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MEASURING THE EFFECTIVENESS OF A TWO-PERIOD ALGEBRA CLASS: A PROGRAM EVALUATION

Tracey K. Landry
National Louis University

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Tracey K. Landry
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This document was created as *one* part of the three-part dissertation requirement of the National Louis University (NLU) Educational Leadership (EDL) Doctoral Program. The National Louis Educational Leadership EdD is a professional practice degree program (Shulman et al., 2006).

For the dissertation requirement, doctoral candidates are required to plan, research, and implement three major projects, one each year, within their school or district with a focus on professional practice. The three projects are:

- Program Evaluation
- Change Leadership Plan
- Policy Advocacy Document

For the **Program Evaluation** candidates are required to identify and evaluate a program or practice within their school or district. The "program" can be a current initiative; a grant project; a common practice; or a movement. Focused on utilization, the evaluation can be formative, summative, or developmental (Patton, 2008). The candidate must demonstrate how the evaluation directly relates to student learning.

In the **Change Leadership Plan** candidates develop a plan that considers organizational possibilities for renewal. The plan for organizational change may be at the building or district level. It must be related to an area in need of improvement, and have a clear target in mind. The candidate must be able to identify noticeable and feasible differences that should exist as a result of the change plan (Wagner et al., 2006).

In the **Policy Advocacy Document** candidates develop and advocate for a policy at the local, state or national level using reflective practice and research as a means for supporting and promoting reforms in education. Policy advocacy dissertations use critical theory to address moral and ethical issues of policy formation and administrative decision making (i.e., what ought to be). The purpose is to develop reflective, humane and social critics, moral leaders, and competent professionals, guided by a critical practical rational model (Browder, 1995).

Works Cited

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ABSTRACT

This paper details a program evaluation of a two-period freshman Algebra course in a two-high school district. The study examines the degree to which the two-period course is an effective intervention for freshman math students as compared to the one-period freshman Algebra course by reviewing student assessment data, student growth indicators, and course enrollment data. In addition to quantitative data, student, teacher, and administrator perceptions of the course inform the investigation into the two-period remedial math class. The paper concludes that the two-period math program is not having the desired impact and should be reconfigured or reconsidered altogether.

PREFACE

There were several leadership lessons learned through the process of this program evaluation. Like the ongoing cycle of curriculum review engaged in by teachers and teaching teams, so too should building and district administrators conduct program reviews in regular intervals to determine if existing programs of study are maximizing student learning. In addition, the process of program review is most effective when done with a team of stakeholders and informed by relevant data.

The two-period math program evaluated in this paper was implemented eight years ago, but no review of its effectiveness in meeting student needs had since been done. This holds true not just for math, but in areas around the district. Programmatic changes occur often, in all departments and subjects, in order to meet the learning needs of students in this dynamic and ever-changing world. Ironically, however, new programs are rarely measured for effectiveness or altered to keep up with the shifting needs of students. I am not referring to simply the addition of new courses, but a systemic review of the sequence of study that students engage in, from freshmen through senior year. Like this two-period math course, which upon close inspection proved relatively insufficient as a math intervention, other programs of study in Social Studies, English and Science, need similar review. Is World History the best way to welcome freshmen into the social sciences? Does our elective-based senior English structure lend coherence to the overall program and prepare students for college? Does the traditional Biology, Chemistry, Physics science sequence best meet the needs of our students, especially in light of the new state science standards? To make sure our sequence of study is the most meaningful for students, administrators should conduct program reviews on a regular basis.

To conduct an effective program evaluation, however, two components are essential. Meaningful and actionable data must be used to inform decisions, and multiple stakeholders, including students, should be involved in the review process. An analysis of student growth data in the two-period math class, as compared to those students enrolled in the one-period course, revealed that students were growing at the same rate, or less, than their peers in the one period course. As a result, the cost to students of giving up another class to spend two-periods learning math is not justified. Data should be similarly used to make decisions in any conversation regarding course and program success.

Because programmatic changes impact teachers and students alike, their voices must be heard when conducting a program evaluation. Teacher interviews informed the evaluation of the two-period math program by showing alignment or misalignment of the vision of the course between teachers and administration, and gave the perspective of those adults "on the front line" of instruction. Similarly, student survey data allowed the evaluator to consider student voice regarding the impact of the course on their learning. These sources of data must be utilized not only to inform decisions, but to ensure the people impacted feel that changes were made *with* them and not *to* them. Lasting and meaningful change happens only when the rationale for it is made clear and the stakeholders understand its purpose and believe in its importance.

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SECTION ONE: INTRODUCTION

Purpose

In *The Why Behind RTI* (2010), Buffum, Mattos, and Weber write that, "RTI's underlying premise is that schools should not wait until students fall far enough behind to qualify for special education to provide them with the help they need" (p. 10). In an effort to support and remediate freshmen students who struggle in math, High School District 123 implemented a two-period remedial Algebra class (Algebra 1A/1B) in school year (SY) 2006-2007 in the hopes of advancing student math skills enough to bring them to grade level. Though it is in its eighth year, the Algebra 1A/1B course has never been meaningfully evaluated to determine its effectiveness. The purpose of this program evaluation is to determine if the program goals are appropriate and whether student achievement in math improves as measured by standardized test performance. A secondary purpose is to determine whether students are able to leave the remedial math track as a result of this class and demonstrate average or better performance. While student performance growth as a result of enrollment in the course is the primary focus of research, other consequences, intended and unintended, for students emerged through survey data and prove useful in future planning.

This course is very expensive to run, encompassing .4 of a teacher's 1.0 FTE. In some cases, the course is co-taught with two certified teachers in the room both periods, every day, thus costing twice as much. As Director of Curriculum and Instruction, I need to determine whether the course, as currently structured, merits continued funding; if the student experience is a positive one that results in an increase in performance and

confidence; or if changes to or complete elimination of the program should be considered. The school has a responsibility to support all students, and an in effort to make sure we are providing an effective and appropriate learning model to our struggling freshman math students, it is time to evaluate the existing program and measure its efficacy.

Rationale

Student enrollment in the Algebra 1A/1B is growing at an alarming rate at High School North. In the last year, the number of students recommended for this intensive course grew by 50%, and yet we have no clear data to suggest it is an effective intervention. Very few students who begin in this low math track ever leave it, suggesting that math skills never develop enough for teachers to recommend movement out of the track. In addition, students enrolled in this 100-minute class are typically unable, as a result of the time commitment, to schedule any elective classes their freshman year, limiting their exposure to other subjects and elective areas of interest. There is also little data to suggest that these students meet and exceed standards to any greater degree than students in the regular math track. In fact, a cursory review of the standardized test data reveals that students in 1A/1B are less likely to meet and exceed standards in math than any other general education student group.

In addition to an increase in enrollment, recent shifts in the curriculum delivery model have occurred in this course. For the last year, each school in the district has incorporated a computer-based math program to help differentiate instruction. Each of the two high school buildings are utilizing a different computer program during the second of

the two-periods several days per week; the extent to which they are effective should also be evaluated.

As the District Director of Curriculum, I believe we need to better understand and make a judgment about the efficacy of this program in order to continue support for it. Because this two-period, co-taught class, is very expensive and comprises ¼ of a student's day, we need to be able to prove it is effective for students and find what, if anything, should be changed to better meet student needs.

The efficacy of the two-period math program can be viewed in part through the requirements of the federal mandates for interventions. Since 2004, when the reauthorization of the Individuals with Disabilities Education Improvement Act (IDEIA) required schools to implement scaffolded levels of support to help all students grow and achieve, school systems have worked to implement meaningful interventions ranging from differentiation in general education classroom instruction (Tier 1) to individualized and ongoing tutoring (Tier III). These interventions not only cost tax payer dollars, but impact daily instruction and the student experience in general. Taxpayers and the members of the community we serve must know we are implementing meaningful, research-based and effective systems of support for all students.

Goals

In this era of Response to Intervention (RtI) school districts work to find appropriate Tier One and Tier Two interventions to remediate skill and content deficits and allow students to perform at a rate equal to their grade-level peers. Since the goal of RtI is to target interventions to student needs, graduated levels of support are available to

students. Differentiated instruction in the general education classroom is considered a Tier One intervention, the lowest level of support. More targeted interventions are available as students move up the RtI scale. Tier Two interventions provide small group instruction outside of the regular classroom period and are flexible in nature, allowing students to move out of the intervention once the target skill or content goal has been reached. Some students need still more intensive services, using Tier Three supports to meet in ongoing one-to-one or small group settings. Because Algebra IA/IB is a general education course, it best falls into the Tier I level of support.

The two-period Algebra class (Algebra 1A/1B) was an intervention put into place about eight years ago for freshman students identified as struggling in basic algebraic concepts as measured by Explore scores, Measures of Academic Progress (MAP) assessment results, 8th grade teacher comments, 8th grade grades, and other math placement tests. Explore Tests are those given to incoming freshman for both placement purposes and serve to establish benchmark data for later comparison with ACT test scores from a student's junior year. Enrolled students have two consecutive hours of math, often in a co-taught classroom, where it is expected that concepts can be covered at a slower pace and with more support. As a further support, this year a computer based intervention has been added twice per week to supplement course content and allow for individualized skill development.

In the ideal, because of this added support, students would gain the needed Algebra skills to leave the preparatory math track and return to grade-level instruction by sophomore year, or sooner. However, this has not happened. Therefore, goal of evaluating this program is to determine whether the extended math block is having the

desired positive effect on student achievement as measured by standardized test performance.

Other goals include measuring the number of students who enter grade-level math classes after completion of the two-period course, as well as student achievement in the two-period course and all subsequent math courses. It will also be important to learn how the teaching methodologies and pedagogy in the two-period course differ from the typical Algebra I course to ensure we are utilizing best practice for this at-risk population.

Research Questions

The primary research question is, "Is the two-period math class an effective academic intervention for freshman students of High School District 123?" Secondary research questions include:

- What are the articulated goals of the course and how do we measure the degree to which they are achieved?
- Are students growing at the expected rate as measured by Explore and ACT tests?
- How is the Algebra 1A/1B course different across the two buildings in the district, both in instructional methodologies and student growth?
- Are the entrance criteria for admittance to Algebra IA/IB appropriate?
- Are students able to enroll in other desired coursework despite taking this two-period remedial math course?
- How many students take more than the required math courses for graduation?

SECTION TWO: LITERATURE REVIEW

Measuring the effectiveness of the two-period Algebra course is informed through investigation of existing literature on similar, related, and framing topics. This section will begin with a review of significant studies done on similar two-period programs, and will continue with literature on Response to Intervention and how it informs the continuum of supports in place for students. The section will end with a review of current literature on best practice in teaching math to remedial learners.

"Double-Dose Algebra"

An extensive study of the two-period algebra course in Chicago Public Schools revealed that while test scores in math did increase following the implementation of two-period algebra, failure rates also increased in both the two-period and single period Algebra courses (Durwood, Krone, Mazzeo, 2010, p. 6). The authors of the study assert that failure rates increased for a couple of different reasons. Double-dose algebra, not accompanied by other supports to address school attendance and culture, won't reduce the failure rates, the study revealed (p. 10). The issues of school attendance and discipline on class performance are twice as impactful in a class that is twice as long. Furthermore, the students who entered the course with the lowest skill levels were "more likely to fail algebra after the implementation of the double-dose algebra policy, and test score gains were lower for these students than for students closer to the policy cutoff" for admittance into the course" (p.7).

Researcher Takako Nomi posited that the increased failure rate among those lowest performing students in the two-period algebra class might be due to higher

expectations of the teachers who were professionally developed to teach the course. The failure rate increase was not restricted to those students in the double-dose class, however. Students in one-period algebra faced a faster pace and a stronger cohort of learners, so marginal students were more challenged, and perhaps perceived themselves as the bottom of their new and respective pack (Nomi and Allensworth, 2009, p. 142). As a result, the failure rate increased in the single period course as well as the longer one.

Despite the challenges of the new program, the study did reveal an increase in student test scores in math associated with the implementation of double-dose Algebra, as measured by the PLAN test written by ACT. The unintended consequence of tracking, which occurred by separating out those students struggling in math, resulted in a change in teaching techniques which supported the remedial learner. This explains the increase in math performance in the remedial class and supports the notion that professional development for teachers of this two period class is essential. The impact was across all algebra students, however, not just those in the two-period course (Nomi and Allensworth, 2009, p. 125). Students in the college-track, one-period course also saw an increase in test scores, but a reduction in grades. This could be, in part, due to a lack of development for teachers of the regular algebra course in differentiating instruction amongst average and high performing students (p. 115).

In a later study, Takako Nomi expanded upon her initial work to examine the degree to which the heterogeneity in the classrooms caused by sorting students by ability impacted the score improvement. Her findings were that the schools across the Chicago Public School (CPS) system, the subject of her research, had varied effects from the double dose algebra course based primarily on the degree to which they sorted students.

She asserted, "We showed that enrolling in double-dose algebra would benefit learning, but having lower-ability classmates would hurt learning. Thus, the overall effects of double-dose algebra seemed to be weaker for schools with more intense sorting than schools that used less sorting" (Nomi, 2012, p. 4). This finding is supported by John Hattie, who in 2009 found ability grouping of students in math has only a .01 effect size on performance (p. 90). The lesson to learn for High School District 123 includes the importance of additional supports for all students, both those in the remedial class and those in the more advanced sections, and to take notice of the degree of heterogeneity in the tracked classrooms.

Other studies examine the more long-term effects of the Chicago Public School Double-Dose course. In 2013, Cortes, Goodman and Nomi summarized the long-term benefits to include an increase in college entrance exam scores, high school graduation rates and college enrollment rates (p. 2). It was further found that double-dose students close to the proficiency cut off, despite below-average reading skills, saw the most gains. In this study, they found that the proportion of students earning a B increased by more than 65%. Across all math courses taken after freshman year, the mean GPA increase was .14, so the long term impact on GPA was minimal (p. 6). However, among students that were enrolled in two-period Algebra as freshman, scores on the math portion of the ACT were ".15 standard deviations above that for the control group" (Roblen, 2012, p. 1). Furthermore, double dose students were 8.6 % more likely to enroll in college within five years of starting high schools, though most to a two-year college (p. 1).

A study inspired by the Chicago study examined the doubling up of math in middle school and found diminishing returns over time, unlike the high school study

(Heitin, 2014, p 1). In the middle school study, researcher Eric Taylor discovered that while 6th grade students in double dose math classes scored higher while enrolled, the gain was half as large the year after returning to one-period math, and 1/3 the gain was seen two years later. By the time these same students reached high school, the gain they saw in 6th grade was all but gone (Taylor, 2014, p. 36).

The takeaways from these studies that might inform the future of the two-period Algebra course in District 123 include the consideration of students both just above and just below the cut off score used for placement. Is one group more likely to see results than another? In the studies examined above, those students just below benchmark saw better gains than those just above. The impact of tracking is seen to magnify the effects on marginal students. In addition, it will be important to understand the type of professional development teachers received both in teaching a dual period and in teaching strategies which help remedial learners. The studies noted that it was the professional development given to teachers that helped achieve gains in performance (Nomi and Allensworth, 2009). The use of longitudinal data on student performance should also inform the longer-term impact of enrollment in this course on student performance in math, to include measurement of how student performed after they left the course both in other math coursework and on ACT assessments.

Important differences between the Chicago Public School program featured in previously cited studies and the program in D123 include that the two-period course in CPS was divided into two distinct periods, one focused on the regular curriculum and one on remedial coursework for catch-up. Schools in CPS were encouraged to offer these courses sequentially and with the same instructor, but there was no guarantee of this for

the enrolled students. In D123, the courses are taught in a two-period block and always with the same instructor. Furthermore, the D123 Algebra block is not necessarily divided into two required halves, one traditional in content and one remedial. Instead, the teacher(s) has the autonomy to use the time as needed.

A second important difference between the CPS studies (Cortes, Goodman, and Nomi, 2013) and that of D123, is a focus on teaching and content differences between the one and two-period courses. Nomi (2013) acknowledges that this was not a focus of her study, though course content and teaching strategy might have contributed to the increase in scores in all sections of Algebra. The study of Algebra 1a/1b in High School District 123 will include interviews with teachers about differences in approach to document differences in teaching technique, course content, and student engagement between and among one and two-period courses.

Regarding teaching in the block schedule format, the National Council of Teachers of Mathematics published a report which studied the impact of teaching math in a longer block (Kramer and Keller, 2008). Their findings indicated that, "students under a block math schedule scored higher on most measures of mathematics achievement than had earlier cohorts of students who had studied a traditional curriculum under a traditional schedule" (2008, p.1). The study further concluded that the longer period was successful for several different reasons. Teaching methodology shifted away from lecture and direct instruction to student-centered activities, and it was part of a larger block system, not limited to 9^{th} grade math, so students got exposure to higher level coursework over the four years. In addition, extensive system-wide professional development was provided, to prepare teachers to teach in a block format.

Response to Intervention

The two-period Algebra course in High School District 123 is one support mechanism in place in the larger continuum of services available to students. This continuum of services fits with the Response to Intervention (RtI) model required by the Federal Government following George W. Bush's reauthorization of the Individuals with Disabilities Act (IDEA) in 2004 which launched this initiative (McCook, 2006, p. 3). The State of Illinois subsequently published the State RtI plan in January of 2008. The basic premise includes that it is incumbent upon schools to use data to identify struggling students, particularly those in core areas like reading and math http://www.isbe.net/pdf/rti_state_plan.pdf, 2008, p 1.).

The RtI Model expects that the needs of the vast majority of students (about 80%) can be met with appropriate instruction in the general education classroom. This level of support, that which takes place in the general education classroom, is labeled a Tier 1 intervention (McCook, 2006, p. 26). In an effort to hold schools accountable to meeting the needs of students in a graduated approach, and to reduce referrals to special education, Tier 1 instruction requires differentiation of the traditional curriculum within the classroom setting. As Algebra 1a/1b is a general education course that differentiates the general curriculum, it falls under the auspices of a Tier I intervention. All levels of intervention, Tier I and beyond, require the ongoing monitoring of student progress to determine if the intervention is working (p. 67).

The purpose of this study is to determine if the Tier I intervention of the two-period Algebra course is an effective intervention for the students of High School District

123. Graduated services of support, above and beyond the classroom, fall either into Tier II or Tier III categories.

Tier II interventions are those available to students outside the regular classroom structure. Tier II support is done in a small group setting and is flexible in nature, allowing students to leave the intervention when a learning goal is reached (Buffum, Mattos, Weber, 2010, p. 10). One-to-one or small group tutoring are examples of Tier II interventions. Students in D123 do have access to a math tutoring lab all day, and math teachers are additionally available before and after school each day. The extent to which these tutoring resources are used by our Algebra 1a/1b population are examined in an effort to determine what variables, other than enrollment in the two-period course, might contribute to student success or failure.

Tier III support is the most intensive under the RtI model. A student receiving Tier III support has, or is being evaluated for, an Individualized Education Plan (IEP), and therefore is receiving services which are ongoing and individualized. While the enduring goal of a Tier III intervention is to graduate a student from it, the commitment is typically a long-term one (Buffum, Mattos, Weber, 2010, P. 15). Because the program evaluation at issue in this paper is a Tier I intervention, with some support from Tier II, Tier III is outside the scope of this research, but important to understand in contextualizing the full range of supports required under IDEA as of 2004.

RtI and Tier I Instruction

The RtI Action Network, a non-profit thin-tank, the goal of which, "is to guide educators and families in the large-scale implementation of RTI so that each child has

access to quality instruction and that struggling students – including those with learning disabilities – are identified early and receive the necessary supports to be successful" (www.rtinetwork.org. "about us"). RtI Action Network has produced literature around using RtI to improve learning in math. Amanda VanDerHeyden wrote that, "RtI is focused on improving student learning" (2014, p.1). As such, teachers need careful screening tools to measure student learning. Furthermore, she asserts that effective math instruction should include a system for adjusting instructional efforts to ensure adequate learning or accelerate where needed. A list of effective strategies in her work include: a well-sequenced program that builds on prior knowledge and reviews previously mastered skills for maintenance, demonstration of correct and incorrect responses, substantial opportunity for student practice with direct support, and gradual release of responsibility (VanDerHeyden, 2014, p. 1).

The strategies discussed by VanDerHeyden are appropriate for a Tier I classroom intervention and is a part of what is measured in the D123 study. The extent to which the teachers of the course are measuring student mastery and how they do that will be a point of emphasis.

Instrumental to a student success model is the implementation of instructional methodologies in Type I interventions that meet the needs of all students, including those labeled as "remedial" (Fuchs,2014). Research suggests that students learn math best when complex word problems are contextualized for better student understanding (Bottge and Hasselbring, 1993, p. 1). Further, "remediation is based on the misconception that for students to learn new information, they must go back and master everything they missed" (Rollins, 2014, p. 9). Instead, it is suggested that teachers focus on only key foundational

skills, and once taught, move to the more complex, grade-level appropriate content as soon as the foundational skill is mastered. This is done through an "Acceleration Framework" which includes: student thinking and relevance, articulation of learning goals, scaffolding and practice, introduction of new vocabulary and review of prior vocabulary, dipping into the new concept, and conducting frequent formative assessments (Rollins, 2014).

Specific practices which enable ideal learning conditions for the study of mathematics were the focus of a meta-analysis on the subject. Jones, Vermette, and Jones (2012) summarized the findings on 13 research studies on effective models of instruction. The findings were as follows:

- Expectations matter.
- Low-track classrooms tend to lead to a watered-down curriculum.
- Cooperative learning must include rigorous tasks and require metacognition.
- Using peers and parents to support the learning of math through tutoring and homework collaboration improved student performance.
- Self-efficacy increases as students observe their teachers to be both caring and challenging.
- Multiple solution options increased learning.
- Struggling math students may benefit from think-alouds and verbalization.
- Interest in math and the use of manipulatives DID NOT impact mathematics achievement (p. 176).

The National Council for Teachers of Math (NCTM) produced a study that supports some of the findings of Jones, Vermette, and Jones described above. A 2009 article spoke to the importance of student perceptions of a class and of themselves on achievement in math. Increased student agency and shared authority over learning tasks increased student engagement with and mastery of the material. When students perceive the teacher as the authority and "the one with the answers," their participation was superficial, completing assigned homework and sitting quietly in class. Those students expressed less confidence in their own mathematical ability than students engaged in more rigorous and self-directed learning. The more students took ownership of the product, the more confident they became (Cobb, Gresalfi, Hodge, 2009; Gerston, 2007).

Most important under the RtI model, and the focus of the article *The Why Behind RtI,* are the large questions it poses for school organizations. Questions like, "What is the fundamental purpose of our school?" "What knowledge and skills will our children need to be successful adults?" and "What must we do to make learning a reality for every student?" frame the importance of the study of Algebra 1a/1b. As a school organization we need to be certain that we are creating a structure which supports the success of all students, be they remedial or gifted learners. Our community, our teachers, and our students deserve to know that we have wrestled with these questions and stand with confidence behind the courses we offer (Buffum, Mattos, Weber, p. 13).

Characteristics of High Quality Learning Institutions

A host of research projects, books, and publications discuss the key elements of good teaching in general and high-impact strategies for teaching across all types of

learners. The practices of good teaching will be highlighted here and the strategies observed in D123 classrooms will be measured against them.

In *Qualities of Effective Teachers* (2002), James Stronge emphasizes the importance of quality feedback and a variety of formal and informal assessments to help move students towards mastery (p. 54). Giving students ongoing feedback and low-risk ways of measuring their own learning leads to enhanced self-reflection and focused learning. Stronge further asserts that good teachers think through common misconceptions and reteach materials either in small or whole-group as needed (p 57). A variety of techniques have been identified as high yield. Be it math or history class, students benefit from homework and practice, cooperative learning, feedback on mastery of articulated standards, and use of graphic organizers (Marzano, Pickering and Pollock, 2001).

According to Grant Wiggins and Jay McTighe (2005), teachers are most effective when beginning with the end in mind. By knowing where students need to be at the end of a lesson, a teacher can better determine how to get students to that understanding and how to assess their progress along the way. Using this method, a teacher can support students not only in knowing content, but understanding it within the context of their own lives (p.4).

Wiggins and McTighe endorse an approach to instruction that focuses on inquiry, transfer of learning, and student engagement. Quality lessons are tied to standards, predictive of student misunderstanding, and help students gain understanding of the big ideas of the discipline (p 5.) In *Schooling by Design*, Wiggins and McTighe assert that for a teacher to effectively create units which focus on transfer and big understandings, the

mission of the school must align to and support that goal. Just as a teacher should plan with the end in mind, a system must structure its supports of students and staff to achieve its desired end- as written in its mission statement (p. 25). Similarly, Alan Blankstein (2004) writes in *Failure is Not an Option* that, "central to the success of high –achieving schools is a collaborative culture is focused on teaching and learning. This culture supports regular meetings of teachers who share responsibility for assessing needs and developing solutions that address all students' learning "(p. 127).

Summary

High School District 123 has ongoing Professional Development time dedicated to curricular planning and data analysis, and functions under the Understanding and Schooling by Design framework, but does the Algebra 1a/1b course fit into the larger vision of the math department? More generally, is the two-period Algebra class consistent with the mission? Have enough supports been put into place for both teachers and students in the math department to achieve the desired goals? Are teaching methodologies successfully moving students towards mastery of worthy content and skill objectives? Finally, are students gaining agency and confidence through participation in the course? These questions are considered in this evaluation of the Algebra1a/1b course.

SECTION THREE: METHODOLOGY

Research Design Overview

A program evaluation of the two-period math class is best achieved through a mixed methods approach, utilizing both quantitative and qualitative data. Statistical analysis of warehoused data to measure longitudinal student performance in conjunction with interviews to ascertain personal stakeholder perceptions of the course inform a judgment on its overall effectiveness. Data mined from PowerSchool, our data-warehousing software, reveals information about numbers of enrolled students, including their Explore, MAP, and ACT/PSAE scores when available, and demographic information. This information will reveal who is taking this class and at what academic level they initially perform. Furthermore, mined PowerSchool data allows for the examination of student grades in the course relative to their growth from EXPLORE to ACT. Findings were shared with the teachers and administrators to gain their reflections and interpretations of the data.

Qualitative data was gathered, in part, through interview questions to understand what goals the teachers and department chairs have for students in the course and how they measure success. Stakeholder perspective on how well the current course structure is working and its impact on enrolled students was also be gathered. While student performance on math assessments is one measure of success of the program, so too is the overall impact of the course on a students' educational experience. Are students feeling resentment at being enrolled? Are they prevented from taking other courses because they cannot meet prerequisites or because they do not have room in their schedules? Are

students “turned off” to math, or do they gain confidence and leave the prep math track because of the skills gained through this course? Do enrolled students go on and take more math classes than they otherwise might, or do they stop taking math as soon as the graduation requirement is met? If a student’s math performance or confidence has increased, do they attribute it to the course or to other math interventions, like the math tutoring lab or individual practice? Collection of such data allows the researcher “to see things that were not captured by standardized tests” (Patton, 2008, p. 453).

Participants

The participants from whom data were collected included the teachers, the mathematics department chairs, the principals, and students currently or formerly enrolled in the two-period course.

Teachers

Teachers were invited to participate in an interview if they currently teach the course and included both the regular classroom and special-education co-teachers of the course. Teachers provided information about goals of the course, methods used to measure student mastery, teaching techniques, and challenges and successes of the current course structure.

Department Chairs

There are two math department chairpersons in High School District 123, one mail and one female, and both were interviewed for this study.

Principals

The principals of both high schools in the district were interviewed. The principals provided insight into their perceptions of the course, including its purpose and the cost to run it.

Students

Current students of the course were invited to take a survey regarding their experiences in and impressions of the class. The group included predominantly freshman students. Students provided information about the student experience in general, about the degree which they appreciate the support given in the course and whether the course had a positive or negative impact on their achievement.

Data Gathering Techniques

To collect multiple sources of data, data were gathered using achievement test scores, grades, course enrollments, interviews, survey, and demographic information. Data uncovered through research in PowerSchool was shared with teachers both to gain their perspective on it, and to help in jointly establishing priorities and goals for the research. The hope is that teachers feel the research is being done **with** and **for** them, not **to** them.

Achievement Test Score

Data were collected using PowerSchool, our data warehousing system, to identify currently enrolled students as well as those who took the course over the last three years

and compile as much assessment information as possible, including Explore, and ACT/PSAE scores where available. This information was used to compute each student's longitudinal performance growth on these measures and compare that to typical growth. Explore scores were further used to determine a score range for the typically enrolled student in Algebra 1A/1B and find patterns of growth based on entrance scores. A sample of students in the regular Algebra class was identified to create similar data sets for comparison.

Demographic Information

Demographics of enrolled students were collected through PowerSchool. This allowed the identification of any particular demographic trends in the class. Is this an otherwise at-risk population in need of other supports in the building?

Student Transcripts

Using PowerSchool, student transcripts were studied to identify how many left the remedial track and how well they performed. Transcripts also provided data on which and how many other math classes students once enrolled in Algebra IA/IB and their performance therein.

Group Interviews

Teachers of Algebra 1a/1b were interviewed to gain information about course goals, methods used to measure student mastery, teaching techniques, and challenges and successes of the current course structure. Teachers from each school were interviewed in

separate groups. The teacher interview was semi-structured, wherein the interviewer "mapp[ed] out pertinent questions with possible probing sub questions…to allow the opportunity to digress from the primary question and probe a response to understand more clearly what is seen as a provocative remark on the part of the interviewee" (James, Milenkiewicz, Bucknam, 2008, p. 73).

Through the interview process, teachers helped to answer the following questions: Are the actual and written curriculum the same? Are the articulated goals of the course those being measured? Are two periods required to bring students up to grade level? What about the current structure is working and what should be changed? Are we correctly identifying students for enrollment? Are we adequately supporting the teachers of the course, or is additional professional development needed?

Interviews with the math department chairs shed light on the goals of the course, how students are placed into it, how the course fits into the entire math scope and sequence and whether and to what degree the current structure and employed teaching methodologies are having the desired impact.

Both principals were similarly interviewed so their perceptions of the course, its intended outcomes and the perceived benefit to cost ratio are discussed.

Student Survey

Using Survey Monkey, a survey was created and administered to current students to ascertain student opinion on the emotional and academic impact of enrollment in the course. The survey was structured using a Likert scale with room for comments that were later analyzed for response trends.

Data Analysis

Quantitative

SPSS was used to conduct data entry and analysis of the information mined from PowerSchool. Course math enrollments and test scores, as well as basic demographic information served as variables used to generate trends around student growth and characteristics. Mean scores of the general population and the study group were determined to compare average and expected growth. Within administered surveys, Likert scale responses were used as variables in data analysis to find patterns in student responses to the survey, and descriptive statistics generated from any written comments made.

Qualitative

All interviews (teachers, department chairs, and principals) were transcribed and coded for themes. The themes which emerged were prompted by goals of the course, methods of assessing goal attainment and student mastery, instructional methods used in the remedial course. Analysis of the perceptions of these adult stakeholders, when compared to the quantitative data, led to a deeper understanding of the phenomenon and lived experience of the double-period Algebra in High School District 123.

SECTION FOUR: FINDINGS AND INTERPRETATIONS

Introduction

This study was conducted to answer the primary research question, "How effective is the High School District 123 double-period Freshman Algebra class in improving student performance in math as compared to the one-period Freshman Algebra class?" Research was conducted through quantitative and qualitative methods. Quantitative methods included analysis of student standardized test scores from the graduating classes of 2013 through 2015 to provide data on student performance and growth overall and across subgroups. In addition, student surveys of those currently enrolled in the two-period math class (1A/1B) provided insight into student perceptions of the course and its impact on their learning.

Qualitative methods included interviews of six teachers, two department chairs, and two principals across both high schools in High School District 123. Teachers in each building were interviewed in small groups, while the department chairs and principals were interviewed individually. All interviews were recorded, transcribed, and coded for patterns and themes.

First I will present the quantitative data results, including test score performance for students in Algebra 1A/1B and the single period Algebra course, first for High School North (HS North) and then for High School Central (HS Central). The percent of students in each class and each school who go on to take four years of math will also be shared. Finally, student survey data from across the district will be analyzed to reveal student perceptions and experiences in the two-period course.

After examining the quantitative data, district-wide interview data will be examined to provide a holistic picture of the impact and perceptions of the two-period algebra class and the extent to which adult and student perceptions of the course align.

Student Test Scores and Growth Benchmarks

Using the District's data management software, PowerSchool, student records were exported into Statistical Package for the Social Sciences software (SPSS). The analyzed data included ethnicity, IEP designation, Explore math scores, ACT math scores, and grades in all math courses for each student enrolled over the last three years. The purpose in analyzing these data was to determine whether or to what degree students in the two-period course met growth goals in math from the Explore test, taken in the fall of 8th grade, to the ACT test, taken in the spring of their junior year, as compared to students in the one-period Algebra course. Both tests are multiple choice assessments given to determine if a student is on target to be college and career ready. The Explore is aligned to the same benchmarks as ACT, the gold-standard assessment for college entrance, and together they allow schools to measure student growth from freshman through junior year in the core subject areas of reading, math, English and science. For the purposes of this research, we will focus on student performance in the math portion of both exams.

To determine the growth targets for the purposes of measuring student growth in this study, resources from ACT, the maker of both the Explore and ACT tests, were used. According to ACT (2014), College Readiness Benchmarks are numbers ACT uses to

indicate readiness in corresponding college courses. ACT describes the benchmark numbers as:

> scores on ACT subject-area tests that represent the level of achievement required for students to have a 50% chance of obtaining a B or higher or about a 75% chance obtaining a C or higher in a corresponding credit-bearing first-year college courses (ACT, www.act.org, 2014).

Table 1 shows the College Readiness Benchmarks for each subject area as determined by ACT for Explore Grade 8 and ACT.

Table 1 College Readiness Benchmarks

College Course	ACT Subject-Area Test	Explore Benchmark Grade 8	ACT Benchmark
English Composition	English	13	18
College Algebra	**Mathematics**	**17**	**22**
Social Sciences	Reading	16	22
Biology	Science	18	23

While all subject areas tested are represented in the above table, the focus of this study is the mathematics test, bolded in Table 1, in both the Explore and ACT test. The above benchmark table suggests that a student on track for success in College Algebra will have no less than a 17 on the math portion of their Explore test as an 8th grader and a 22 on their ACT as a junior. Therefore, a student who starts at benchmark on the Explore test must grow five points to remain at benchmark on the ACT. However, the growth goal of 5 points is unique to those students at or above benchmark. According to a study released by ACT in 2009, students who are below the college readiness benchmark are expected to grow less than students on target. While national average growth in math between Explore and ACT is 4.4 points, students who are two or more points below

benchmark on Explore are expected to grow 4.0 points, and those who are less than two points below benchmark are expected to achieve 3.5 points of growth. These numbers hold true for all students, regardless of ethnicity, gender, or IEP designation (ACT, 2009, p. 2-4).

Using the above benchmark numbers as the growth guidelines, an analysis of student growth between Explore and ACT was conducted, both for Algebra 1a/1b and regular, one-period Algebra in both high schools in the district. The Explore and ACT math scores were identified for all the students and for different sub-group populations identified and described below:

- **All 1a/1b students:** Includes all students in Algebra 1a/1b course in 2013, 2014, 2015 that have both Explore and ACT math scores.
- **All Regular Algebra students:** Includes all students in the one-period Algebra course in 2013, 2014, 2015 that have both Explore and ACT math scores.
- **IEP:** Includes all students enrolled in that course who have an Individualized Education Plan, and are therefore receiving special education services.
- **Regular Ed:** Includes all students a course who do not have an Individualized Education Plan and are not receiving additional services through the special education department.
- **CRB**: Stands for College Readiness Benchmark to serve as a reminder of the ACT cutoff score used to determine if a student is on track for success in college. The cutoff for Explore math is 17 and 22 for ACT math.

While both high schools in District 123 offer algebra as a one or two-period course, the data for High School North will be examined first, followed by that of High School Central.

Table 2 HS North Student Performance Comparisons

HS North1a/1b Group	**N= number of students**	**Average Explore Math (College Readiness Benchmark=17)**	**Average ACT Math (College Readiness Benchmark=22)**	**Average Point Growth**
All 1a/1b students	123	12.55*	15.94*	3.39
IEP	44	11.36*	15.14*	3.78
Regular Ed	79	13.29*	16.36*	3.07

*Significance at P=.001

The data in Table 2 show the average Explore and ACT math scores for students in High School North 1A/1B Algebra course and the resulting average growth in points between those two math assessments. It is important to note that the correlation between the Explore and ACT math test scores for this group of students is fairly strong, at .422, which indicates that the relationship between the two scores is predictive one, so when the performance on the Explore is higher, it is likely that the score on the ACT will also increase.

When examining the High School North1A/1B student body overall, they are not making the necessary gains. With an expected growth of 4 points, the whole 1A/1B student group falls short by .61. The IEP and Regular Ed students, when measured separately, also failed to make the necessary gains, missing by .22 and .93, respectively. On the surface, it appears that 1A/1B is serving no students well. However, when the student groups are broken down further, into co-taught and non-co-taught classes,

different patterns emerge. Co-taught classes are ones in which both a content area teacher and a special education teacher jointly teach the course. The co-teacher serves an instructor of the course, not as an aide. Table 3 below summarizes the findings from IEP and Regular Ed students when in a co-taught vs. a non-co-taught setting.

Table 3 HS North Two Period Student Performance

HS North 1a/1b Group	**N= Number**	**Average Explore Math (College Readiness Benchmark=17)**	**Average ACT Math (College Readiness Benchmark =22)**	**Average Point Growth**
All Co-taught	81	12.07*	15.54*	3.47
All Non-Co-Taught	42	12.75*	16.85*	4.1
IEP co-taught	30	9.09*	14.92*	5.0
Regular Ed co-taught	14	13.1*	15.9*	2.8
Regular Ed not co-taught	65	13.5*	17.9*	4.4
IEP not co-taught	14	12.22*	15.7*	3.48

*Significance is P=.001

The shaded cells indicate that group has made the necessary gains in math scores between Explore and ACT to have achieved expected growth as defined by ACT. Upon analysis of the data, the average point growth among students in the non-co-taught course made the necessary gains. Regular education students, in particular, seem to have raised the average gains amongst that group as they achieved more than expected growth by almost half a point. While two of the three groups measured in the non-co-taught course show impressive gains, the only group to do so in the co-taught classroom were the IEP students, who outpaced the growth of all other students. The regular education students made dismal gains in the co-taught course, missing the mark by 1.2 points. Poor growth in the Regular Ed co-taught population brought down average growth of the whole co-

taught group so that it missed the mark by .53, despite the 5.0 points of gain made by the IEP population in the co-taught class.

The findings seem to indicate that HS North regular education students, those without an IEP, do well with just one teacher in the double period course, while HS North students with an IEP do well in the co-taught classroom. Students with IEPs have other supports like guided study halls and case managers to support their overall performance, however, which could account for difference in growth between the IEP and Regular Education cohorts.

When determining the effectiveness of the two-period math course on student groups, it is important to consider how students of different ethnicities fare. When breaking down HS North 1A/1B data by ethnic group, the results are less than impressive.

Table 4 HS North Two Period Explore/ACT by Ethnicity

Ethnicity	**N**	**Explore math**	**ACT math**	**Growth**
American Indian	3	13.66*	17*	3.34
Asian	2	13.5*	18.5*	5
Black	10	13.5*	15.57*	2.07
Hispanic	36	12.21*	15.5*	3.29
White	69	12.68*	16.14*	3.46
Multi-racial	3	8.7*	15*	6.3

*Significance is P=.001

Of the identified ethnic subgroups, only two met their expected growth goals. These were Asian and Multi-Racial, of which there were 2 and 3 students, respectively, across the three years of student data. While individual students within each subgroup may have met expected growth goals, the average Explore and ACT scores of the above subgroups suggest that as a whole, our minority subgroups don't fare well in two-period

Algebra. The two largest subgroups in HS North 1A/1B also failed to meet expected growth. The white population, comprising 56% of the student population fell more than half of a point short and the Hispanic population, which accounts for 30% of the cohort missed the target by .7 points. While the white population failed to meet growth goals, they made the most gains of those groups who failed to meet the target and our black population made the least growth between the two assessments.

One-Period Algebra at North

Like Algebra 1A/1B at HS North, the regular, one-period Algebra class at HS North demonstrates mixed student growth results. For context, it is important to note that students in the one-period Algebra course are those who demonstrate basic competencies in math and score high enough on their Explore scores to be placed in this class. However, it is not an honors or gifted course. Students who perform at or above benchmark are typically placed in Geometry Honors or Advanced Algebra Trigonometry as freshmen. So, these are students who might be considered college prep, but are enrolled in the "regular" math track. It is also important to note that there are no co-taught Algebra courses at HS North. Students who need co-teaching are placed into Algebra 1A/1B. Below is a chart detailing the performance of HS North regular one-period Algebra students in math on the Explore and ACT tests.

Table 5 HS North One Period Explore/ACT Performance

HS North Regular Algebra Group	**N= number of students**	**Average Explore Math (College Readiness Benchmark =17)**	**Average ACT Math (College Readiness Benchmark =22)**	**Average Point Growth**
All reg algebra students	346	14.14*	17.86*	3.72
IEP	40	14.09*	17.81*	3.72
Regular Ed (non-IEP)	306	16.00*	20*	4

*Significance is P=.001

HS North regular education students, those without an IEP, exceeded expected growth by .5 points. However, the IEP students did not, and because the IEP population entered the course with a significantly lower average Explore score, nearly 2 points lower than the regular education students, the average of all students was lowered, thus increasing the amount growth needed for the whole class to meet growth expectations. As a result, all regular algebra students did not have an average growth rate that met expectations.

Unlike the Algebra 1A/1B course at HS North, the regular Algebra course showed impressive growth rates among most of the ethnic subgroups. Table 6 outlines the growth performance of student subgroups in the one period algebra course at North.

Table 6 HS North One Period Explore/ACT by Ethnicity

HS North Regular Algebra Group by Ethnicity	**N= number of students**	**Average Explore Math (College Readiness Benchmark=17)**	**Average ACT Math (College Readiness Benchmark=22)**	**Average Point Growth**
American Indian	2	17*	20*	3
Asian	8	15.5*	20.83*	5.33
Black	13	15.7*	19.36*	3.66
Hispanic	81	14.53*	18.07*	3.54
White	222	15.87*	19.70*	3.83
Multi-racial	20	15.11*	19.31*	4.2

*Significance is P=.001

The data in Table 6 reveal that most of the subgroups met or exceeded growth standards in the regular one-period Algebra course at North. The Hispanic population, however, fell short of their goal by .46 points. While the Hispanic population failed to make expected growth in both the one and two-period Algebra class, the gap between expected and actual growth for the Hispanic population was less in the one-period class, where they scored .25 points closer to the goal. Like in the 1A/1B class, the Hispanic population is the second largest subgroup in the course at 23%, a distant second from the white population which comprises 64% of the one-period Algebra student population.

The other high school in District 123 also offers both a one period and a two-period algebra class, thought there are some distinctions discussed later in this study. What follows are the data for students at High School Central. The following is a table that reveals the performance of students in the two period, 1A/1B course at HS Central.

Table 7HS Central Two Period Explore/ACT Performance

HS Central 1a/1b Group	N= Number of Students	Average Explore Math (College Readiness Benchmark=17)	Average ACT Math (College Readiness Benchmark =22)	Average Point Growth
All 1a/1b students	109	12.2*	15.26*	3.06
IEP	56	10.8*	14.63*	3.83
Regular Ed (non-IEP)	53	13.10**	15.7**	2.6

*Significance is P= .001 **Significance is P<.005

Table 7 shows the performance of High School Central 1A/1B Algebra students. None of the student groups in the chart made the necessary gains, much like North's 1A/1B course. Interestingly, the 1A/1B IEP population at Central gained more points than those in the same course at North, despite coming in with a lower Explore score. The other two groups, however, gained less than those students at North. In fact, North's regular education students outpaced growth among Central's regular education students by nearly half a point.

There are some important differences between the 1A/1B programs at North and Central that impact the comparisons between the two courses, however. The program at Central is much smaller than North's, running only one section per year for the last several years, and that one section is always co-taught. The program at North runs three sections, two of which are co-taught and one isn't. As a result, no data were available disaggregating between co-taught and non-caught courses for Central 1A/1B students. The data further indicate that the students enrolled in 1A/1B at Central for the last three years come in with lower average Explore math scores, indicating that the student

population at Central is less skilled than those at North, on average, and likely less diverse in their skill sets.

When the data are broken down by student ethnicity, High School Central's 1A/1B course, like High School North, is not impacting students as desired. Table 8 shows that almost no students in the two-period course, when grouped by ethnicity, made the necessary gains. The only exception is the Asian student population, of whom there were only two in the last three years. While there is much room for improvement in the High School North numbers, Central's data are even worse.

Table 8 HS Central Two Period Explore to ACT by Ethnicity

HS Central 1a/1b Group by Ethnicity	**N= number of students**	**Average Explore Math College Readiness Benchmark=17**	**Average ACT Math College Readiness Benchmark =22**	**Average Point Growth**
American Indian	0	0	0	0
Asian	2	11*	15*	4
Black	13	12.13**	14.57**	2.44
Hispanic	37	12.47**	15.41**	2.94
White	49	12.23*	15.5*	3.27
Multi-racial	8	11*	14.5*	3.5

*Significance is P= .001 **Significance is P<.005

As different from the two-period Algebra program at HS North, the one-period Algebra course at Central shows more positive results in student growth. A review of Table 9 reveals that one group, those students with IEPs, achieved expected growth of four points. And while the other two groups, Regular Ed and All Students, failed to meet expected growth, their gains were better than the same groupings in its two-period class.

Table 9 HS Central One Period Regular Explore to ACT

HS Central Regular Algebra Group	N= Number of Students	Average Explore Math College Readiness Benchmark=17	Average ACT Math College Readiness Benchmark =22	Average Point Growth
All reg algebra students	309	14.98*	18.28*	3.3
IEP	49	14.02*	18.00*	3.98
Regular Ed (non-IEP)	260	15.03*	18.31*	3.28

*Significance is P=.001

An important difference between the single period courses in each building is the use of co-teaching. At Central, there are both co-taught and non-co-taught one-period Algebra classes. At North, co-teaching only happens in the two-period course. Table 10 reveals the performance breakdown of Central students in one-period Algebra based on whether they are co-taught.

Table 10 HS Central One Period Co-Taught vs Not

HS Central Regular Algebra Co-taught and Not-Co-Taught	N= number of students	Average Explore Math (College Readiness Benchmark=17)	Average ACT Math (College Readiness Benchmark=22)	Average Point Growth
Co-taught	89	14.87*	18.21*	3.34
Not co-taught	220	15.1*	18.6*	3.5
Co-taught w/IEP	23	13.88*	17.2*	3.32
Co-taught no IEP	66	15.1*	18.56*	3.46

*Significance is P=.001

When examined by co-taught groupings, more students achieved desired gains. Students in a classroom with just one teacher, and regular education students in a co-taught setting, made the target gains, although just barely. While the co-taught group as a

whole did not make the expected growth, when broken down by IEP and Regular Education designations, those students without an IEP made the mark while those with an IEP did not. As a whole, it appears that the IEP students in the single period course perform better than those in the two-period course, and they grow more without a co-teacher. It further appears that while the regular educations students did not meet the growth target in either HS Central Algebra course, be it one period or two, they benefitted more from the one period course.

Like the two period Algebra course at HS Central, the only student ethnic group to make expected gains in the one period course was the Asian population, of which there were only 17 across three years of data. The only other group to come close to reaching the growth goal was the largest population, the white students, who missed expected growth by only .19. Table 11 details the performance of all the identified subgroups measured for the purposes of this research.

Table 11 HS Central One Period by Ethnicity

HS Central Reg Algebra Group by Ethnicity	**N= number of students**	**Average Explore Math (College Readiness Benchmark=17**	**Average ACT Math (College Readiness Benchmark=22)**	**Average Point Growth**
American Indian	1	15**	17**	2
Asian	17	16.22*	20.88*	4.66
Black	21	14.4*	17.38*	2.98
Hispanic	60	14.2*	17.42*	3.22
White	145	15.29*	18.6*	3.31
Multi-racial	19	14.9*	17.26*	2.36

*Significance is P= .001 **Significance is P<.005

Number of Students Taking Four Years of Math

Another measure used to inform the long-term impact of Algebra 1A/1B is how many students went on to take more than the required years of math. High School District 123 requires 3 years of math to graduate, but D123 ACT performance data show students who take 4 years of the core courses (English, Math, Science, Social Studies) perform better on the ACT. In High School District 123, in 2014, students who took only three years of math scored an average of 19.9 on the math portion of the ACT while students who took 4 years scored an average of 23 on the same test. It would stand to reason, then, that taking a fourth year of math would be beneficial to all math students. Unfortunately, only 13% of 1A/1B students at North and 29% of 1A/1B students at Central took a fourth year math class. And for most of those taking a fourth year, the course was not a course new to the student, but a repeat of an earlier course. The regular Algebra statistics were better, with 57% at North and 64% at Central completing a 4^{th} year math class. While those students enrolled in the remedial, two-period course, likely have a disdain for the subject and therefore are less likely to take more than is required, data shows that students in the one period course also enter and exit the class below benchmark but go on in greater numbers to take a fourth year of math.

Student Survey Results

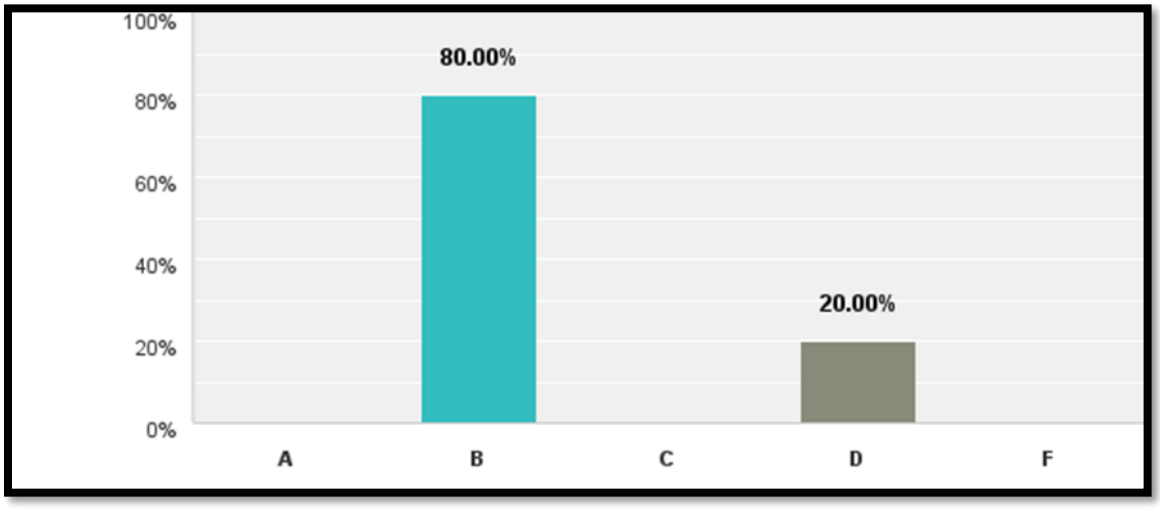
To gain insight into student perceptions of the Algebra 1A/B course, current 1A/1B students completed a survey sent electronically through Survey Monkey. It is important to note that none of the students at High School Central returned a signed permission slip and so did not complete surveys. Therefore, all data reported were

collected from students at High School North. Given the disparity between the performance of the 1A/1B students in each building, the lack of desire to participate might be telling. Of the permission slips returned by North students, one had a note from a parent excited about the survey and expressing a willingness to meet with me to discuss her wonders about the course. Though we did not have an opportunity to meet, she indicated that she and her husband are unhappy that two periods of her son's day are given to his least favorite subject.

One of the goals of the student survey was to determine how students perceive math in general and perceive taking math for two periods. Cobb, Gresalfi, Hodge (2009), found that as student confidence increased, so too did their performance in math. A complete list of the survey items given to students can be found in Appendix D. Of the 34 respondents, 60% were female freshman and 40% were male freshman.

Figure 1 Current Performance

Item 1: What is your current approximate grade in 1A/1B?



Most respondents, 80%, believe they are earning a B in Algebra 1A/1B. The remaining 20% are earning a D in the class. Most students, then, are performing at an

above average level of mastery of concepts testing up through November of the 2014-2015 school year.

Figure 2 Desire to Be in Two Period Class

Item 2: I wanted to be enrolled in Algebra 1A/1B instead of a one period math class.

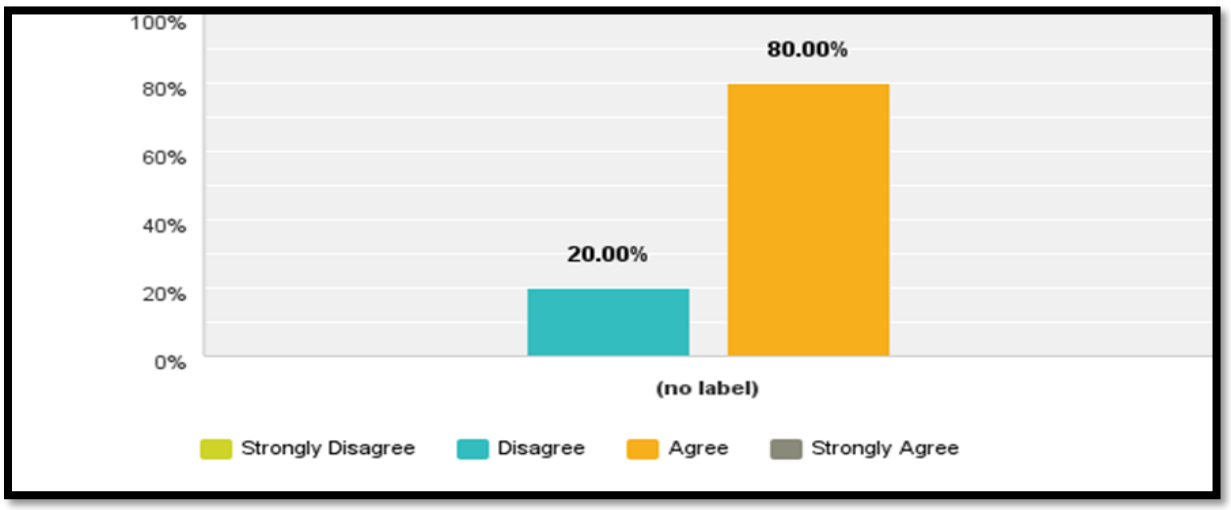


Figure 2 indicates that most students who responded to the survey wanted to be in the two-period math class, while 20% disagreed that they wanted to be in 1A/1B. Whether the student responses truly reflect their initial responses to being placed into the two-period math class, or if they have been impacted by their experiences since being placed into it are is unclear. However, 80% of students responded positively.

The following two figures indicate student confidence in math. The first shows student responses to a question about the connection between increasing math skill and having a longer class in which to learn it, and the other asks about their confidence levels as it relates to being enrolled in 1A/1B.

Figure 3 Impact of Two Period Course on Confidence

Item 3: I believe my math is improving as a result of having two periods in which to learn it.

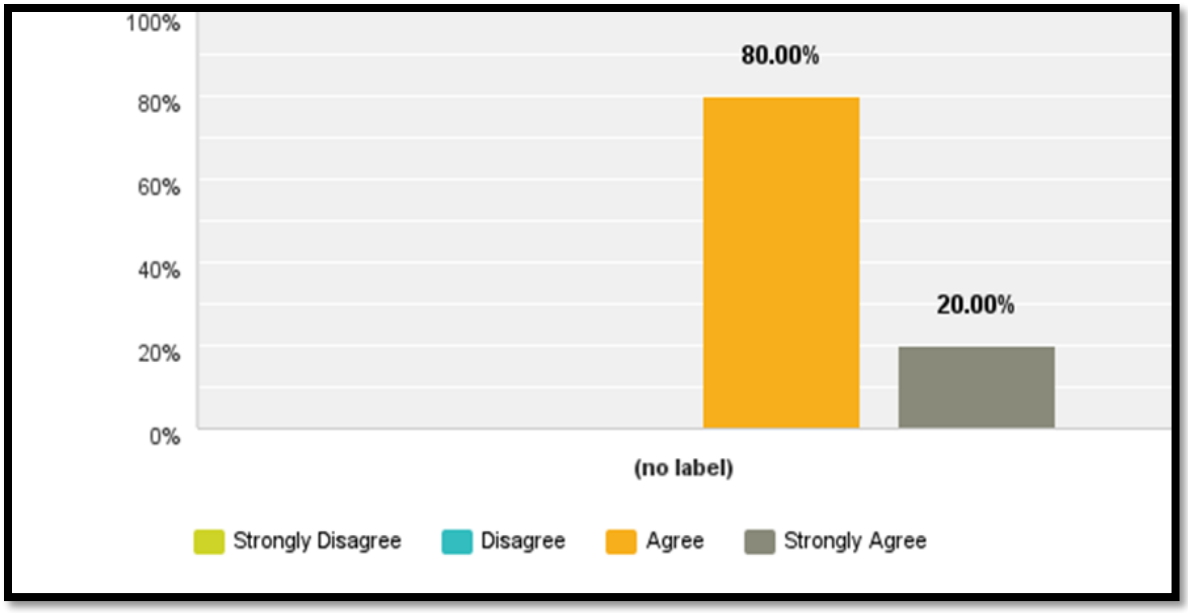
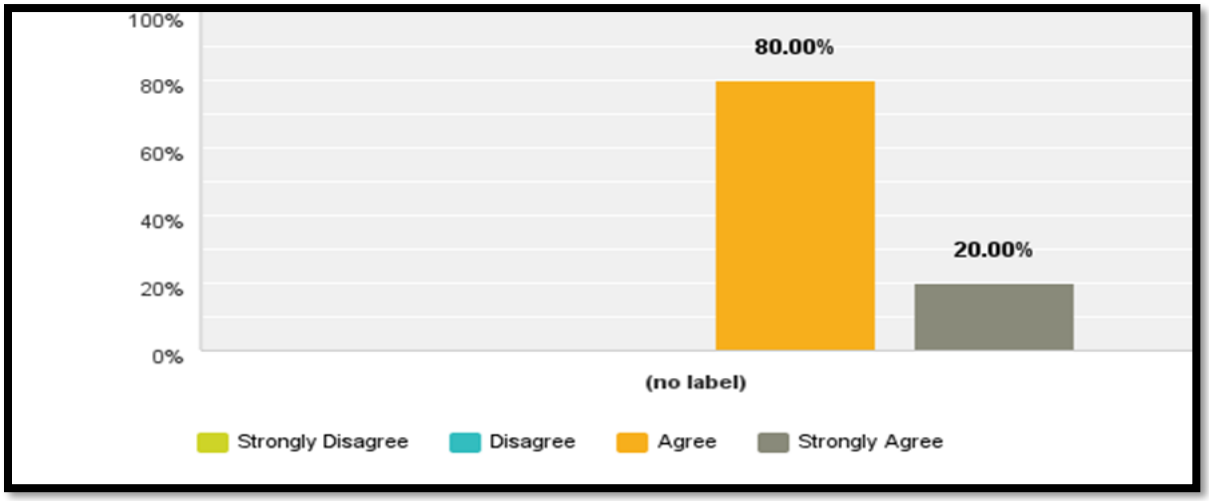


Figure 4 Impact of Math Course on Math Skills

Item 4: I am gaining confidence in my math skills as a result of taking 1A/1B.



The same students who indicated a desire to be in the two-period math class also indicate that they believe their math abilities and confidence are improving by through enrollment in the two-period course. Specifically, 80% of students believe they are getting stronger at math and 20 % indicated the opposite, when asked both about their math specific skills and their overall confidence in math. One student wrote a comment in

the survey which indicated the same. “I believe that being in this class has helped me overall. I used to be afraid to raise my hand, but I have gained confidence now”, wrote a 1A/1B student.

Figure 5 Utilization of Other Math Supports

Item 5: I utilize other math resources, like the math lab or before and after school tutoring.

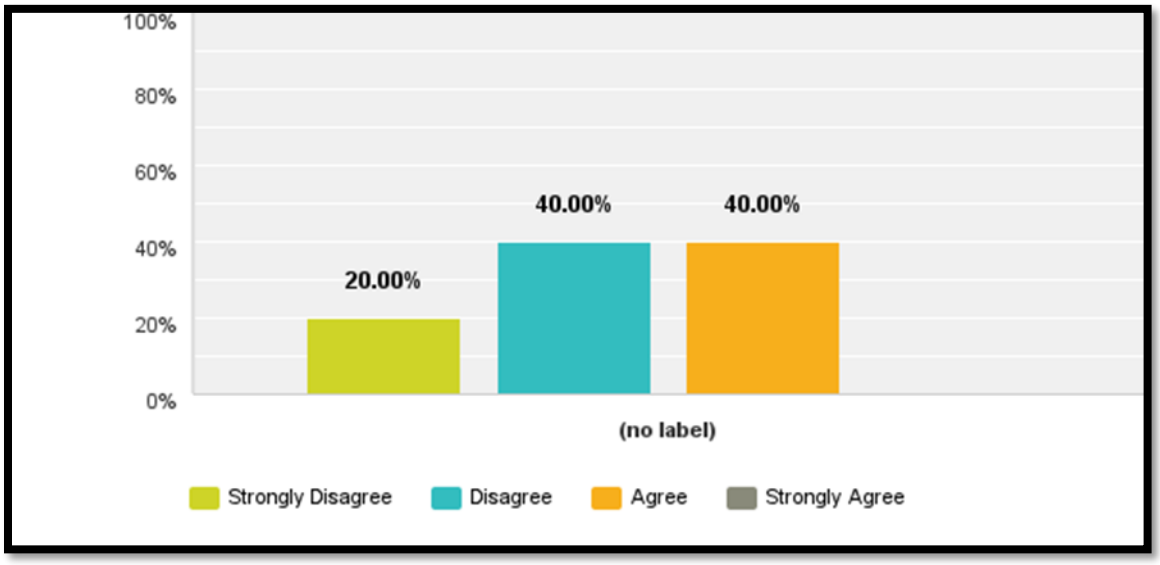


Figure 5 indicates a larger continuum of responses than in previous questions. About 40% of students indicated they do use other math supports available in the building while the remaining 60% indicate that they don’t. Interestingly, the same 20% of students who indicated their math performance is not improving are the same ones who absolutely don’t use any other resources in the building. That students are not using additional supports might explain why several 1A/1B groups did not meet their growth goals.

Figure 6 Impact on Enrollment in Other Courses

Item 6: There were other classes I wanted to take this year, but there was no room in my schedule.

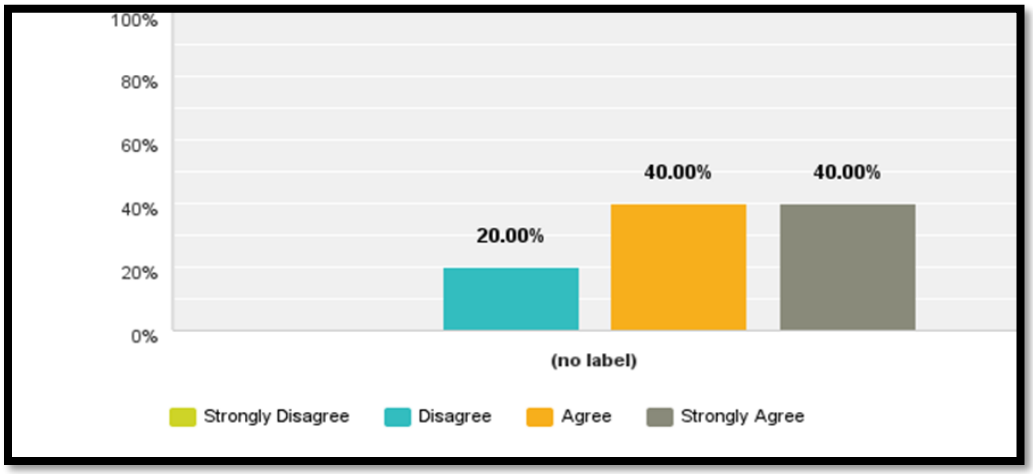
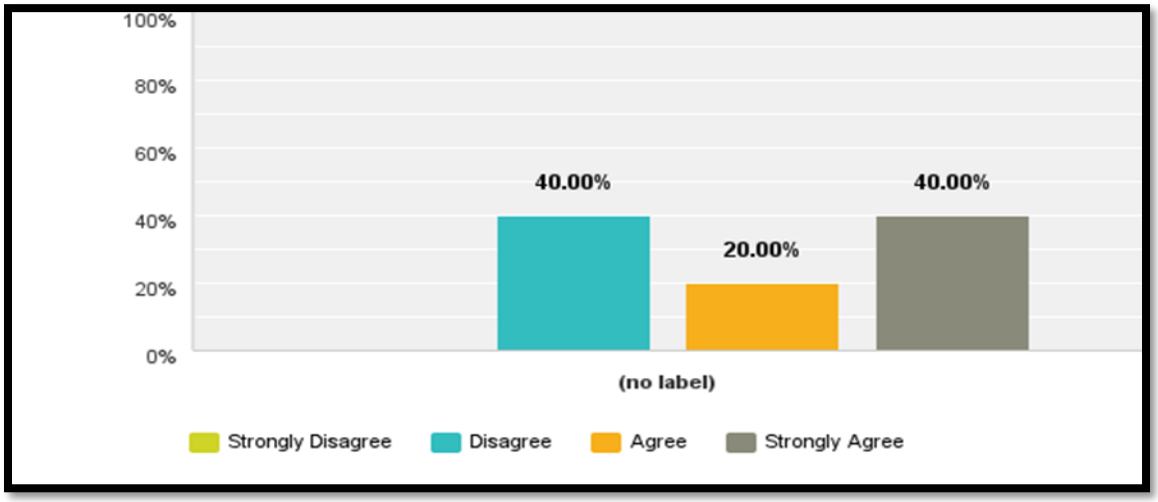


Chart 6 indicates that 80% of students either agreed or strongly agreed that there was another class they'd hoped to take during the school year, but were limited by their enrollment in the two-period math class. This is indicative of a "cost" of the two-period course structure, students are unable to pursue their interests through elective courses.

Figure 7 Number of Years of Math Hope to Take

Item 7: I plan to take 4 years of math.



The results outlined in Chart 7 are a surprising departure from data trends analyzed in this program evaluation which indicate very few, less than 20%, of 1A/1B students tend to enroll in a fourth year of math. Regression analyses done by ACT and outlined in this paper indicate that students who enroll in a fourth year of math perform better on their ACT than those who don't. Of the students who responded to this survey, 60% indicated that they plan to take a fourth year of math. If that happens, the rate of growth between Explore and ACT may be greater for this cohort than for previous groups

The next series of questions relate to the structure and instructional methods of 1A/1B. The intent is to uncover how students feel about how the class is taught and whether they are comfortable amongst their 1A/1B classmates.

Figure 8 Instructional Methods

Item 8: The way math is taught in 1A/1B makes it easy for me to learn the material.

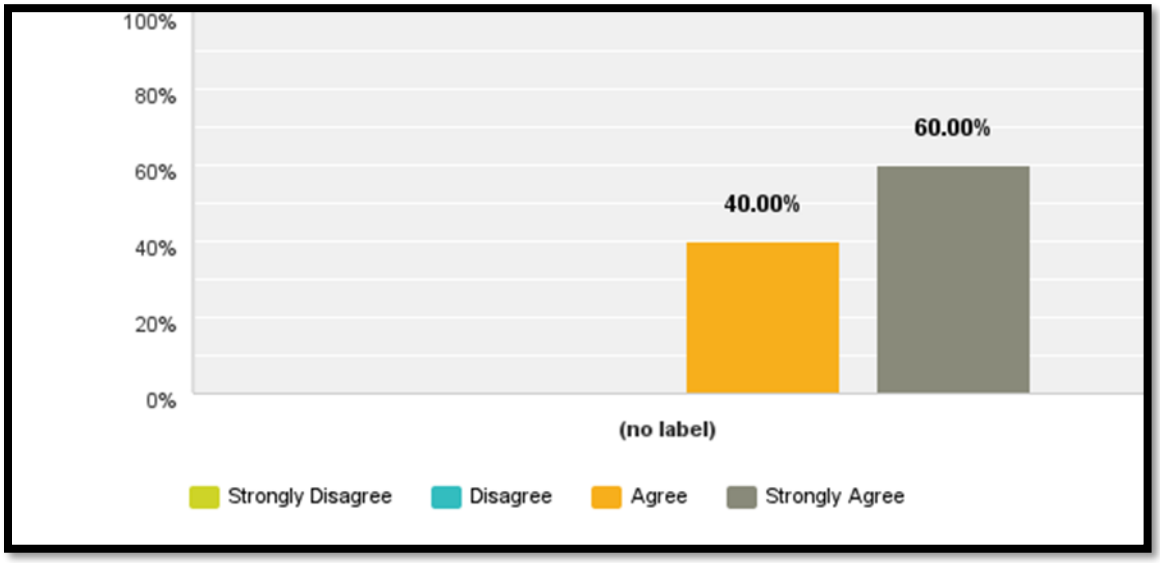


Figure 9 Pace

Item 9: This class moves at the just the right pace, not too fast and not too slow.

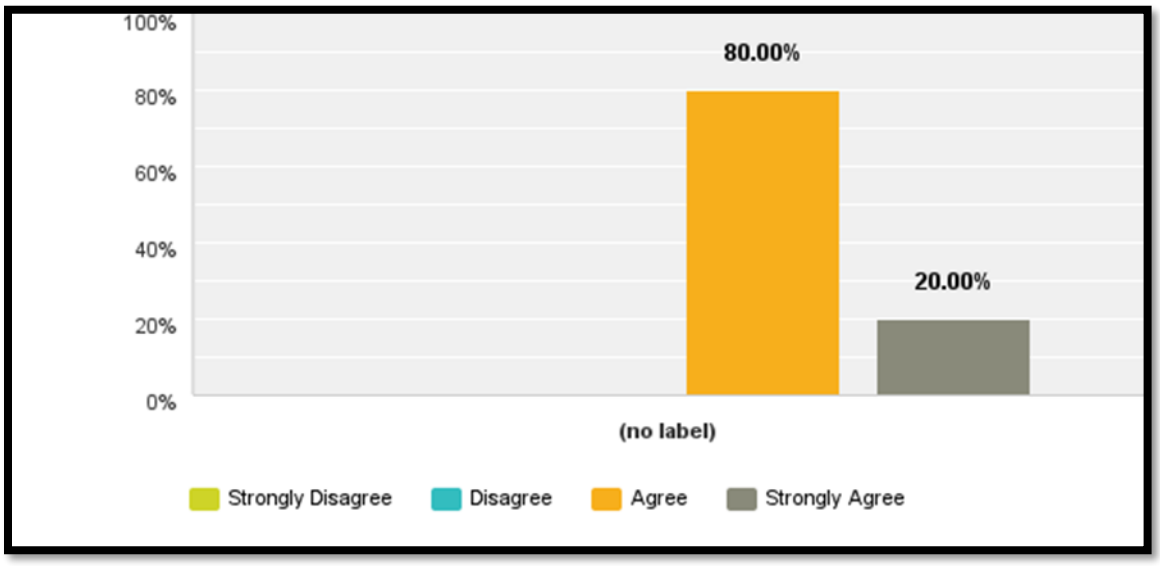
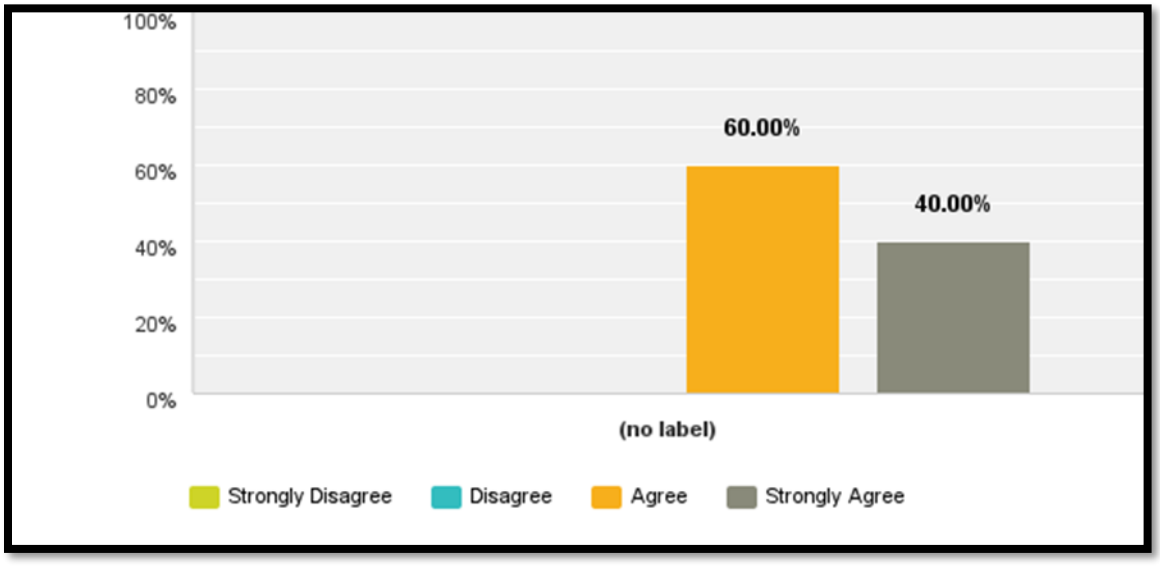


Figure 10 Classroom Environment

Item 10: I feel comfortable in 1A/1B, like I am with other students who learn the same way I do.



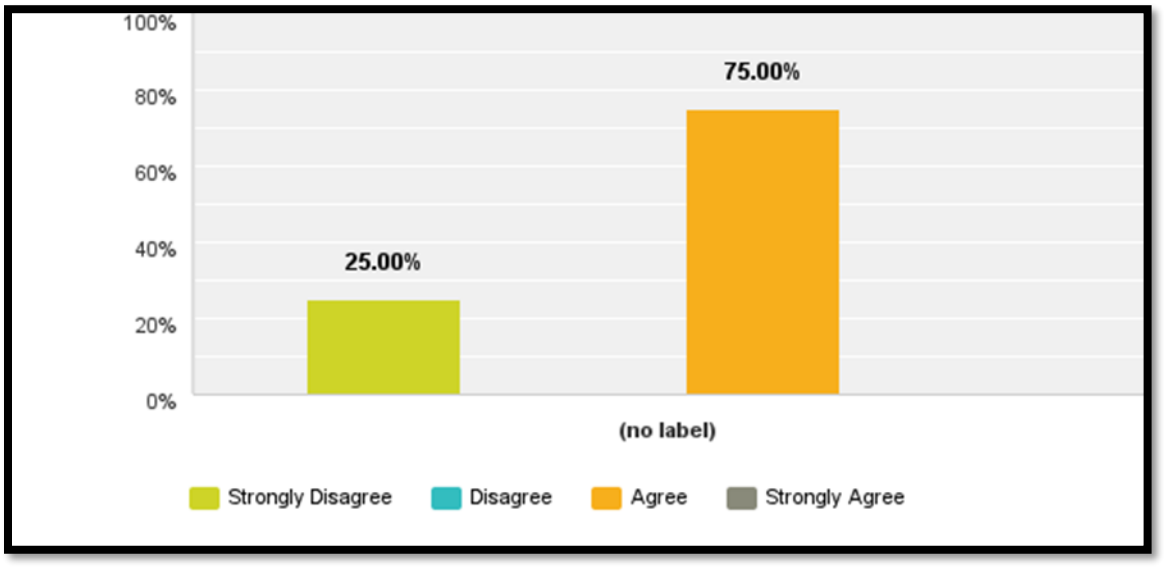
All the surveyed students either agreed or strongly agreed that the class moves at a good pace, that the instructional methods are effective, and that they feel as though they

are among like peers. One student wrote a comment in the survey to support this. “I find it really easy to co-operate, it most certainly helps with improving. _____is a fun teacher when the time is right and he knows how to make math fun. Algebra 1A/1B is a sufficient class”, wrote a student.

The final question of the survey simply asked students if they like math. The intent is to find if the perception of the adults, that the students in 1A/1B are those who hate math, is true. Figure 11 shows the results.

Figure 11 Enjoyment of Math

Item 11: I enjoy math.



Interestingly, the student responses indicate the opposite of adult perceptions about students’ enjoyment of math. Three out of four students agree that they enjoy math while one in four dislikes it strongly.

The student survey data revealed the following trends for students currently enrolled in Algebra 1A/1B:

- Contrary to adult perceptions. 80% of student respondents indicated they like math.
- 80% of respondents wanted to take another class but couldn't because of their enrollment in the two-period Algebra class.
- The vast majority of students see their confidence improving as a result of enrollment in 1A/1B.
- Despite data indicating that most students in 1A/1B don't take a fourth year math class, 80% of respondents indicate they plan to a math class senior year.
- Only 40% of students utilize other math supports in the building, like individual or group tutoring.
- Most students feel comfortable in Algebra 1A/1B.

Themes from Interviews with Teachers, Department Chairs, and Principals

Several different interviews were conducted to gather opinions about the purpose and success of the 1A/1B program. All interview questions are in Appendices A-C. The principal of each high school was interviewed individually. In the interest of full disclosure, the principal of Central High School is my husband. The Department Chairs were also interviewed individually, while the teachers in each building were interviewed in their teaching teams. The primary themes to emerge from the interviews included:

- The purpose of Algebra 1A/1B is different across adult groups in the buildings;
- The typical student enrolled in Algebra 1A/1B is described as less able and less confident than the regular Algebra student;
- There are mixed feelings on the success of the two-period program;

- Methods of measuring success of the students in the A/1B program are inconsistent;
- There are differences in how the one and two period courses are taught;
- Teachers believe a different school year calendar, one where summer break is used more effectively, would help the 1A/1B students.

Theme 1: The purpose of Algebra 1A/1B is different across adult groups in the buildings.

The principals of both buildings believe that the ultimate purpose of Algebra 1A/1B is to remediate students enough in two periods of math to catch them up to their peers and move to the regular track of math. This was revealed in the following conversation:

Researcher: What is your understanding of the purpose of Algebra 1A/1B?

Principal 1: These are students who are, generally speaking, below grade level in Algebra and math reasoning. So, the purpose would be to use two class periods in order to catch them up to their peers.

Researcher: OK. So if I'm understanding then the ultimate purpose is to get them up to grade level, to catch them up, to their peers?

Principal 1: To catch them up to their grade level, to their peers.

The principal of the other high school said something similar though in more detail.

Principal 2: The purpose of Algebra 1A/1B is for students to not only learn Algebra I content, but it's also to help build some of those skills that they may be deficient in. That is the reason that it is a 2-period course, so my expectations for the course would be that the extra built in period of time

would be used for that skill development. Ideally, that would be based on an individual student, because all students might have different skills that they need to improve upon. So it is my expectation that that's what the extra period is used for, to help build those individual skills so that those students can be successful in their future math courses.

Both the Department Chairs and the teachers were shown the course description as it appears in the 2015 course registration guide and asked if it accurately reflects the purpose of the course. The description of Algebra 1A/1B as found in the 2015 High School District 123 Registration Guide reads:

> This two-semester two-period sequence is designed to incorporate a review of skills prerequisite for algebra as well as the basic concepts of algebra. The goal of the course is to provide meaningful connections and increase problem solving skills. Modern terminology and methods are used to study the real number system. Sets, variables, operations with polynomials, solving and graphing linear equations and inequalities, and solutions of quadratic equations are some of the many topics covered. A scientific calculator is required for the class, but a graphing calculator is recommended.

Both Department Chairs agreed that the purpose of the course was accurately described in the excerpt from the registration guide, but added some detail to it.

Researcher: What is the goal of Algebra 1A/1B?

Department Chair 1: The goal of 1A/1B is to take students who have not demonstrated that they are quite ready for the regular Algebra class and do the best we can to prepare and try to catch them up a little bit so that they can hopefully go on and be successful in Geometry and courses thereafter. That's the ultimate goal of the course. My goal

would be for them to, when the get to Advanced Algebra Trigonometry, for them to be able to get there as a junior and complete it successfully and have some of their gaps remedied.

Department Chair 2: Two-sided goal, one would be to have extra time for students to make more meaningful connections with their content. Second goal to be able to develop better fundamental skills in algebra...

\ We've had conversations with teachers as recent as August when we talked about what the purpose of this class was and I like to say it's not to bore them for 100 minutes.

Department Chair 2: Well, the idea is for many students, we would hope, now I don't have a number for many, but I'd like to see more students be able to exit the preparatory track after this class.

Researcher: So, what would it look like for them if they were to do that, exit this class? Where would they go next?

Department Chair 2: Right, sophomore would be Geometry, AAT their junior year and then their senior year would probably be at this time Probability and Statistics or pre-Calculus, those are their two options.

In essence, though the description does not indicate as much, the department chairs believe the students should be able to leave the preparatory track after taking this class. Most students, however, don't leave the prep track after completing 1A/1B.

The teachers in both schools agreed that the written description adequately explains the purpose of the course, but unlike the administrators, teachers don't believe it is possible to remediate most of the students enough for them to leave the prep track and return to a regular math track. The conversation below reveals this discrepancy.

Researcher: What is the goal of Algebra 1A/1b?

Teacher 1: I believe originally started the AB curriculum, the goal was for the two periods to be enough for students to stay at the same pace as the one period classes so that at the end of the time, students would have the ability to, "Oh, okay. I just needed some touch up. Now, I'm good. Now, I can go into geometry." It was that way for a while. We had multiple AB sections but since we've lost that flexibility, the pacing, even with the two-period along with … It says here, 'designed to incorporate a review of skills pre-requisite for algebra,' trying to bridge the gap for a lot of the students to get them even just to the point where we're supposed to be starting while moving forward. We don't have the ability to get them to the point, the same place that a one-period class is going to right now.

Teacher 2: I feel like we really try the meaningful connections and problem solving skills, but sometimes kids come in with such great deficits that it's hard to make those connections in problem solving skills. Sometimes we try to do problems where they work backward and we connect to something else, and it's just over their head. Then you just lose them. I would think it's trying to find that balance

between making those connections, trying to build that problem solver within them, with not losing them through frustration and, "I don't care. I don't get it. I'm going to ignore you now." It's hard to find that balance sometimes for those kids, but I would say overall that I would agree with this.

Researcher: Anyone else have a purpose different than what is described here?

Teacher 3: I agree. I think everything described is accurate. However, with the calculator part, "A calculator is required for the class and a graphing calculator is recommended." With the graphing piece of it, the graphing calculator ...

Teacher 4: Yeah, we don't ever use that in there.

Later in the interview one of the teachers returned to the purpose of the course and added, "We try to make up for the skills they lack already moving in to this class, wanting to try and stay close to what Algebra is without….yeah, we need to find the best way to help with skill they lack as well as move on in Algebra."

The above interview questions about the purpose of the course reveals disagreement between the teachers and the administrators on whether students can and should leave the preparatory or remedial math track following successful completion of 1A/1B. The administration believes that is an achievable goal, while the teachers see that as unrealistic.

Theme 2: The typical student enrolled in Algebra 1A/1B is described as less able and less confident than the regular Algebra student.

While neither of the principals commented on student traits, the department chairs and teachers of the course in both buildings described 1A/1B students as those with learning, behavior, or confidence issues which inhibit their success in math. When asked to describe their typical student, teachers responded in the following ways:

Teacher 1: It's someone who doesn't like math. It's someone who feels that they're bad at it. I think that's the biggest thing we have to overcome.

Teacher 2: I would say: typically lacking in study skills or organizational skills. I think just the management, like how to manage their emotions to how to manage their papers to manage their study.

Researcher: Executive function issues?

Teacher 2: Yeah.

Teacher 3: Because of that, typically there's a lot of students who have Title IV's or IEPs or the ESL students

Teacher 5: We have kids that are coming in with somewhere between the second and the fifth-grade math ability that we're supposed to be teaching algebra to. We have kids that, like I said, we have stronger students. We have some students that have the ability but like I said, the confidence like one of the students we talked about. We do have the students where behavior and decisions have put them either not necessarily in a remedial class but previously, there's no disability or learning issue but it's just the skills aren't there because they get pushed through. They haven't passed a math

> class since fourth grade that they've been pushed through all the time. They come in with these big deficits of skills.
>
> Maybe the ability is there if we could fill this gap. That's generally the one common denominator I guess we could say that we have kids coming in who do not have the skills that even before Common Core, you would say an eighth grader should know and be able to do these things in math.

The Department Chairs responded similarly when asked to describe the typically enrolled 1A/1B student. One department chair stated, "A lot of these kids have struggled in math and have a fairly negative attitude toward math, so sitting for two periods in a row in math is not a motivating factor all the time." The other stated, "it's a big difference in the population as you can tell from the IEPs, it's a big difference in the population, the student population between the (one and two) period as well."

In all, both teachers and department chairs believe these are students who hate math, who have been "pushed through", and have learning and emotional issues that put them at academic risk.

Theme 3: There are mixed feelings on the success of the two-period program.

Though the teachers and department chairs indicate that the 1A/1B student population needs more support than those in other courses, there is no consensus on whether the two-period program is successful or if it should be expanded. When asked about the structure of the course responses were as follows:

Researcher: What is your overall impression regarding the effectiveness of offering math over two periods?

Department Chair 1: I don't think it is that effective. I guess maybe I should say I'm not satisfied with how it is going currently and looking for ways to make changes because I would like it to be effective. I really want it to be, and the ultimate goal being that students improve and sort of build up their skills two grade levels, or closer to grade level so that they can exit that track. I really want it to be that way, but it's going to take some work to get it that way I think, based on recent trends for me.

Department Chair 2: I think there's pros and cons… The motivation part is the negative piece. The positive piece is it gives us more time to try to fill those gaps.

The teachers at High School North discuss the efficacy of the course primarily through their ability to give students time to do work during class in a two-period structure. The excerpt below outlines teacher reflections on 1A/1B.

Teacher 1: The challenging part is keeping them engaged for the two periods. There's definitely plenty of work for them to do and for us to do in the two periods at the rate they go at, but when they come back for that second period you've really got to do something to get them up and energized and ready to go again for another period.

Teacher 2: It gives us ... It gives students the time to cover a topic more fully, so we don't feel like we're rushing through something. They get

that opportunity to practice. If we are able to cover it a little bit quicker, then we have additional resources to use in our practice, an activity or something that they can use their skills now.

Teacher 3: The guided practices are an important thing that we really go through a lot of with the two periods. You couldn't do that in a single period. It's a one time, you're on your own ... I think that those guys can just feel like it's coming in too fast and that's when they shut down the fastest.

Teacher 4: I don't know. It's hard because the next year they only have a single period. They don't have it, they have an aide, they don't have another co-teacher. I feel like it's hard to ... I wonder ... It's not enabling, because I feel like a lot of the kids do need it, but, at the same time, we give them all that time in class to practice, practice, practice, that I think they get to a point where they don't have to do anything outside of class. Then, when it becomes their sophomore year, they need to be doing stuff outside of class and I think it takes them a while to adjust. I talk with the geometry prep teacher a lot, and ... It's a struggle. It's a big jump for a lot of kids. I don't know what ... if anything could be done. I don't know what could be done, but I do struggle with that a lot. I'm always thinking about next year, am I enabling them right now. I try to instill those skills in them to go to the math lab and get help outside of class. I don't know.

The teachers of High School Central also focused on the importance of allowing students time to do homework or practice problems during class. What follows is a portion of the interview with Central teachers revealing their belief that 1A/1B is an effective structure to help students get work done.

Teacher1: Having the time is good. Having two groups that you can find in their classroom, go to in their classroom, things like that is very beneficial for the kids and having myself, Mindy and Ms. Christy who's our aide help out in that way, we're able to really help the kids.

Also, just the time you have to practice in class … one of the biggest things I guess going back that just triggered something about the typical student is homework is optional at that for a lot of these kids. Doing work outside of school is a very difficult thing for a lot of these kids.

Teacher 2: Whether they're IEP-ed or have a 504 or they're just in general education, that's a common factor. The rationale for why homework doesn't get done is different for those different groups of kids. Some are motivation. "I don't really care,. "I'm not going to do the homework." Some is an independent level.

Teacher 1: Yeah. Having that time in class to practice more is a big benefit for a lot of these kids. We're trying to manage this year with the high and the low about championing still trying to challenge the kids that are getting it a little quicker but not letting the kids that are a

little bit behind just fall off the wagon. That's a challenge with the pacing of it this year but still, it allows us to do more activities. It allows us to do more game type things. It does give us time to get to know our kids a little better.

I know in algebra, I try and spend time but with everything that's being pushed down our throat, Common Core and the stuff we're supposed to cover, it's like, "Man, I got 50 minutes and I'm going to use every single one of the minutes to get us to where we need to be by the end of the day."

Whereas, here we have a little more time. At every Monday, we try and do some stuff to get to know stuff about people and teachers and the students and stuff like that because for this group of kids, that's a big piece of it as well is going beyond just the math but making sure that the kids really feel like a lot of them, there's some life situation stuff that contributed to their struggles academically.

When asked specifically about the challenges presented by the two-period structure the teachers at High School Central stated:

Teacher 1: I don't think we ever struggle to fill it up.

Teacher 2: We don't ever run out of stuff. No.

Teacher 1: We don't run out. One more problem, one more practice, one more assessment, one more exit slip, that's never a problem. We've got also to create games and activities that we do with the kids, basketball, baseball, around-the-rooms, all sorts of things so that

we're constantly getting the kids up and moving as well. If we were the types of teachers that have kids sit for two 50-minute periods, I think that that would be an issue but we're not.

Teacher 2: I think the biggest issue with an algebra unit is the biggest argument is we're taking kids that have not had success in math so they've developed a dislike of math. Then, we are making them do, let's say work on the thing that they probably dislike the most in school for twice as long as anything else.

If it's a Catch-22, because we've done a curriculum with algebra where it was algebra A. One year, essentially the first semester of algebra was freshmen year. The second semester was sophomore year but that runs into problems with if you don't pass A, the first year, now you're two years behind. You know what I mean. There's a lot of issues there as well.

I feel the two period classes especially doing ALEKS three days a week, that breaks it up a little bit. They only have this for the two 50-minute periods twice a week to sit, to be in the class for that long. I get they're still doing math with ALEKS but it's a little bit different. It's more individualized on a computer.

Teacher 1: Also, with ALEKS, they can pick their topic. It's not somebody saying you have to do fractions. They can skip fractions and they'll eventually have to get to it but they don't have to do it today.

Teacher 2: That's the biggest difficulty is just getting kids to buy in to working hard at math for two periods. It's not all the kids. We have some kids that math isn't a dislike for them. It's just something that's been, they haven't been as successful at it but we definitely have a number of kids …

For example, the one kid's just, "I've never been good at math. I' always fail. I make a mistake every time I try so I'm just not going to try." It's trying to work with that student who gets to that mindset for two 50-minute period is draining on us as well. I'll be honest. There are some days where I finished the first, second period, I'm like, and "I'm ready to go home." I've expended all of my emotional energy on some of these kids."

ALEKS, referenced in the preceding interview excerpt, is a computer program used in Algebra 1A/1B at High School Central. The students visit the computer lab twice per week and use the second of the two periods to work on the individualized computer program. The intent of the program is to remediate basic math skills. The program uses a pre-posttest structure to identify where a student should begin the lessons and determine when the skill is mastered enough to allow the student to move on the next lesson. High School North used a different program to do the same thing last year, but have since moved away from it. They used a program called Edgenuity and felt that it did not begin at levels low enough to meet the needs of the 1A/1B students using it. The teachers also indicated that students were not engaged with the computerized instruction, so they have abandoned the use of it.

Like when discussing the purpose of the class, both teachers and chairs have a lack of clarity around whether or not the two-period course structure is a good one. Teachers seem to believe that it is necessary to use time to do homework in class, since this is a group of students who won't do homework otherwise. The department chairs do not express much confidence in the two-period model, or at best, express mixed feelings on its efficacy.

Theme 4: Methods of measuring success of the students in the A/1B program are inconsistent.

The principals, the department chairs, and the teachers all responded differently about how best to measure success of students in the 1A/1B program and of the two-period program in general. The differences are revealed in the interview segments below.

Researcher: How would you like success of this course to be measured?

Principal 1: Are they meeting grade level? Are they continuing their math? Are they succeeding in their future math courses?

Principal 2: Students need to be measured consistently throughout the year. Have they achieved mastery of those skills that they were deficient in? Through a variety of assessments, throughout the year… you know….it's about skill development but it is also about Algebra I content.

As seen in the following interview segment, the Department Chairs responded more like principal 2 above, focused on ongoing growth throughout the year as opposed to the long term implications focused on by Principal 1.

Department Chair 1: I'm very interested to see student's growth compared to themselves in August when they come in to the math program through May, and to see what kind of growth a student is capable of achieving. But I also would like to see growth measured by their self-reflection and their growth, maybe their perception of themselves in math.

Department Chair 2: To me, student success should be measured based on the standards that the course is linked to. To me, student success should be measured based on how well students do in those areas. Do they understand the material? If they're given problems connected to these standards, can they do them and how well can they do them?

In regards to tracking student success, only Department chair #1 indicated that specific student growth data on students in 1A/1B is gathered. Using an RtI screener, which measures students' basic math abilities both at the beginning and at the end of the course, the team reviews student progress, though no specific statistics were shared during the interview. The other department chair indicated that no course-wide data was kept on student performance in 1A/1B.

The teachers of the 1A/1B course focused their responses on measuring student success around using formative, day-to-day measures. For some teachers, success is measured in student engagement, for others it is measured by student attitude, yet for some it is measured on daily quizzes. The conversation below reveals the day-to-day assessment mechanisms the teachers rely on.

Teacher 1: It's literally being able to get them to stay engaged, to not shut down for an entire period. We have some students where it's, "Yeah, success for you would be an excellent understanding, an A on a test or quiz." There's a wide range, success is individualized for a lot or our kids.

Teacher 2: We do a lot of exit slips, just to see who's getting it. I'll just say growth and success with any class in school and understanding and things like that are obviously a big part of algebra. There are fewer degrees of success then in other classes. Either they know how to do it or not.

Teacher 3: We measure success with our daily quizzes. Daily progress checks. We do RtI screeners as well, but our weekly and daily quizzes give us better information.

Teacher 4: Yeah, but the RtI screeners, I only saw one time that we ever talked about it is helping or not helping. To me, there wasn't enough information. I don't understand because they can't use a calculator on it and all we do is calculator-based stuff.

Teacher 4: With our group it teams like memory and things like that play a factor- we have to do small assessments regularly or they get overwhelmed.

In general, the teachers focus more on day-to-day measurements of success, and don't believe these students can retain the information for any length of time. Midterms and finals are less useful for the teachers than day to day assessments that allow them to

reteach concepts that are not being retained by students. Administrators, on the other hand, want success measured in larger indicators of student mastery of course learning targets.

Theme 5: There are differences in how the one and two period courses are instructed.

The teachers were explicit in the difference in instructional methods between the one and two period course. The verdict often was that the second hour of the two-period course is used for practice or homework completion and that even with the additional time these students would never leave the prep track in math. The teachers believe they are unable to catch these students up to their peers in one-period math. The result is low-level instruction which centers on "drill and kill" style learning, particularly at Central. This is revealed in the segment below:

Researcher: What are differences between how you instruct in the one and two period Algebra courses?

Teacher 1: One big difference is you do a lot more discovery in the one period class. I am not worried those kids aren't going to figure out what we're trying to get to. With AB, I can try and do some discovery, but there's a lot more guiding them to get to what I want. The questions I prompt really go towards getting that final conclusion.

Teacher 2: I think Algebra 1, overall, gets through more than AB does, for sure. And there is more depth.

Teacher 3: Because we have a double period, we can review a whole period before we take each test and quiz. A lot of Algebra 1 is going home and studying. 1A/1B kids don't have those study skills yet.

Teacher 4: The 1A/1B students we have had not much success in the past with math and haven't had traditional pre-algebra class at the middle school. The learning comes best with direct teaching, a lot of taking a student through, and "this is how we do this. These are the steps to follow" while trying to teach them why. Many of our kids are not at the why level, they are at the "how do I do this" level.

Teacher 5: The assumption is when a student is in regular algebra that they come with a set of skills so they can hit the ground running. Some of the AB kids struggle with basic math functions. We need to directly instruct those. For example, in the one period we will teach 4 different ways to do something. In AB, we teach one at a time.

Teacher 5: We give the AB kids bookmarks with tricks to remembering how to solve a problem so they can look to it if they forget.

Teacher 4: Yeah, we require regular algebra to memorize a lot more. In AB they can use the cheat sheets, in Algebra they can use a pencil, a calculator, and their brain.

Despite the findings of educational researchers like Grant Wiggins and Jay McTighe (2005) that teachers should start with the end in mind and instruct towards it, the only goal teachers seem to have for 1A/1B students is to stay engaged, to master basic

concepts using cheat sheets, and hopefully grow in mathematical confidence. Similarly, Rollins (2014) reminds us that the best way to remediate struggling students is to avoid teaching everything they ever missed, but to surgically select the most important skills, teach those, and then help students apply the new knowledge to current and age-appropriate topics of instruction. Instead, the AB teacher in District 123 are trying to remediate all skills and thus never give students the chance to catch up to their peers.

Theme 6: Teachers believe a different school year calendar, one where summer break is used more effectively, would help the 1A/1B students.

Teachers in both buildings indicated, without being prompted by a specific question, that a reconsideration of the academic calendar would be beneficial for the students of 1A/1B. One teacher indicated that a year-round calendar would help students who might otherwise lose skill and content memory over the summer. Another teacher indicated that it might be helpful to create a summer school course that reviews basic math and calculator skills. It was suggested that students who complete this course might be able to "test out" of 1A/1B and move into regular one period Algebra.

In summary, interviews with the teachers, the department chairs, and the principals revealed the following about Algebra 1A/1B in District 123:

- While 1A/1B is intended to build math skills, there is disagreement between teachers and administrators regarding whether the students will catch up to their peers as a result of taking this course.
- Teachers of both schools identify significant ability and confidence differences between students in the one and two period courses.

- There are mixed feelings about the success of the structure of the two period course.
- There are no consistently identified methods by which to measure student success in the 1A/1B classroom.
- Teachers identified differences in how they instruct 1A/1B differently from the one period Algebra course.
- Teachers believe that the current school calendar disadvantages the students of 1A/1B.

SECTION FIVE: JUDGMENT AND RECOMMENDATIONS

The purpose of this paper was to determine the extent to which Algebra 1A/1B is a successful intervention for the struggling freshmen math students of District 123. Are these students growing at expected rates? Are they able to catch up to their peers? Do these students go on to take more than required math courses? Does enrollment in the two-period course limit elective course options for these students? The program evaluation was done through quantitative and qualitative analysis. Using SPSS, an analysis of student growth in math performance as measured by Explore and ACT scores for both the one and two-period Algebra students was completed. In addition, the number of students taking a fourth year of math was determined. Furthermore, a survey of currently enrolled Algebra 1A/1B students was conducted to gather their impressions of the course.

The qualitative measures included in this study were interviews conducted with the principals, math department chairs, and teachers of the 1A/1B and regular Algebra courses. The interviews were coded and placed into themes.

Judgment

Overall, 1A/1B has not proven to be an effective intervention for the freshmen math students of District 123. Students in the 1A/1B course generally showed less growth, performed more poorly on the ACT, and took fewer math courses their senior year than those same groups in the one-period algebra course. In addition, students in the 1A/1B course almost never catch up to their peers in their math skills and so remain in a basic math course sequence. Though isolated groups of 1A/1B students met their growth

goals, most did not. And of those groups who met growth goals in the 1A/1B course, the growth of their counterparts in the one period class typically grew as much, if not more. Though neither of the one or two-period Algebra classes demonstrated tremendous success, the limited student growth in 1A/1B course does not merit the costs to students of having to give up two periods in their day to take it.

A 2014 study by Takako Nomi found that sorting of students into more homogenous classes made up primarily of low-functioning students limited the success of the two-period math program in Chicago Public Schools. This proved true in D123 as well. At High School Central, only very low functioning math students populated their one section of 1A/1B, while High School North created three heterogeneous classes. The more heterogeneous class at North mostly outperformed the more homogenous one at Central, where none of the large groups of students met their growth goals. Interestingly, however, the more mixed one-period classes at Central grew to a lesser degree than those more homogenous one-period classes at North. This may have something to do with instructional techniques. Jones and Jones (2012) found that students who relied on the teacher as the authority grew less and gained less confidence than those students who participated in a student-centered, inquiry-based classroom. Central's dependence on teacher-centered strategies which focus on rote math skills could account for the overall poorer showing in Algebra as compared to students at North, where instruction is inquiry-based and students are frequently assessed for mastery.

While teachers in both buildings expressed a similar belief that 1A/1B students were more limited in their abilities than those in the one period class, Central teachers were more resolute in that belief and focused more on rote and basic skill development

than those at North. In addition, North uses daily formative assessments to measure student understanding, while those at Central are less intentional about that process. Moreover, the Central staff uses two periods per week doing online basic skill development instead of the more project and application-based work done at North.

Be it the more successful program at North or the less successful one at Central, the students in 1A/1B were generally within .5 growth points from their one-period peers. Given that 80% of student survey respondents indicated that they wanted to take another class but didn't have space in their schedule, a cost-benefit analysis of the 1A/1B course reveals that aside, perhaps, from IEP students who need co-teaching, the 1A/1B course does not result in enough student gain to merit the cost of a full class-period.

There was a fascinating disconnect between teachers and students of 1A/1B regarding their feelings about the course. During the interview at both buildings, teachers indicated a dislike for teaching the course and admitted that not all teachers are "cut out" to teach it. They further indicated that there are certain days that they dread teaching the class. Students did not feel the same, with most survey respondents indicating that they like the class and are gaining confidence. However, that students in the one-period course grow about as much or more as most of their two-period counterparts, it is likely they, too, are growing in confidence and ability. And, despite the current survey results, years of trend data indicate that student in 1A/1B don't grow in math skills enough to desire to take a fourth year of math.

Recommendations

This program evaluation has informed five recommendations for future studies and program considerations.

Incorporate short-term data points

The data used in this program evaluation included long-term measures of success- whether or not students grew in their math skills between freshman and junior year and how many students went on to take a fourth year of math. Further studies should include analysis of short-term measures, like skill development from the beginning to the end of freshman year using RtI assessments and MAP scores. This would allow District 123 results to be compared to those of previous studies which found that improvement from the two-period course has diminishing returns.

Make better use of summer school

Another recommendation which emerged from the process was the desire to use the summer-time more effectively to build and maintain student skills. Teachers in both schools expressed a desire to better use summer for instructional purposes. A summer bridge or math skill building summer course might help to bolster student confidence coming in to freshman year. The development of such a course should be a priority.

Reconsider the school calendar

Might students be better situated to learn and retain skills and content in a different instructional calendar? Teachers in both buildings suggested an alternate

learning structure, year-round school for example, might improve student learning. Research done for this evaluation shows that schools with a block-schedule format have better results in the two-period math program than those schools who offered 1A/1B as a singularly block format class. Investigations into new possibilities for school structures should be investigated.

Eliminate or revise the two-period algebra course

Because growth for 1A/1B students was not sufficient enough to catch them up to their peers, research suggests it would prove useful to identify a group of students who would otherwise be placed into 1A/1B and follow them closely as they are instead enrolled in the one-period course. If those students do as well or better as those in 1A/1B, it is recommended that the two-period course be eliminated, offering solely co-taught and non-co-taught one-period Algebra courses.

Increase dialogue about program purpose and goals

Finally, this evaluation revealed disparity between teacher and administrators around the purpose of 1A/1B and how its success should be measured. Should 1A/1B remain a course offering, conversations must occur between these parties to develop a common understanding of the overall purpose of the course. The content of such a discussion should be informed by the data uncovered through this program evaluation.

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Appendix A

Teacher Interview Questions

Questions of Philosophy

1. How do students' best learn Algebra?
2. What does effective Algebra instruction include?
3. How do we best remediate students who are deficient in basic math skills?

Questions about 1a/1b

4. What is the goal of Algebra 1a/1b? Does this course description (provided to interviewee) accurately describe the course and its purpose?
5. How do you measure student growth and success in the course?
6. Who takes this class, tell me about your typical student?
7. Do teaching strategies differ between Algebra 1a/1b and regular college-prep algebra courses? If so, how?
8. How effective do you find the two-period structure? What seems to work well and what is challenging?
9. In your opinion, does the extended block of time improve student performance in math?
10. Tell me about the professional development you received on teaching in a larger block of time?
11. If you asked the average 1a/1b student to describe their experience in the course, what might they say?
12. How do teachers respond to being assigned to teach the Algebra 1a/1b course?

13. Do you have a co-teacher? If so, how does he/she function in the room and does that look differently than co-teaching in the regular 50 minute class period?
14. Is there anything else you'd like to tell me about Algebra 1a/1b specifically, or the math curriculum more generally?

Questions about student support

15. Are students who are successful in your class making use of other supports, like tutoring outside of class or the math lab?

Appendix B

Department Chair Interview Questions

1. What is the goal of Algebra 1a/1b? Does this course description (provided to interviewee) accurately describe the course and its purpose?
2. How should student success be measured?
3. What is the role of the two period math class within the larger scope and sequence of the department?
4. Why two periods? Do you have expectations as to how that time is used?
5. Is there specific professional development provided for teachers of this course?
6. How do you place students into the course?
7. What have been your enrollment trends over the last couple years? How many sections do you run?
8. Do you keep on student performance in this course, if so, what have you found?
9. What is your hope for the students who take and successfully complete the Algebra 1a/1b course?
10. How do you determine if the course is co-taught?
11. Would you consider, if given the option, making other courses run two periods instead of one?
12. What is your overall impression regarding the effectiveness of offering math over two periods?
13. What other supports do you have in place for students in your math program?

Appendix C

Principal Interview Questions

1. What is your understanding of the purpose of Algebra 1a/1b? Are your expectations different for this course because it is two-periods long?
2. How would you like success of the course to be measured?
3. How does this class fit into the larger RtI support structures you have in place for students?
4. What is the approximate cost of running the Algebra 1a/1b? Is cost a concern?
5. Have you given consideration to offering other courses in a block format?

Appendix D

Student Survey Questions

1. What is your current year in school?

9 10 11 12

2. What is your current grade in 1a/1b?

A B C D F

3. What is your gender?

Male Female Prefer not to say

4. I wanted to be enrolled in Algebra 1a/1b instead of a one period math class.

Strongly Disagree Disagree Agree Strongly Agree

5. I believe my math is improving by having two periods in which to learn it.

Strongly Disagree Disagree Agree Strongly Agree

6. I utilize other math resources like the math lab or before and after school tutoring.
Strongly Disagree Disagree Agree Strongly Agree

7. There were other classes I wanted to take but couldn't because of the two periods of math.
Strongly Disagree Disagree Agree Strongly Agree

8**.** I plan to take 4 years of math.

Strongly Disagree Disagree Agree Strongly Agre

9. The way math is taught in Algebra 1a/1b makes it easy for me to learn the material.
Strongly Disagree Disagree Agree Strongly Agree

10. The pacing of the course is appropriate for me
Strongly Disagree Disagree Agree Strongly Agree

11. I feel comfortable in Algebra 1a/1b, like I am with other kids who learn the same way I do.

Strongly Disagree Disagree Agree Strongly Agree

12. I am gaining confidence in my math skills as a result of taking Algebra 1a/1b**.**

Strongly Disagree Disagree Agree Strongly Agree

13. I enjoy math.

Strongly Disagree Disagree Agree Strongly Agree

14. Is there any other information you would like to share about your experiences in Algebra 1a/1b?