4% LEP
J	808	Rural	73% White 15% Black 5% Hispanic 7% Other	5% LEP
K	1018	Suburban	63.2% White 3.2% Black 17.2% Hispanic 24.8% Other	11.4% ESL
L	774	Suburban	70% White 3% Black 17% Hispanic 10% Other	N/A
M	735	Suburban	67% White 5% Black 6% Hispanic 22% Other	LEP 10%
N	764	Urban	64% White 1% Black 10% Hispanic 25% Other	N/A
O	Online	Online	Online	Online
P	559	Suburban	65% White 2% Black 9% Hispanic 24% Other	N/A
Q	578	Suburban	82% White 2% Black 4% Hispanic 12% Other	N/A
R	1385	Suburban	63% White 4% Black 24% Hispanic 9% Other	17% ED (economically disadvantaged) 5% LEP
S	1043	Urban	70% White 11% Black 5% Hispanic 14% Other	N/A
T	974	Suburban	66% White 13% Black 6% Hispanic 15% Other	1% LEP
U	806	Suburban	70% White 1% Black 8% Hispanic 21% Other	4% LEP
V	492	Urban	25% White 13% Black 44% Hispanic 18% Other	29% LEP
W	5645 total middle schoolers, schools are both k-8 and 6-8 in district	Urban, Suburban	White 67.5% Black 3.8% Hispanic 20% Other 8.7%	N/A
X	695	Rural	81% White 1% Black 8% Hispanic 10% Other	N/A
Y	490	Urban	39% White 11% Black 48% Hispanic 2% Other	14% LEP
Z	662	Suburban	97% White 1% Black 1% Hispanic 1%	0% LEP

			Other	
A-B	120 Total for 7th and 8th	Rural	95% White 1% Black 2% Hispanic 2% Other	0% LEP
A-C	490	Urban	78% White 5% Black 11% Hispanic 6% Other	1% LEP
A-D	70 Total for 7th and 8th	Rural	97% White 2% Black 0% Hispanic 1% Native American	0% LEP
A-E	327	Suburban	92% White 1% Black 1% Hispanic 6% Other	0% LEP
A-F	509	Urban	58% White 8% Black 21% Hispanic 13% Other	4% LEP
A-G	136 Total for 7th and 8th	Rural	98% White 1% Black 1%Hispanic	0% LEP

School	Socioeconomic	General approach	**Principal Criteria**
A	7% Free/reduced lunch	Compacting	Teacher rates Homework/Tests/Retention 1-15 Teacher rates Attendance/Work Ethic/Ability 1-10 Grade 6 Final Average rated 0-12 Grade 5 Math Assessment rated 0-9
B	2.1% Free/reduced lunch	Skipping based on scoring Some Compacting if attempting to Opt In to adv placement in 8th	Cogat Composite Score - 0-5pts ITBS Math - 0-5pts IAAT - 0-5pts Math Average - 0-5pts
C	28.2% Free/reduced lunch	Algebra for all in 8th (Compacting in the sense that all curriculums lead to Algebra in 8th)	Both Math 7 and Math 7 Honors prepare students for Algebra or Algebra Honors in 8th Grade, to be in Algebra Honors must have successfully have completed advanced 6th grade or a year-long accelerated curriculum, score above 91st percentile on IAAT, and score a pass advanced on grade 7 math SOL test
D	20.6% Free/reduced lunch	Skipping based on completion of initial advanced placement	CogAT or SCAT score, or school G/T Placement Committee, if not placed by committee, parents/teachers can submit additional information for review
E	N/A	Compacting and Enhanced Classes	End of course assessments, Math grades, Teacher appraisal, Basic skills exam
F	6.7% Free/reduced lunch	Compacting Starting in 6th grade	Placement is based on score on the placement exam
G	34.9% Free/reduced lunch	Some Compacting but mostly skipping	In 6th grade your placement is based on your achievement probability of scoring a level 3 in Algebra 1, In 7th grade your placement is based on where you were in 6th grade and your achievement probability of scoring a level 3 in Algebra 1
H	N/A	Primarily Skipping	8th grade placement is based on 3 categories with scoring rubric: Achievement Tests, Classroom Achievement and Characteristics/Study Habits, these each come with scoring rubrics, Achievement test max 14pts, Classroom Achievement max 14pts, Characteristics/Study Habits per teacher max 14pts (7 ranked by teacher max each of 2)
I	N/A	Primarily Skipping	8th grade placement is based on 3 categories with scoring rubric: Achievement Tests, Classroom Achievement and Characteristics/Study Habits, these each come with scoring rubrics, Achievement test max 14pts, Classroom Achievement max 14pts, Characteristics/Study Habits per teacher max 14pts (7 ranked by teacher max each of 2)
J	N/A	Primarily Skipping	8th grade placement is based on 3 categories with scoring rubric: Achievement Tests, Classroom Achievement and Characteristics/Study Habits, these each come with scoring rubrics, Achievement test max 14pts, Classroom Achievement max 14pts, Characteristics/Study Habits per teacher max 14pts (7 ranked by teacher max each of 2)
K	46.3% Free/reduced lunch	Compacting, with option to skip 6th grade math all together	A challenge exam taken at the end of 6th grade decides placement in either Common Core 7th Grade Math or Accelerated 7/8 Compacted Math. An 80% or higher on the challenge exam at end of 6th
L	14% Free/reduced lunch	Skipping early on to advanced 6th grade math which may be considered a compact of 6th and 7th grade topics	Step 1:Performance data, grade level standardized tests, and observational data using checklists based on gifted characteristics Step 2:Out-of-level tests that do not suffer from the ceiling effect, scores analysed by Building Advisory Committee
M	18%	Skipping	Step 1: In-house math screener is given to all CMP grade 6 students (>75% move to step

	Free/reduced lunch		2) Step 2: Second screener by the TAG department at Central Office (>80% move on, and can take mores screeners for subsequent levels until they "top out") Step 3: A review committee reviews in-house screener, the district screener, MAP data, math grades, in-class scores, teacher data/observations, and CogAT scores Step 4: Recommendations are made and student is placed
N	17% Free/reduced lunch	Compacting	All students have choice
O	N/A	Personal Progression (Compacting)	Students take classes online, if they wish to take one above their grade level they take a placement exam to show ability
P	15% Free/reduced lunch	Quest Classes, which are more advanced classes but remain at grade level (Compacting)	Parents apply, then students take CogAT, Iowa Assessment, and Renzulli Creativity Scale, then these exams are reviewed and student is placed
Q	N/A	Skipping	must achieve ERB scores in or above the eighth stanine on the Math and Quantitative Reasoning sections, score at least 20 on the Glencoe Diagnostic & Placement Test 2 and have the recommendation of the fifth-grade teacher.
R	19% Free/reduced lunch	Skipping, Testing Up	Students in 6th - 8th grade can take an exam to get credit for a class they haven't yet taken, if they score above 80%. The student will then skip that class and move into the next one
S	N/A	Skipping, Algebra for All at or before 8th grade	Organization and Study Habits, Reasoning Skills, and Summative Assessments decide placement. To be advanced a student must score above a 90% on the placement assessment, and be above 95% National Norms in the quantitative reasoning and mathematics sections
T	14% Free/reduced lunch	Compacting	Students must have 2 of 3 items:Report Card Grades (A average/90% or higher),CPA (Comprehensive Placement Assessment) – Score To Be Decided,Teacher Feedback Checklist (8 or more) - this checklist ranks 11 items as consistently or not consistently, items are highly motivated and inquisitive, accepts the challenge of solving mathematical problems, explains thinking in written form, learns quickly at a fast pace, learns quicker than peers at a faster pace, works independently, analyzes problems and sees results easily, thinks outside the box, self-confidence, highly fluent in mathematics, and uses various approaches to solve problems
U	14% Free/reduced lunch	Compacting	Based on placement test taken at end of 6th grade year, along with academic math grades and Smarter Balanced scores (when available), student must have a minimum score in the 90th percentile on the end of 6th grade placement test, also a minimum in the 90th percentile on Smarter Balanced math and ELA assessments
V	63% Free/reduced lunch	Doesn't detail, but the advanced classes seem to have a Compact element to them	Math Readiness Assessment, Math Grades, SBAC Assessment Results, Teacher Recommendations (though no specifics were indicated)
W	26% Free/reduced lunch	Skipping	AIMS results, District achievement benchmark data, teacher assessment, and diagnostic test (designed to test a student's ability to think about math 2 grade levels above them)
X	23% Free/reduced lunch	Compacting	"All 6th grade students are invited to apply for advanced placement in mathematics as 7th graders. Applications for students will be available March 14 and are due March 30. Completion of the student application (which also includes a teacher evaluation form) makes a student eligible to take the District Middle School Placement Test. The applications and performance on the Placement Test will be reviewed by a collaborative team of the middle school math department chairs and the district math specialist. Students that qualify will be sent letters stating their placement into the assigned math level by the end of May."
Y	67% Free/reduced lunch	Compacting	Teacher recommendation, standardized test scores and teacher evaluation
Z	33% Free/reduced lunch	Compacting	Chosen at end of 5th grade, all 5 previous elementary teachers meet with math department, discuss state math tests, math class averages, and work ethic. Rank all students based on these categories and select the top 20 students
A-B	30% Free/reduced lunch	Compacting	class average (must be 85 or higher), state testing results, and teacher recommendation, each is scored on a scale 1-5, of a possible 15 points, students need 12 to be placed in advanced math (teacher recommendation is said to be most accurate tool, according to this school)

A-C	58% Free/reduced lunch	Compacting	District designed exam offered to all students, the score on this exam is combined with teacher recommendations, 5th/6th grade averages, and NYS Ela and Math exam scores. These are reviewed by a committee
A-D	47% Free/reduced lunch	Skipping	Selection for program is not made until the end of 7th grade, base on a 95% or higher grade average for the year, teacher recommendation, algebra readiness placement exam and state exam scores
A-E	27% Free/reduced lunch	Compacting	Must be a High Performing Student (90+ average), with teacher recommendation, Iready score at or above grade level, and have a final exam score in the 95 percentile
A-F	84% Free/reduced lunch	N/A	Teacher Referrals are based on: Academic performance,class grade,4th grade NYS Science test result,5th grade NYS ELA and math test result,Academic behavior,completes homework,willing to devote extra time and effort to succeed,demonstrates high interest in subject,demonstrates self-discipline and motivation,demonstrates an aptitude for problem solving and,critical thinking activities,demonstrates an ability to think and learn,independently, Attendance, and School Behavior. When student sits for placement test, the score and the above criteria determine placement
A-G	14% Free/reduced lunch	N/A	Based on 2 tests and teacher recommendation, each test is worth 4 points and teacher recommendation is worth 4 points, need 9 points to get in

School	Pathway	Parental Override	Fall Back	Jump up/in	Unique characteristics	Score
A	7th-CC7/8 8th-CC8/Alg1	Can Opt Out	Yes	Yes	They use a scoring system to decide if the students are prepared for the accelerated program	9
B	7th - take Algebra if total pts are at least 17, take Pre-Algebra if total is at least 9 pts	Can Opt Out	Yes - only if below 80%	Yes if student gets 21pts, a 7th grader can be advanced to Algebra I in 8th grade	Approximately 98 percent of Carroll's seniors go on to attend a college or university after graduation. More than 90 percent of Carroll students take a college entrance exam, with composite scores on the SAT and ACT that exceed state and national averages. Placement is solely based on performance and not on teacher recommendation	6
C	Algebra for all in 8th	No	No	No	29.38% of the 1,154 drop-outs in the 2014-2015 school year were due to achievement problems	1
D	regular math course with one 2-hour class per week, the class is designed for more independent thinkers and is more rigorous, upon completion students may take Algebra in 8th	Yes	N/A	Yes	Howard County students score above the national averages on standardized tests and more than 93 percent of graduates continue their education beyond high school.	2
E	Multiple pathways based on completion of previous class	Yes	Yes	Yes	N/A	10
F	Multiple pathways based on completion of previous class	N/A	Yes	Yes	For late bloomers there is an option to do compacted courses later in high school in order to still be able to do AP Calculus your senior year	2
G	All paths seem to start in 6th grade and based on where you are at the end of that year you will follow a specific pathway	Yes, but a review team has the final say	Yes, but the principal has the final say	N/A	Regardless of parent involvement Review Team and Principal have final say in both getting into and getting out of the program	2
H	Broken into 3 paths: College Prep, Honors and Advanced Placement Horizons	Yes	Yes	Yes	Advanced Placement Horizons can lead to the completion of AP Calculus in 11th Grade, average number in 7th grade is 16, average number in 8th grade is 21	8
I	Broken into 3 paths: College Prep, Honors and Advanced	Yes	Yes	Yes	Advanced Placement Horizons can lead to the completion of AP Calculus	8

	Placement Horizons				in 11th Grade, average number in 7th grade is 11, average number in 8th grade is 9	
J	Broken into 3 paths: College Prep, Honors and Advanced Placement Horizons	Yes	Yes	Yes	Advanced Placement Horizons can lead to the completion of AP Calculus in 11th Grade, average number in 7th grade is 22, average number in 8th grade is 23	8
K	pathways are either 7th, 8th, Algebra 1, Geometry, Algebra 2, PreCalculus or 7/8, 8/Algebra 1, Geometry, PreCalculus, Calculus	Yes, parents can have child take challenge exam at end of 5th to possibly skip 6th Grade Math	N/A	N/A	N/A	2
L	If put into Math 6A, the average student will take Honors Geometry, Honors Algebra 2, PreCalculus and then Calculus in 9th, 10th, 11th and 12th grade. Another path starts with Pre-Algebra 1 in 6th grade and ends in Advanced Calculus or AP Statistics in 12th	Yes,Parents may nominate children who are not recommended for additional testing	Yes	Yes, bridge courses in the summer and entrance exams	At any point in their high school career, students can take a summer bridge course in order to enter the next class the following school year	9
M	Depending on how far up you test, a student may start at almost any level and work up from there. at the middle school level they teach up to Algebra 2, then they may progress further after in high school	No	Yes	Yes	Students keep taking the math screeners until they "top out", so in theory a student could skip right to Algebra 2, if they show enough knowledge of the math content is the levels before.	7
N	7th-CC7/8 8th-CC8/Alg1 9th-Geometry	Yes	Yes	Yes	families make the decision as to what is best for their children.	6
O	Courses may be taken in the order in which makes the most sense for the student	Yes	Yes	Yes	Based solely on individual ability and individual needs, online courses in mathematics	6
P	Students who meet criteria are put into 6th Grade Quest classes, and then move up through the Quest classes	Yes - each year the parents must make the decision to apply or not	Yes - each year students must reapply	Yes - each year students can re-apply	First school seen, that calls them Quest courses, but students must be in the 99th percentile on the CogAT to qualify, along with 98th National percentile rank on the Iowa Assessment and 80th percentile on the Renzulli Creativity Scale	5
Q	Starting in 6th grade, they take 7th grade math, then move up	No	Yes - if scores fall below standards	No	N/A	6
R	Can accelerate up until 8th grade, and get as high as Algebra 1	No	No	No	Students can test up to but not including Algebra 1, once at the Algebra level students must take the courses	-1
S	Accelerated students take Pre-Algebra in 6th then either Algebra 1A or Algebra in 7th, then Algebra 1B or Geometry in 8th Grade	No	Yes - but only within their pathway	Yes - but only within their pathway	Though there is some option about which course is taken each year, the advanced placement pathways are separated from regular, with no way out until 9th grade if you took the Algebra1B in 8th. Regardless of being advanced or not all students except the ones who take Geometry in 8th grade have the option to take Geometry or Geometry Honors in 9th. Only those who take Geometry in 8th grade can choise between Algebra 2 or Algebra 2 Honors	6

T	Starts in 4th grade compacting 4th and part of 5th, then in 5th compacting part of 5th and part of 6th, then part of 6th and all of 7th, then in 7th grade taking 8th grade math, then moving on to Algebra in 8th	No	No	No	Start compacting in 4th grade	4
U	7th-7/8, 8th-8/Alg1, 9th-Geo or Geo/Alg2, 10th-Alg2 or PreCalc, 11th-Pre-Calc or Calc AB, 12th-CalcAB or Calc BC (all are accelerated pathways	N/A	N/A	Yes	Quoted "Advanced math courses are highly dependent on English Language Art skills."	3
V	Accelerated 6th, Accelerated 7th, Integrated 1 Advanced, Integrated 2 or Integrated 2 Advanced, Integrated 3 or Integrated 3 Advanced, Pre-Calc or Calc, Calc or College Math	N/A	No	No	Very vague and leave out a lot of information, like parental overrides, scores and grades necessary	6
W	Accelerated students start Algebra 1 in 8th grade all others in 9th, then they have courses broken into years 1-7, students can move to next year column based on readiness, performance and teacher recommendations, all students take Algebra 1 in year 1 and Calculus 3 in year 7	No	No, but an elective will be given, that gives extra help in Mathematics per grade level if needed	Yes	In 2011, SUSD was "moving toward making Algebra I available to all eighth-graders" --- 88% Graduation rate Average ACT 29, SAT 1860	6
X	Two tracks available for accelerated students: Track 1 takes Algebra 1 in 8th grade and builds from there, Track 2 takes Algebra in 7th grade and builds from there	Yes	N/A	No	N/A	8
Y	7th-7/8, 8th-Algebra 1	Yes	Yes	N/A	Have the most detailed form outlining what will have a student removed from the advanced program, but no information on whether a student can jump in at a later date	5
Z	6th and 7th - 6/7/8 8th - Algebra 1	N/A	Yes	Yes	N/A	3
A-B	7th - 7/8 8th - Algebra 1	N/A	Yes - if average falls below 85%	N/A	About 22% of students are placed in advanced mathematics, this is not a limit however (they have had up to 33% in their advanced math placement)	6
A-C	7th - 7/8 8th - Algebra 1	N/A	Yes	N/A	20-25 students selected each year, about 15-18 students continue on into 9th grade	7
A-D	8th - Algebra 1	N/A	No	N/A	No special classroom, students mixed in with the regular class of 9th grade students (Average number selected for advanced placement is 3)	4
A-E	5th - Accelerated 5th, 6th - Accelerated 6th, 7th - Accelerated 7th, 8th - Algebra 1	N/A	Yes	Yes	Typically 20% of students enter Accelerated 6th, 4-5 drop out by the end of that year, then 3-4 more drop out of the program by the end of Accelerated 7th. Thus 20% of 105 per grade = 21, 21 - 5 - 3 = 13 students end up on average in Algebra 1 in 8th grade, less that 2/3 of the original group	8

A-F	N/A	N/A	N/A	N/A	N/A	2
A-G	N/A	Yes	Yes	Yes - at least one case of a student taking summer course to catch up and advance	N/A	8
AVERAGE						**4.47**

Advanced Placement Criteria Scoring	
-2	Limiting number allowed to enroll
0	Skipping
+1	Compacting
-2	76-100% teacher recommendation
-1	51-75% teacher recommendation
+1	26-50% teacher recommendation
+2	11-25% teacher recommendation
-1	0-10% teacher recommendation
+3	4 or more criteria
+2	3 criteria
+1	2 criteria
0	1 criteria
+2	Parental override to enroll and remove
+1	Parental override to only enroll or only remove but not both
0	No parental override
+1	Able to drop back
+1	Able to jump in
+1	Scoring rubric
+2	Open enrollment for all, without criteria

Appendix B

Names	O(original) or A(added)	Highest Math Completed	Approximate Class Rank	ACT/SAT Scores	Career Goals	Top College Choices	Other	Score	Score Without Class

									Rank
A	O	Calc2	5th	N/A	Nurse	N/A	N/A	16	10
B	A	Calc1	18th	N/A	Therapy	D'Youville	N/A	11	8
C	O	Pre-Calc	17th	N/A	N/A	N/A	N/A	9	6
D	O	Calc2	2nd	36/2260	N/A	Washington and Lee, Hamilton, Colgate	N/A	19	10
E	O	Calc2	9th	27	Physics Professor	Wells, Houghton, Fredonia	N/A	15	10
F	O	Calc1	8th	28	Financial Advisor	Dayton	N/A	13	8
G	O	Pre-Calc	20<X<30	27	Dentist	N/A	N/A	8	6
H	A	Calc2	16th	N/A	Finance	Geneseo	N/A	13	10
I	A	Calc2	12th	N/A	Engineer	University of Buffalo	N/A	14	10
J	O	Pre-Calc	15th	N/A	Economics	Kent State	N/A	9	6
K	O	Calc2	1st	N/A	Aerospace Engineer	Michigan	N/A	20	10
L	A	Calc2	6th	N/A	Piolet	Emory Riddle	N/A	15	10
M	A	Calc2	13th	N/A	Engineer	N/A	N/A	14	10
N	O	Trig	N/A	N/A	Musician	N/A	Homeschool Finish	Not Scored	Not Scored
O	O	Trig	N/A	N/A	N/A	N/A	Moved	Not Scored	Not Scored
P	A	Calc2	4th	N/A	N/A	N/A	N/A	17	10
Q	A	Pre-Calc	20th	N/A	Teacher(Special Ed)	Grove City	N/A	9	6
R	A	Pre-Calc	11th	N/A	Journalist	N/A	N/A	10	6
S	A	Trig	N/A	N/A	N/A	N/A	Early Grad	Not Scored	Not Scored
T	O	Pre-Calc	7th	N/A	N/A	N/A	N/A	11	6
U	A	Trig	N/A	N/A	N/A	N/A	Moved	Not Scored	Not Scored
V	O	Calc1	14th	N/A	N/A	N/A	N/A	12	8
W	O	Pre-Calc	10th	N/A	N/A	N/A	N/A	11	6
X	A	Pre-Calc	20<X<30	N/A	N/A	N/A	N/A	8	6
Y	A	Pre-Calc	19th	N/A	N/A	N/A	N/A	9	6
Average O								**13**	**7.82**
Average A								**12**	**8.2**

Appendix C

[redacted]

2015-2016 8th Grade Math Placement Recommendation for
Honors Algebra I, Algebra I - Part I or College Prep

Student Name: _____
Current School: _____
Current Math Placement in 7th grade: 7th Gr. College Prep Math _____or Honors Pre-Algebra _____

To determine if student qualifies for Honors Algebra I, Algebra I – Part I or College Prep, fill in sections A through C.

A. **Standardized Test Score Component – Achievement**

PASS – Date: _____ _____score _____ points

703 and above	→	14 points
667 - 702	→	12 points
600 - 666	→	8 points
Below 600	→	4 points

For students transferring in from out-of-state **only**:
(Neither PASS or MAP scores are available)

Most Recent Standardized Achievement Test
Test: _____ Date Administered: _____
_____% _____ points

95th – 99th Percentile = 14 points
90th – 94th Percentile = 12 points
85th – 89th Percentile = 10 points
75th – 84th Percentile = 6 points
70th – 74th Percentile = 4 points
Below 70th Percentile = 0 points

PASS

A: Points = _____

B. **Classroom Achievement (Grade Earned)**

_____ 1st 9-Weeks Grade

_____ 2nd 9-Weeks Grade

_____ 3rd 9-Weeks Grade

97 - 100 = 14 points
93 – 96 = 13 points
90 – 92 = 12 points
85 – 89 = 10 points
80 – 84 = 6 points
75 - 79 = 4 points
Below 75 = 0 points

(Add each 9-weeks grade and divide by 3 or divide by 2 if only two 9-weeks grades are available)

_____ **Mathematics Average Grade**

B: Points = _____

C. Characteristics and Study Habits

Criteria	2	1	0	Points Given
Work Habits	Works independently, self-motivated, stays on task	Works independently and stays on task, but sometimes has to be re-directed	Often needs to be re-directed to stay on task	
Organizational Skills	Completes and turns in all assignments on time, comes to class prepared, and is neatly organized	Completes and turns in most assignments, is organized and usually prepared	Misses assignments, is not well-organized, and comes to class unprepared	
Attendance	Attendance is consistent	Has missed 5-10 days	Has missed more than 10 days	
Thinking Skills	Exhibits/uses higher order thinking skills consistently (evaluates, synthesizes, analyzes, and applies)	Sometimes exhibits/uses higher order thinking skills	Rarely exhibits/uses higher order thinking skills	
Current Placement	Handles the pace of current placement with ease	Handles the pace of current placement, but has difficulty with some content	Has much difficulty with current placement	
Demonstrates Mastery of Basic Computational Skills	Adds, subtracts, multiplies and divides whole numbers, fractions and decimals fluently (80%-100%)	Has some trouble with addition, subtraction, multiplication and division of whole numbers, fractions and decimals (50%-79%)	Has difficulty with basic computational skills (below 50% on skills test)	
New Skills Readiness	Easily assimilates new skills/concepts readily and retains knowledge	Assimilates new skills/concepts after much practice	Has difficulty assimilating and retaining new knowledge	

C: Points = _____

Appendix D

Survey for Longitudinal Study (space for answers deleted)

Before beginning I would like to assure all participants in this survey that the actual names of the students and the School itself will be omitted from the final paper and will in no way be published at the conclusion of this thesis. The purpose of this survey is to take a closer look at a unique situation present at your school, in order to shine light on something schools nation wide might be overlooking, when setting up their criteria for advanced placement. I would also like to take this moment to again thank you for your assistance in this project.

Survey Questions:

a. Identify the advanced class:
b. Identify the original top tier students (12ish):
c. Identify the added students (10ish):
d. Highest math course taken at conclusion of high school
e. Approximate class rank:
f. ACT/SAT:
g. Career goals:
h. Intended College Major:
i. Top college choices:
j. Any additional data: