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Implementation Insights

FOUNDATIONS OF ALGEBRA: 2009-10

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Program Goals and Strategies

Foundations of Algebra was designed to provide high school students with low mathematics performance an extra opportunity to review and study foundational mathematics concepts prior to enrolling in Introductory Mathematics and subsequently Algebra I. The primary strategy employed was to enroll students in grade 9 in Foundations of Algebra in the fall and Introductory Mathematics in the spring and to provide the newly developed curriculum and materials. Beginning in 2009-10 students who scored a Level I or low Level II on their grade 8 mathematics End-of-Grade (EOG) were eligible for Foundations of Algebra. Students who scored a high Level II were to be enrolled directly into Introductory Mathematics. Introductory Mathematics also utilized newly developed curriculum and materials.

Foundations of Algebra provides students an opportunity to "solve relevant and authentic problems using manipulatives and appropriate technology" (High School Program Planning Guide 2009-10, p. 84). Furthermore, authentic algebraic concepts are connected to remedial lessons so that teachers and students can see how arithmetic can be used to access and improve fluency with algebraic concepts.

Table 1 details the need addressed by Foundations of Algebra, the inputs required, the strategy employed, and the program outcomes or goals. This report is focused on the first year of Wake County Public School System's implementation of Foundations of Algebra, 2009-10. Therefore, the primary focus will be on implementation elements such as training, student enrollment, and course-taking patterns.

Major Findings

- **Students Served:** 877 high school students participated in Foundations of Algebra in the fall of 2009 while another 774 students were enrolled directly into Introductory Mathematics in the spring of 2010. 1,600 students enrolled in Introductory Mathematics in 2008-09 were used as a comparison group.
- **Training:** Seventeen of the 22 Foundations of Algebra teachers who responded to a fall 2010 survey reported receiving training. Thus, more than 1 in 5 of the respondents did not receive training. The vast majority, 82% (14 of 17) of those trained, reported that the training was sufficient to allow them to implement Foundations of Algebra in their classroom.
- **Implementation:** Eighty-two percent of Foundations of Algebra students were Level I or II; however, less than two-thirds of students (63%) scored Level I or ***low*** Level II—the program's criteria. Twenty-seven percent of students enrolled directly into Introductory Mathematics met the recommended criteria of ***high*** Level II scores.
- **Mathematics Course Enrollment:** A higher percentage of students who participated in Foundations of Algebra enrolled in Algebra I and Algebra I Part I than did comparison students. Fifty-nine percent of Foundations of Algebra students and 62% of Introductory Mathematics only students enrolled in Algebra I or Algebra I Part I after completing Introductory Mathematics compared to 39% of comparison students.
- **Recommendations:** Implementation could be strengthened by providing more consistent training and reviewing the student selection process to ensure only appropriate students are enrolled in these foundational mathematics courses. Other areas for improvement include the availability of materials, smaller class sizes, and to increase the course's pacing flexibility.

Implementation Insights reports provide basic information on program implementation such as whether the appropriate students were served. These reports should be used by program staff and decision-makers as guides to determine the future needs and direction of training and program implementation.

WAKE COUNTY PUBLIC SCHOOL SYSTEM

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Table 1
Foundations of Algebra Logic Model, 2009-10 to 2012-14

Need: North Carolina's Department of Public Instruction (DPI) identified the need for an additional course. Under the newly adopted Future Ready Core graduation requirements, all students were required to take Algebra, Geometry, Algebra II, and a fourth mathematics course to graduate. Thus, DPI eliminated Technical Mathematics I and II and added Foundations of Algebra and Geometry to support student success with the new requirements. Foundations of Algebra was designed to help students be more successful in Algebra I by exposing them to foundational topics needed for higher-level mathematics. Students who scored a Level I on their grade 8 mathematics EOG or who persistently scored low Level II throughout middle school were eligible for Foundations of Algebra. Eligible 9th grade students were enrolled in Foundations of Algebra in the fall and Introductory Mathematics in the spring (rather than Introductory Mathematics alone).

INPUTS	STRATEGIES	OUTCOMES – IMPACT		
		Short-Term 2009-10	Intermediate 2010-11	Long-Term 2012-14
Foundations of Algebra materials were developed and Introductory Mathematics materials were revised. Teachers were identified at the school level to teach Foundations of Algebra. Funds for training (2009-10 High School team budget). Funds for materials (i.e student copies of worksheets) provided by the school.	• Provide teachers with staff development around Foundations of Algebra. • The High School Math Team facilitates a monthly Foundations of Algebra Professional Learning Team (PLT). • 9th grade students enroll in Foundations of Algebra in the fall and Introductory Mathematics in the spring and use newly developed curriculum and materials. • Mid to high Level II students enroll directly into Introductory Mathematics in the spring and use newly developed curriculum and materials.	• Provide materials to teachers. • Teachers implement curriculum materials within classroom. • Level I and persistently low Level II students enroll in Foundations of Algebra in the fall and Introductory Mathematics in the spring. • Mid to high Level II students enroll in Introductory Mathematics in the spring. • Improvement on Blue Diamond* assessments pre to post.	• A higher percentage of Foundations of Algebra students enroll in Algebra I than similar (Level I and low Level II) 2008-09 students. • Higher percentages of Foundations of Algebra student and Introductory Mathematics only students' proficient on Algebra I End-of-Course (EOC) than similar students (Level I and low Level II) in 2008-09. • All Foundations of Algebra sub-groups meet mathematics growth targets (academic change) on Algebra I EOC. • A higher percentage of 2009-10 Foundations of Algebra/Introductory Mathematics and Introductory Mathematics only students meet mathematics growth targets (academic change) based on Algebra I EOC than 2008-09 Introductory Mathematics students. • Higher percentage of Foundations of Algebra / Introductory Mathematics and Introductory Mathematics only are proficient on Algebra I EOC than similar 2008-09 students (Level I and Level II) enrolled **directly** into Introductory Mathematics.	• Foundations of Algebra students are able to pass Algebra I and Geometry at a higher rate than previous cohorts. • All students graduate on time and prepared for the future.

Note: Although it was initially planned for Blue Diamond assessment results to be examined, these data were not available at the time of this evaluation.
Data Source: Program information provided by Curriculum and Instruction staff.

Background

The newly adopted Future Ready Core graduation requirements require all students to take Algebra I, Geometry, Algebra II, and a fourth mathematics course to graduate. DPI eliminated Technical Mathematics I and II and added Foundations of Algebra and Geometry to support student success with the new requirements. Foundations of Algebra was intended to strengthen students' mathematics skills prior to Algebra I. The Foundations of Algebra curriculum materials utilized for training and classroom instruction were developed in the spring of 2009 (with revisions through the fall of 2010) by WCPSS's Curriculum and Instruction staff with the input of teachers and published via Walch Publishing. In 2009-10, Foundations of Algebra was implemented in Wake County Public School System's (WCPSS) high schools.

High School Mathematics Course Sequence

While Algebra I is a graduation requirement for all students, not all students enter high school having mastered the foundational concepts necessary to be successful in Algebra I.[1] Prior to the implementation of Foundations of Algebra in 2009, all students who performed below grade level based on their grade 8 mathematics EOG were enrolled directly into Introductory Mathematics. With the addition of Foundations of Algebra, students who scored Level I or a low Level II were provided an extra opportunity to review and study foundational mathematics concepts prior to enrolling in Introductory Mathematics and then Algebra I. Students who scored in the middle or high ranges of Level II were to be enrolled in Introductory Mathematics only.

Foundations of Algebra was available in 16 high schools and two alternative schools in 2009-10. It provided students an opportunity to "solve relevant and authentic problems using manipulatives and appropriate technology" (High School Program Planning Guide 2009-10, p. 84). Mathematical concepts covered in Foundations of Algebra include:

> using equations, inequalities, and formulas to solve problems; computations involving integers and rational numbers; ratio, proportion, and percent; exponential and scientific notation; linear relationships; simplifying algebraic expressions; scaling and proportional reasoning; making scale drawings; surface area and volume of cylinders, prisms, and composite figures; transformations in the coordinate plane; collecting and analyzing data; surveys; and probability (High School Program Planning Guide 2009-10, p. 84).

Students enrolled in Foundations of Algebra in the fall were expected to be enrolled in Introductory Mathematics in the spring. Introductory Mathematics prepares students for Algebra I by teaching problem solving techniques and includes content such as: "simplifying numerical expressions; number theory; concept of functions and variables; graphing linear equations; linear

[1] "The only exceptions to the Algebra I requirement are for students who are enrolled in the Occupational Course of Study or have an Individual Education Program (IEP) that identifies them as Learning Disabled (LD) in math and states that the disability will prevent them from mastering Algebra I. Once a student is exempt, the exemption holds until the student exits public school" (High School Program Planning Guide 2009-10, p. 9).

regression; problem solving using linear equations and inequalities; and problem solving using measurement and geometry" (High School Program Planning Guide 2009-10, p. 84).

Table 2 displays the course sequence available to schools in 2009-10 based on the student's grade 8 mathematics EOG level.

Table 2
Mathematics Course Sequence by Grade 8 EOG Level

Grade 8 EOG Level	Fall	Spring	Next Courses
Level I	Foundations of Algebra	Introductory Mathematics	Algebra I or Algebra I:Part I and II
Low Level II	Foundations of Algebra	Introductory Mathematics	Algebra I or Algebra I:Part I and II
Mid to high Level II		Introductory Mathematics	Algebra I or Algebra I:Part I and II
Level III and IV	Algebra I or Algebra I: Part I and II (or higher depending on middle school course taking)		Geometry (or higher based on prior courses)

Data Source: High School Program Planning Guide 2009-10

National Research

National attention regarding the "poor math performance" of U.S. students compared to students in other industrialized nations has increased educators' focus on mathematics (Faulkner, 2009, p. 24). A study conducted by Sims (2008) found a key difference between U.S. and Chinese classrooms in the amount and quality of students' "math talk." *Math talk* was defined as "explanations, declarations of formal principles or procedures, and other mathematical statements" (Sims, 2008, p. 121). In China, while the structure of the classroom was often teacher led, students were more likely than their U.S. counterparts to engage in teacher-orchestrated student discussion, i.e. "math talk." Through higher levels of involvement students gain a shared belief that they and their classmates are responsible for engaging in higher level content focused discourse. Students' active participation in the classroom is a critical factor in their learning (Sims, 2008).

"At the heart of the recent focus on mathematics has been an increased emphasis on developing students' number sense" coupled with the realization that this concept has not been defined clearly for our teachers (Faulkner, 2009, p. 24). Number sense is often defined by a student's ability to solve a given problem(s); thus, a student has number sense if she or he can solve a particular problem. This type of circular definition perpetuates the misconception that mathematics ability is innate rather than developed. In order to support teachers' understanding of number sense and therefore their ability to transfer this understanding to their students, it is helpful to consider number sense in terms of its components. The number sense model developed by Cain, Doggett, Faulkner, and Hale (2007) includes language, algebraic and geometric thinking, quantity/magnitude, numeration, equity, base 10 form of a number, and proportional reasoning. These elements are interconnected but not sequential (Faulkner, 2009).

"The Components of Number Sense provides a framework for teachers to think of math as a set of connected principles and to present the math to students in this fashion" (Faulkner, 2009, p. 28).

Curriculum materials should assist teachers to increase student engagement and learning; however, even the best curriculum is only as good as its implementation. Ball and Cohen (1996) offer several reasons why curriculum implementation may be unsuccessful: teachers' perspectives are not taken into account; teachers make individual decisions in the face of weak curricular guidance; and text books and other curricular materials may be viewed as constraining or controlling teaching and knowledge. In order to have the curriculum implemented with fidelity, the curriculum must be developed in a manner whereby both its use and construction are activities that draw on teachers' understandings and students' thinking (Ball & Cohen, 1996).

Students in remedial courses often have fewer opportunities to engage in "math talk" and process concepts. Foundations of Algebra was designed around central concepts to improve student understanding and decrease their reliance on memorization. By connecting authentic algebraic concepts with remedial lessons teachers and students can see how arithmetic can be used to access and improve fluency with algebraic concepts. Course materials, designed to offer curricular guidance, were divided into seven learning units. Each learning unit detailed: the unit objective, essential vocabulary, key concepts, example dialogue, and daily lesson plans[2]. Within the daily lesson plans teachers were provided a summary, learner objective, materials list, warm-up activity, formative assessment, student worksheet, and direct instruction. Teachers were also given suggestions and cautions regarding students' comprehension of the content. Example dialogue was included to clarify the focus of the lesson and to help teachers avoid the use of short cuts that often result in misconceptions because students do not understand the mathematic concept from which they are derived.

Methods

This report focused on the implementation of Foundations of Algebra in 2009-10 and the course-taking patterns and grades of eligible students. Implementation was assessed via a survey of teachers who taught Foundations of Algebra in 2009-10. The survey had a response rate of 76%, with 22 out of 29 teachers responding. Students' grade 8 mathematics EOG level scores were examined to determine whether the appropriate students were enrolled in Foundations of Algebra in the fall and Introductory Mathematics in the spring.

In addition to examining program implementation, two initial impact indicators were considered: students' Introductory Mathematics grades and mathematics course-taking patterns. Introductory Mathematics grades were examined to determine whether students who participated in Foundations of Algebra prior to Introductory Mathematics had higher grades than the 2008-09 cohort of students who did not have access to Foundations of Algebra. Course-taking patterns were examined to determine whether a higher percentage of students took Algebra I or Algebra I

[2] Foundations of Algebra is divided into seven learning units: Different Forms of Numbers, Everything Based on Tens, Working with Integers, Simplifying Numerical Expressions, Simplifying Algebraic Expressions and Solving Equations, Linear Relationships, and Working with Data.

Part I following the Foundations of Algebra/Introductory Mathematics course series than 2008-09 students who were enrolled in Introductory Mathematics only.

The 2009-10 cohort of high school students who enrolled in Foundations of Algebra in the fall and Introductory Mathematics in the spring and students enrolled directly into Introductory Mathematics were the focus of this study. In 2009-10, with the addition of Foundations of Algebra, the 1,651 students who would have been enrolled in Introductory Mathematics were split into two groups—those enrolled in Foundations of Algebra prior to Introductory Mathematics and those enrolled directly into Introductory Mathematics. The Foundations of Algebra cohort consisted of the 877 high school students who participated in Foundations of Algebra in the fall of 2009 while the Introductory Mathematics only cohort consisted of the 774 high school students who were enrolled directly into Introductory Mathematics in the spring of 2010. The comparison cohort consisted of 1,600 students enrolled in Introductory Mathematics in 2008-09.

Training

Central services staff (high school mathematics senior administrators) conducted a 5-day summer training for Foundations of Algebra teachers in 2009 and 2010. In addition to the summer training, teachers could participate in a monthly districtwide Foundations of Algebra professional learning team (PLT).

Evaluation Questions

This study was focused on the implementation of Foundations of Algebra in 2009-10. Thus, the report is organized around the following six questions: questions 1-4 focus on implementation; and questions 5 and 6 address initial impact indicators.

1. What resources are needed to implement the program?
2. What are the characteristics of the students served? Were the appropriate students served?
3. What was the level of training and implementation?
4. What facets of the project are viewed as most effective? Least effective?
5. Did students enrolled in Foundations of Algebra experience higher grades in Introductory Mathematics than similar students?
6. Did students enrolled in Foundations of Algebra participate in Algebra I at a higher rate than similar students?

Question 1: What resources are needed to implement the program?

The costs associated with Foundations of Algebra included expenses such as course materials, staff training, and central service staff and teacher time required to produce materials and provide and attend training.

In 2009-10, it cost $29,153.82 to implement the newly created Foundations of Algebra course in the fall and the revised Introductory Mathematics curriculum in the spring. These funds were used to support the learning of 1,651 high school students at a cost of approximately $18 per

student. Table 3 displays the 2009-10 Foundations of Algebra and Introductory Mathematics expenditures by each of the major expense categories. The largest expense in 2009-10 was for Teacher Resource Binders, which reflects a one-time cost to the system. Thus, the cost of teaching Foundations of Algebra and/or Introductory Mathematics would decrease after year one.

In addition to the cost of the program materials there were also opportunity costs associated with training provided to teachers. The *opportunity* costs associated with developing, providing, and attending training included both the teacher time out of the classroom and central services staff time required to develop and provide training. By producing, providing, and participating in this training, WCPSS devoted staff time that would have otherwise been focused on an alternative approach (either teaching or supporting the traditional high school mathematics program or developing, training, and learning an alternative method); thus, the training represented an *opportunity* cost to the district. Students also experienced opportunity costs since students enrolled in an extra mathematics course (Foundations of Algebra) represented time that would have otherwise been devoted to another course.

Table 3
Foundations of Algebra and Introductory Mathematics
2009-10 Expenditures

	Expense Category	**Amount**
Instructional Materials	Materials - Base Ten Kits, Overhead Algebra Tiles	$1,093.54
	Materials - Marilyn Burns Fraction Kits	$1,077.66
	25 Foundations of Algebra Teacher Resource Binders	$11,351.31
	25 Introductory Math Teacher Resource Binders	$11,351.31
	Total Cost of Materials	**$24,873.82**
Training	Foundations of Algebra Workshop 2009 - Planning & Delivery	$735.00
	Introductory Workshop 2009 - Planning & Delivery	$945.00
	Materials & Printing - rough estimate	$500.00
	Total Cost of Training	**$2,180.00**
Other Expenses	Curriculum Revisions - May 2010	$2,100.00
	Total Cost of Other Expenses	**$2,100.00**
Total Expenditure		**$29,153.82**

Data Source: Program information provided by Curriculum and Instruction staff

Since 2009-10 was the first year of implementation it would be premature to conduct cost effectiveness analysis associated with program outcomes. A cost effectiveness analysis can be conducted once 2010-11 testing data are available.

Question 2: What are the characteristics of the students served? Were the appropriate students served?

Table 4 displays the demographic characteristics of the three cohorts of students:

1. those who participated in Foundations of Algebra in 2009-10,
2. students who were enrolled directly into Introductory Mathematics in the spring of 2009-10, and
3. a comparison group of students who were enrolled in Introductory Mathematics in 2008-09.

It should be noted that in 2008-09 Foundations of Algebra was not offered and many students who scored Level I or II on their grade 8 mathematics EOG were enrolled in Introductory Mathematics. Thus, students enrolled in Introductory Mathematics in 2008-09 comprised the comparison cohort.

44% of students enrolled in Foundations of Algebra were SWD.

Table 4
Demographic Characteristics by Study Cohort

	Foundations of Algebra 2009-10		Introductory Mathematics Only 2009-10		Introductory Math Comparison Students 2008-09	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Free or reduced-price lunch (FRL)	481	54.8%	366	47.3%	802	50.1%
Students with disabilities (SWD)	383	**43.7%**	208	26.9%	505	31.6%
Limited English proficient (LEP)	143	16.3%	117	15.1%	221	13.8%
Male	549	62.6%	467	60.3%	918	57.4%
Female	311	35.5%	294	38.0%	681	42.6%
American Indian	1	0.1%	5	0.6%	3	0.2%
Asian	34	3.9%	15	1.9%	29	1.8%
Black/African Am.	475	54.2%	367	47.4%	821	51.3%
Hispanic/Latino	151	17.2%	156	20.2%	276	17.3%
Multiracial	38	4.3%	32	4.1%	66	4.1%
White	161	18.4%	186	24.0%	404	25.3%
Missing	17	1.9%	13	1.7%	1	0.1%
Total	**877**	**100%**	**774**	**100%**	**1,600**	**100%**

Note: 1: Demographics for Foundations of Algebra and Introductory Mathematics only students based on 2009-10 Student Roster while Comparison cohort demographics were based on 2008-09 Student Roster.
2: Students will appear in more than one category: race and gender, FRL, SWD, and/or LEP.
3: Foundations of Algebra participants total *n*=877, Introductory only participants total *n*=774, and comparison students total *n*=1,600 within race and gender categories.
Data Source: 2008-09 and 2009-10 WCPSS High School End-of-Year Master Rosters.
Interpretation Example: Of the 877 Foundations of Algebra participants, 383 (43.7%) were SWD students.

Table 5 shows the number and percentage of students in the Foundations of Algebra and Introductory Mathematics cohorts by school. Eighteen high schools that offered Foundations of Algebra in 2009-10 were included in this study.[3] The number of students enrolled in Foundations of Algebra ranged from nine students at Green Hope High to 133 students at Broughton High. The Introductory Mathematics only student cohort was also restricted to the 18 high schools that offered Foundations of Algebra in 2009-10.

Table 5
Foundations of Algebra
and Introductory Mathematics 2009-10 Enrollment by School

	Foundations of Algebra		Introductory Mathematics Only	
	Number	**Percent**	**Number**	**Percent**
Apex High	55	6.3%	21	2.7%
Athens Drive High	62	7.1%	31	4.0%
Broughton High	133	15.2%	0	0.0%
East Wake Arts, Ed, Global Studies	23	2.6%	24	3.1%
East Wake Integrated Technology	22	2.5%	7	0.9%
Enloe High	26	3.0%	2	0.3%
Garner Magnet High	79	9.0%	128	16.5%
Green Hope High	9	1.0%	22	2.8%
Holly Springs High	22	2.5%	75	9.7%
Knightdale High	61	7.0%	181	23.4%
Longview	10	1.1%	7	0.9%
Middle Creek High	45	5.1%	6	0.8%
Millbrook High	28	3.2%	58	7.5%
Panther Creek High	59	6.7%	29	3.8%
Phillips High	12	1.4%	3	0.4%
Sanderson High	90	10.3%	106	13.7%
Wake Forest-Rolesville High	50	5.7%	34	4.4%
Wakefield High	91	10.4%	40	5.2%
Total	**877**	**100%**	**774**	**100%**

Note: Six schools—Cary High, East Wake School of Health/Science, East Wake School of Engineering, Fuquay-Varina High, Leesville Road High, and Wake Early College—did not offer Foundations of Algebra in the fall of 2009; thus, they are not included in this report.
Data Source: SIGR1110 file obtained from the FTP interface on 9/9/2010.

[3] Southeast Raleigh High School offered Foundations of Algebra in 2009-10; however, the Foundations of Algebra teacher left at the beginning of the year thus students attending Southeast were not included in this study.

Table 6 displays each student cohort—Foundations of Algebra, Introductory Mathematics only, and comparison students—by their grade 8 mathematics EOG level. The primary criterion for student enrollment into Foundations of Algebra was a Level I or low Level II score on the grade 8 mathematics EOG while students with a high Level II score were to be enrolled directly into Introductory Mathematics.[4] This enrollment criterion is reflected in the data with a higher percentage of Level I students enrolled in Foundations of Algebra (39%) compared to Introductory Mathematics only students (19%), and comparison students (27%). While the vast majority (82%) of Foundations of Algebra students were Level I and II, less than two-thirds of students (63%) scored Level I or low Level II (the program's criteria). Thus, more middle and high Level II students were included than intended. Among Introductory only cohort–42% scored a Level II on their grade 8 mathematics EOG while only 27% scored a high Level II.

63% of students enrolled in Foundations of Algebra met the program's criteria (Level I or low Level II).

27% of students enrolled in Introductory Mathematics met the program's criteria (high Level II).

Table 6
8th Grade EOG Level by Study Cohort

	Foundations of Algebra		Introductory Mathematics Only		Comparison Students	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Level I	257	39.1%	111	19.1%	318	26.8%
Level II	280	42.6%	242	41.6%	461	38.9%
Level III	118	17.9%	225	38.7%	370	31.2%
Level IV	3	0.5%	4	0.7%	36	3.0%
Missing	219		192		415	
Total	**877**	**100%**	**774**	**100%**	**1600**	**100%**

Note: Missing data are not included in the percentage calculations.
Data Source: 2008-09 WCPSS High School End-of-Year Master Roster and 2009-10 WCPSS High School End-of-Year Master Roster.

Question 3: What was the level of training and implementation?

Twenty-nine high school mathematics teachers who taught Foundations of Algebra in 2009-10 were surveyed. Of the 29 teachers who received the survey, 22 (76%) responded; thus, the survey responses are based on the responses of these 22 teachers. Teachers report on the training

[4] Level II has a range of six scale score points. Low Level II refers to the three lowest scale score points and high Level II refers to the three highest scale score points within Level II.

they received as well as their perceptions of student engagement and the utility of the Foundations of Algebra materials and structure.

Training

Of the 22 Foundations of Algebra teachers who responded to the survey, 17 reported receiving training (77%). This means that 1 in 5 of the teachers surveyed did not receive training. The type of Foundations of Algebra training received included: Districtwide Foundations of Algebra PLT, 5 day summer training in 2009, 5 day summer training in 2010, and in school training by the Foundations leaders (see Table 7). Twelve of the 22 teachers who responded to the survey attended the five-day summer training in 2009 prior to the implementation of Foundations of Algebra.

Table 7
Number of Teachers Participating in each Training
by Type of Training

Type of Training	Surveyed Teachers n=22	
	Number	Percent
Districtwide Foundations of Algebra PLT	13	59.1%
5 day summer training 2009	12	54.5%
5 day summer training 2010	3	13.6%
In school training by the Foundations leaders	1	4.5%
No training	5	22.7%

Note: Number of participants reflects the number within each training. Participants may have attended more than one training; thus, the total number of teachers in this table will exceed the total number of respondents.
Data Source: Foundations of Algebra Teacher Survey October 2010.

The districtwide Foundations of Algebra PLT was reported as the most commonly attended training. The number of times teachers reported attending the districtwide monthly Foundations of Algebra PLT meetings ranged from one to eight times; the most common response was two to four times. Teachers who received training were more likely to report using the Foundations of Algebra materials as their curriculum resource than teachers who did not receive training.

The vast majority (82% or 14 of 17) of those trained reported that the training was sufficient to allow them to implement Foundations of Algebra in their classroom. However, when combined with those who had no training, this means that eight teachers (36%) felt the training was not sufficient or indicated they had no training.

Implementation

Teachers were asked to report the level to which they utilized Foundations of Algebra course materials.

- half of the teachers reported using the provided Foundations of Algebra materials as a curriculum resource 100% of the time;
- five (23%) reporting using the materials 75% of the time;
- two (9%) used the materials 50% of the time;
- two (9%) used the materials 25% of the time; and
- two (9%) reported not using the materials at all.

While half of the teachers reported using the Foundations of Algebra materials 100% of the time, this means half of the teachers surveyed supplemented or did not utilize Foundations of Algebra course materials. Table 8 displays teachers' reported adjustments to the course materials.

Table 8
Teacher Reported Adjustments to Course Materials

Question: What specifically did you change or supplement from the provided Foundations of Algebra materials?

Supplemented	Not Utilized
✓ "Additional supplemental worksheets and hands-on activities."	✓ "We did not play trashketball as often as it suggests." *
✓ "I included more drill once we had gotten to the solving of equations"	✓ "I only used about 50% of the manipulatives provided for 10-based arithmetic and operations with integers."
✓ "Used a basic math book as a resource and used 'hands on equations'."	
✓ "We also did many activities with integers."	
✓ "I used many games and puzzles that I had previously used teaching Intro to Math."	
Reason for Adjustments	
✓ "It [trashketball activity] was way too much."	
✓ "During the time I was [teaching] Foundations, it was a working product that was not completed while I was teaching. I had to take the goals and objectives and create parts on my own. There were bits and pieces emailed to me but was hard to follow due to time restraints."	
✓ "Not much, except when the information was not ready on time, which happened [with] about 4 units. Otherwise I thought what we received was pretty good overall."	
✓ "I did not use the information at all because my PLT opted to move away from it since our group leader could not adjust to being given the information piece-meal."	

Note: Trashketball refers to an activity where students shoot rolled up paper balls into trash cans or boxes and evaluate their data from different distances in order to develop the idea of rate.
Data Source: Foundations of Algebra Teacher Survey October 2010.

Question 4: What facets of the project are viewed as most effective? Least effective?

Table 9 shows teachers' perceptions of the percentage of students in their classroom who successfully mastered the course content for each of the Foundations of Algebra learning units. Within each of the seven learning units and overall, the most common response was that *Three-fourths* of students had mastered the content (see Table 9). The highest percentage of teachers reported *Three-fourth or Nearly All* of their students had mastered the content of Unit 1: Different Forms of Numbers and Unit 4: Simplifying Numerical Expressions (73% and 71% respectively) while less than half of the teachers reported *Three-fourth or Nearly All* of their students had mastered the content of Unit 6: Linear Relationships and Unit 7: Working with Data (48% and 45% respectively). It should be noted, that 40% of teachers responded *not applicable* (*N/A*) to Unit 7. This may indicate that this information was not covered during the semester. Without the teachers who responded N/A on Unit 7, the percentage of teachers who reported *Three-fourths* or *Nearly All* of their students mastered Unit 7 increased from 45% to 75% (not shown in Table 9).

Table 9
Teachers' Perceived Student Mastery of Course Content
By Learning Unit

Question: Approximately what percentage of students in your class successfully mastered the course content of each of the following units of Foundations of Algebra? (Mastery=80% or more of content)

Learning Unit	Percentage of Students						
	Nearly All	Three-fourths	Half	One-fourth	None	N/A	Number of Responses
Unit 1: Different Forms of Numbers	13.6%	59.1%	13.6%	4.5%	0.0%	9.1%	22
Unit 2: Everything Based on Tens	9.1%	59.1%	13.6%	9.1%	0.0%	9.1%	22
Unit 3: Working with Integers	18.2%	45.5%	18.2%	4.5%	0.0%	13.6%	22
Unit 4: Simplifying Numerical Expressions	14.3%	57.1%	9.5%	4.8%	0.0%	14.3%	21
Unit 5: Simplifying Algebraic Expressions and Solving Equations	19.0%	47.6%	19.0%	0.0%	0.0%	14.3%	21
Unit 6: Linear Relationships	9.5%	38.1%	33.3%	0.0%	0.0%	19.0%	21
Unit 7: Working with Data	5.0%	40.0%	10.0%	5.0%	0.0%	40.0%	20
All course content	**0.0%**	**60.0%**	**25.0%**	**0.0%**	**0.0%**	**15.0%**	**20**

Note: Nearly all = more than 90%, Three-fourths = approximately 75%, Half = approximately 50%, and One-fourth = <25%.
Data Source: Foundations of Algebra Teacher Survey October 2010.
Interpretation Example: 59.1% of teachers reported that *Three-fourths* of students had mastered the content of Unit 1.

Teachers also reported on students' readiness for Algebra I. Almost all of the teachers (21 out of 22) responding to the survey, reported that they believed Foundations of Algebra improved students' readiness for Algebra I.

Most teachers reported that Foundations of Algebra was a necessity for Level I and SWD students.

Teachers rated both the benefits of and the necessity for Foundations of Algebra for LEP, SWD, Level I, Level II, and other students within their classroom (see Table 10). Teachers were asked to rate the extent to which student subgroups benefited from the addition of Foundations of Algebra. More than two-thirds of teachers reported that each student group benefited from Foundations of Algebra *A Great Deal* or *Somewhat*—ranging from 91% for SWD students to 64% for LEP students. While more than two-thirds of teachers reported that Foundations of Algebra was a benefit for each student group, most teachers reported that it was a necessity for Level I and SWD students (81.0% and 72.7% respectively).

Table 10
Teacher Perceptions of Foundations of Algebra on Student Groups

Student Group	A great deal	Somewhat	Not at all	I don't know	NA	Number of Responses
*Question: To what extent did the following groups of students in your class **benefit** from the addition of Foundations of Algebra?*						
Limited English Proficient (LEP)	9.1%	54.5%	4.5%	9.1%	22.7%	22
Students with disabilities (SWD)	45.5%	45.5%	0.0%	4.5%	4.5%	22
Level I on Grade 8 EOG	40.9%	45.5%	4.5%	4.5%	4.5%	22
Level II on Grade 8 EOG	27.3%	59.1%	0.0%	4.5%	9.1%	22
Other Students	22.7%	63.6%	0.0%	4.5%	9.1%	22
*Question: In your experience, to what extent was the addition of Foundations of Algebra **necessary** for the following groups of students?*						
Limited English Proficient (LEP)	40.9%	27.3%	4.5%	4.5%	22.7%	22
Students with disabilities (SWD)	72.7%	13.6%	9.1%	0.0%	4.5%	22
Level I on Grade 8 EOG	81.0%	9.5%	4.8%	0.0%	4.8%	21
Level II on Grade 8 EOG	31.8%	40.9%	18.2 %	0.0%	9.1%	22
Other Students	27.3%	54.5%	4.5%	4.5%	9.1%	22

Note: Level I or II = students who had an EOG Level I or II the previous year and were therefore considered below grade level.
Data Source: Foundations of Algebra Teacher Survey October 2010.

Table 11 presents teacher perceptions of the effectiveness of each of the seven Foundations of Algebra learning units and overall. The majority of teachers rated each unit and the overall content as effective or highly effective—ranging from 73% for Unit 1 to 50% for Unit 7. Units 5 and 6 had the highest percentage of highly effective responses at 23.8%.

Table 11
Teacher Perceptions of Foundations of Algebra by Learning Unit

Question: *How effective have the following Foundations of Algebra units been in aiding your ability to teach the course content?*

Learning Unit	Very Effective	Effective	Ineffective	Very Ineffective	NA	Number of Responses
Unit 1: Different Forms of Numbers	4.5%	68.2%	9.1%	4.5%	13.6%	22
Unit 2: Everything Based on Tens	13.6%	50.0%	9.1%	9.1%	18.2%	22
Unit 3: Working with Integers	13.6%	54.5%	13.6%	0.0%	18.2%	22
Unit 4: Simplifying Numerical Expressions	14.3%	42.9%	14.3%	0.0%	28.6%	21
Unit 5: Simplifying Algebraic Expressions and Solving Equations	23.8%	38.1%	9.5%	4.8%	23.8%	21
Unit 6: Linear Relationships	23.8%	38.1%	9.5%	4.8%	23.8%	21
Unit 7: Working with Data	10.0%	40.0%	0.0%	5.0%	45.0%	20
All course content	5.6%	55.6%	5.6%	5.6%	27.8%	18

Data Source: Foundations of Algebra Teacher Survey October 2010.

Teachers rated the effectiveness of the elements associated with Foundation of Algebra—use of manipulatives, structure of class, example dialogue, practice and homework materials, assessments, use of games, warm-ups, number theory, and main lessons. The majority of teachers rated each of the elements of Foundations of Algebra as *Somewhat Effective, Mostly Effective, or Highly Effective* (ranging from 77% to 91%). Only two teachers (9.1%) reported the structure of the class (i.e. frequent transitions), the use of games, and the assessments were *not effective*. The use of manipulatives had the highest reported effectiveness with 70% of teachers rating their use as *Mostly Effective* or *Highly Effective* within their classrooms. Only 36% of teachers reported the structure of the class i.e. frequent transitions to be *Mostly Effective* or *Highly Effective*.

70% of teachers rated the use of manipulatives as *Mostly Effective* or *Highly Effective* within their classrooms.

Table 12
Teacher Perceptions of the Elements of Foundations of Algebra

Question: How effective have you found the following elements of Foundations of Algebra to be within your classroom?

Foundations of Algebra Elements	Highly Effective	Mostly Effective	Somewhat Effective	Not Effective	NA	Number of Responses
Use of manipulatives	**25.0%**	**45.0%**	20.0%	0.0%	10.0%	20
Structure of class-frequent transitions	4.5%	31.8%	40.9%	9.1%	13.6%	22
Example dialogue	13.6%	27.3%	45.5%	0.0%	13.6%	22
Practice and homework materials	22.7%	40.9%	22.7%	0.0%	13.6%	22
Assessments	9.1%	45.5%	27.3%	9.1%	9.1%	22
Use of games	18.2%	40.9%	22.7%	9.1%	9.1%	22
Warm ups	14.3%	47.6%	28.6%	0.0%	9.5%	21
Number Theory	5.0%	50.0%	35.0%	0.0%	10.0%	20
Main Lessons	9.1%	59.1%	18.2%	0.0%	13.6%	22

Note: 1. Structure of class-frequent transitions includes movement between classroom activities such as warm-up, number theory, and main lesson.
2. Main lessons are a structural element which follows warm-up and comprises the body of the lesson.
3. **Bold** font indicates the Foundations of Algebra element for which the highest percentage of teachers responded *highly* or *mostly effective*.

Data Source: Foundations of Algebra Teacher Survey October 2010.

Table 13 displays the perceived benefits and challenges to the implementation of Foundations of Algebra. The benefits of Foundations of Algebra as reported by teachers included:

- Ten of the teachers commented on the benefits of the "hands on" activities and/or use of manipulatives. However, two teachers reported concerns regarding the ability to utilize "hands on" activities; one stated that the large class size was an impediment and the other cited the amount of prep work.

- Teachers reported only positive comments regarding the benefits of contextualizing the course content. The benefits included: "Allowing students to see how math works conceptually and concretely," and "I really like the fact that we are teaching students HOW the math works. They like that!"

- The elements of Foundations of Algebra to which teachers responded positively included: fraction work; the emphasis on language, Units 2, 5 and 6; the numbering of daily lessons; the assessments; and practice and homework.

- On the open-ended responses, teachers did not mention any benefits regarding student engagement. However, when asked the degree to which students were engaged in the course, 16 out of 22 teachers (73%) reported students were engaged most or all of the time.

73% of teachers reported students were engaged most or all of the time.

Table 13
Perceived Benefits and Challenges of Foundations of Algebra Based on Open-ended Responses

	Benefits	Challenges
Tactile "hands on" Activities	✓ "The hands-on activities as well as the sample dialogue." ✓ "Different games" ✓ "Hands on applications" ✓ "I like the curriculum and most of the hands on activities. The worksheets are sufficient." ✓ "Manipulatives and activities" ✓ "I liked the materials for base-10 numbers and Hands-on Equations." ✓ "Hands On Equations & Linear Relationships"	✓ "Class sizes are way too large with at-risk students to successfully engage in the hands on activities as well as the games and labs." ✓ "The amount of prep work. The constant transitions from one activity to the next. The frequent absences of students. The energy level required to teach the course!"
Contextualizing Content	✓ "Using numbers in real number text" ✓ "I really like the fact that we are teaching students HOW the math works. They like that! We are also helping them see math as something that is fun." ✓ "Allowing students to see how math works conceptually, and concretely."	✓ "Some of the hands on examples - football with multiplication."
Elements of Foundations of Algebra	✓ "The fraction work was useful." ✓ "Emphasis on language (ex. zero viewed as neutral)." ✓ "Unit 5 and 6. Solving equations and linear relationships mainly re-enforcement of basic skills so that students experience some success in mathematics." ✓ "The base ten unit." ✓ "The daily lessons numbered." ✓ "The assessments included with strong content connection to the practice and homework. Good daily homework quantity and quality. Good tests."	✓ "If there was a textbook/completed curriculum I feel it could have been better." ✓ "Some of the activities are too busy for certain classes." ✓ "Many students come with very little knowledge of our number system at all. They often have no concept of quantity." ✓ "The material is long and drawn out requiring a lot of my time reviewing then adapting it to my lessons to meet the needs of the students." ✓ "Pace too slow, and spending too much time on a particular concept. I do not find it vigorous." ✓ "Organization, grading."
Student Engagement	*No positive reference to student engagement*	✓ "That it tends to be a behavior class." ✓ "Classes are mixed with variety of math abilities and those with higher abilities are less engaged." ✓ "Students still are not motivated. Many of the students in these classes just have no internal motivation when it comes to math. I think that is difficult to change." ✓ "Attention span." ✓ "Better placement of specific students in the class to minimize poor student behavior. I felt very defeated when my attempts and perseverance with the activities were met with classroom disruptions, apathy and aggression."

Data Source: Foundations of Algebra Teacher Survey October 2010.

In terms of challenges, four teachers reported that class size was a factor in the implementation of Foundations of Algebra (see Table 13).[5] Three of the four teachers reported their class size was too large and thus was a challenge to the implementation while one teacher reported that his/her small class size along with the presence of an assistant enabled the implementation of Foundations of Algebra. Six teachers also reported the lack of materials as a challenge to the implementation of Foundations of Algebra. Open-ended responses included statements such as:

- "VERY CHALLENGING to implement when materials and plans were not in place. This was one of hardest courses I've ever taught."
- "Last year, we did not get the material in a timely manner. However this year we have everything that we need in order to prepare for our students."
- "Unfortunately during the time I was teaching this course I was given pieces of the curriculum at different times. The curriculum was incomplete and still being developed."

Based on the sample of teachers surveyed, the primary areas for improvement included training, lack of available materials, selection of the targeted students and limiting class size, and increasing the pace of the course. Table 14 displays teachers' reported recommendations for improving the implementation of Foundations of Algebra.

Table 14
Teacher Recommendations for Improved Implementation of Foundations of Algebra

	Recommendation
Training	"Keep up the training!" "More training" "Everyone should be trained before teaching the class so as to be familiar with the resources and materials."
Materials	"Have materials and workbooks etc. ready before the course is implemented!!!" "It would be great to have a notes section for each lesson for students who require a copy of the teacher's notes." "[More] multiple choice assessments." Remove typos and mistakes from the materials. Those were inconvenient. I did not have books last year. I do not teach it this year. Books would have helped last year. "As long as the material is ready on time, I think it is good overall."
Structure	"Limit class size." "Less students & a co-teacher." "I think we need time to incorporate more of the materials that are already available. There is a lot more material currently available than I was able to use in a year-long course of 43-minute lessons." "By putting true level ones in the class instead of kids with behavior problems. Having the targeted students in the class."
Pacing	"Too much down time." "Reduce the number of pages and dialogue." "Make it more vigorous, less repetitive, less dialogue for the teacher (more outline)."

Data Source: Foundations of Algebra Teacher Survey October 2010.

[5] Although the data regarding class size were not collected for this study, the teacher reported a class size of 22 in the one classroom visited by the evaluator.

Another way of examining the data was to consider the responses of teachers who reported attending training compared to those who did not. Teachers who received training were more likely to:

- Indicate higher student engagement.
- Indicate a higher percentage of students in their class had successfully mastered the course content of each of the seven learning units of Foundations of Algebra.
- Rate the Foundations of Algebra units as effective in terms of aiding their ability to teach the course content.
- Rate the following elements of Foundations of Algebra as effective within their classroom: use of manipulatives, practice and homework materials, assessments, use of games, warm-ups, number theory, and main lessons.

Question 5: Did students enrolled in Foundations of Algebra experience higher grades in Introductory Mathematics than similar students?

This report includes student grades in Introductory Mathematics and mathematics course-taking patterns as initial impact indicators. Student grades remained consistent across the three cohorts of students (see Table 15).

Table 15
Introductory Mathematics Grades
by Student Group

Introductory Mathematics Grade	Foundations of Algebra 2009-10		Introductory Mathematics Only 2009-10		Comparison Students 2008-09	
	Number	Percent	Number	Percent	Number	Percent
A	50	7.7%	44	6.5%	119	8.3%
B	132	20.4%	129	18.9%	289	20.1%
C	155	24.0%	175	25.7%	335	23.3%
D	131	20.2%	143	21.0%	330	23.0%
F	179	27.7%	190	27.9%	363	25.3%
Missing	230		93		164	
Total	**877**	**100%**	**774**	**100%**	**1,600**	**100%**

Note: The percentages represent the percentage of students with grade data available; however, the total number of students includes students with missing data.
Data Source: 2008-09 WCPSS High School End-of-Year Master Roster and 2009-10 WCPSS High School End-of-Year Master Roster.

Question 6: Did students enrolled in Foundations of Algebra participate in Algebra I at a higher rate than similar students?

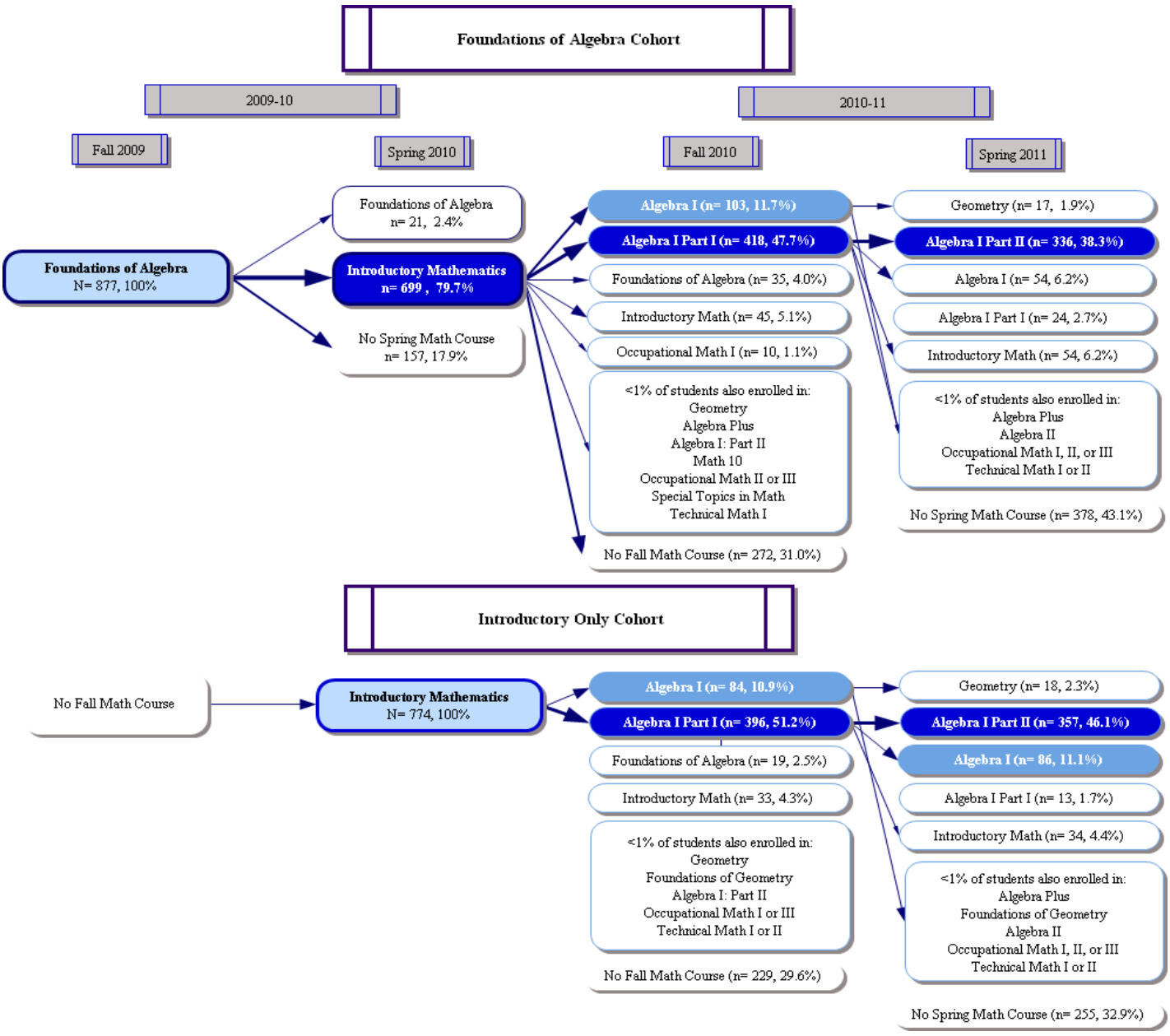
Students who participated in Foundations of Algebra did experience higher enrollment in Algebra I and Algebra I Part I for the 2010-11 school year. Fifty-nine percent of Foundations of Algebra students and 62% of Introductory Mathematics only students enrolled in Algebra I or Algebra I Part I after completing Introductory Mathematics compared to 39% of comparison students. An additional 7% of comparison students enrolled in higher level mathematics. Figure 1 illustrates the mathematics course trajectory for Foundations of Algebra and Introductory Mathematics only student cohorts and Figure 2 displays the trajectory of the comparison student cohort enrolled in Introductory Mathematics in 2008-09. The weighted arrows indicate the number of students transitioning between courses.

59% of Foundations of Algebra students and 62% of Introductory Mathematics only students enrolled in Algebra I or Algebra I Part I after completing Introductory Mathematics compared to 39% of comparison students.

The vast majority (80%) of the students enrolled in Foundations of Algebra in the fall of 2009 enrolled in Introductory Mathematics in the spring of 2010. Approximately half of both the Foundations of Algebra and Introductory Mathematics only student cohorts enrolled in Algebra I Part I in the fall of 2010 (48% and 51% respectively). Another 12% of Foundations of Algebra students and 11% of Introductory Mathematics only students enrolled in Algebra I. Among comparison students, a smaller percentage of students enrolled in Algebra I Part I (32%) and Algebra I (7%) following Introductory Mathematics. However, within the comparison student cohort another 7% of students enrolled in Geometry, Algebra II, or Algebra I Part II. Thus, 46% enrolled in a higher level mathematics course.

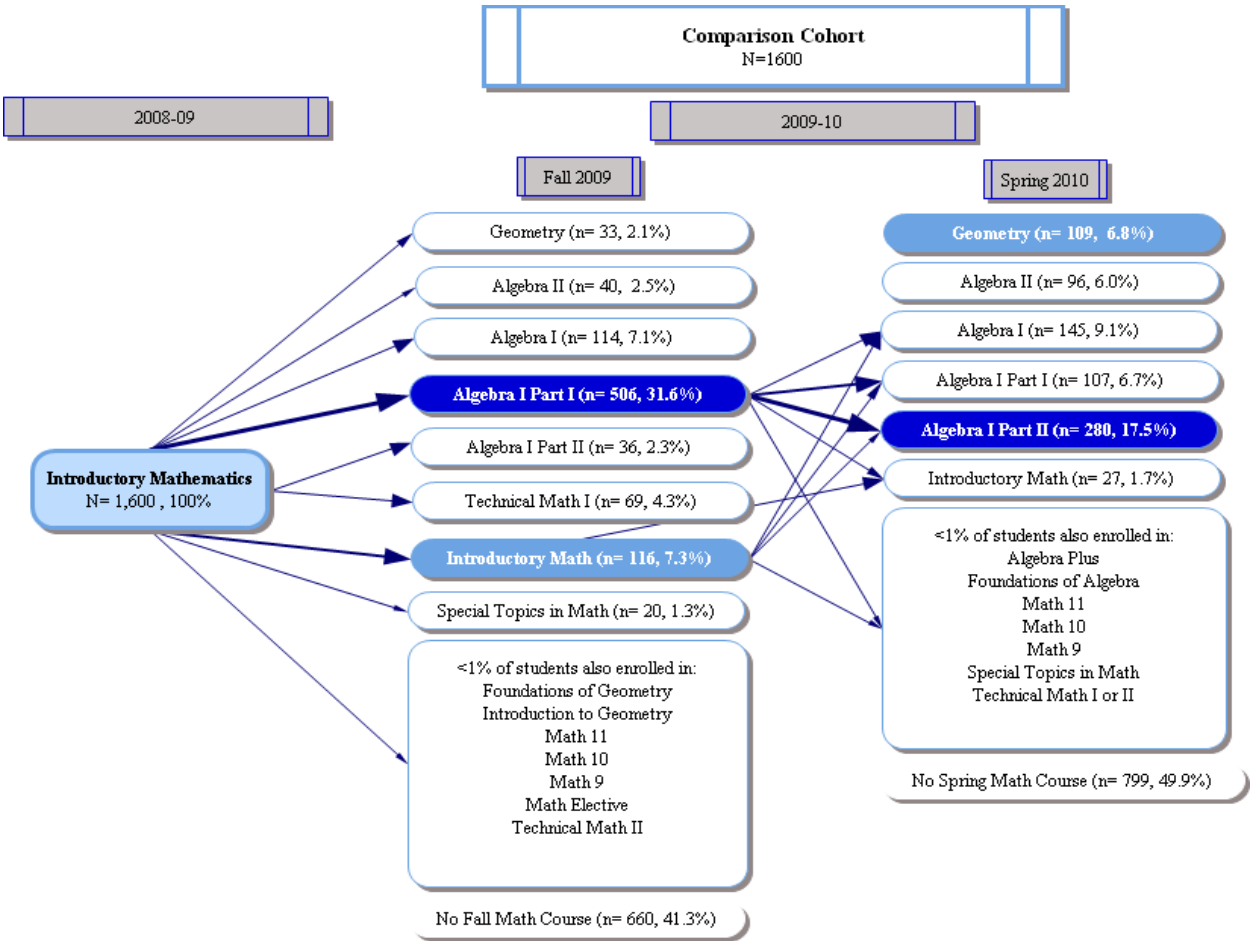
80% of students enrolled in Foundations of Algebra in the fall of 2009 enrolled in Introductory Mathematics in the spring of 2010.

Figure 1
Mathematics Courses by Year
Foundations of Algebra and Introductory Mathematics Only 2009-10 Cohorts



Note: Arrows and lines are weighted to indicate the number of students transitioning between courses. Bolder lines and larger arrows signify larger numbers of students.
Data Source: SIGR1110 file obtained from the FTP interface on 9/9/2010.

Figure 2
Mathematics Courses by Year 2008-09, Comparison Cohort



Note: Arrows and lines are weighted to indicate the number of students transitioning between courses. Bolder lines and larger arrows signify larger numbers of students.
Data Source: SIGR1110 file obtained from the FTP interface on 9/15/2010

CONCLUSIONS

During 2009-10, the first year of implementation, Foundations of Algebra met or partially met four of five of its short-term and intermediate goals (see Table 16).

- Teachers received the new instructional materials; however, teachers reported challenges associated with receiving instructional materials after the course had begun.
- Three-fourths of teachers reported using the materials most (75% or more) of the time.
- The vast majority (82%) of students enrolled in Foundations of Algebra had scored a Level I or II on their grade 8 mathematics EOG; with about two-thirds of these students meeting the program's suggested criteria—Level I or ***low*** Level II.
- However, only slightly more than one-fourth of students enrolled directly into Introductory Mathematics met the suggested criteria for enrollment—***high*** Level II.
- The vast majority of students (80%) enrolled in Foundations of Algebra in the fall were also enrolled in Introductory Mathematics in the spring.

Table 16
Status of Foundations of Algebra Goals

Level	Goal	Status	Implementation Notes
Short-term	Foundations of Algebra materials provided to teachers	Met	Timeliness of materials was an issue
	Teachers implement curriculum materials within classroom.	Partially Met	✓ 50% of teachers used materials all of the time ✓ 23% used materials 75% of the time ✓ the remainder used material 50% or less of the time
	Level I and low Level II students enrolled in Foundations of Algebra in the fall.	Partially Met	63% of students met this criteria
	Mid to high Level II students enrolled in Introductory Mathematics in the spring.	Not Met	26% of student met this criteria
	Improvement on Blue Diamond assessments pre to post.	N/A	Data Not Available
Intermediate	Foundations of Algebra students enrolled in Algebra I.	Met	✓ 59% of Foundation of Algebra students ✓ 62% of Introductory Math students ✓ 39% of students the prior year (08-09)

Interpretation Example: Students enrolled in Foundations of Algebra in the fall of 2009 did enroll in Algebra I at a higher rate than similar students the prior year (59% versus 39%, respectively).

While 2009-10 represented the first year of implementation, the two initial impact indicators considered showed mixed results. Although student grades in Introductory Mathematics were similar to the 2008-09 comparison group, students enrolled in Foundations of Algebra and/or Introductory Mathematics in 2009-10 enrolled in Algebra I at a higher rate than similar students in 2008-09.

DISCUSSION AND RECOMMENDATIONS

Implementation is critical to the success of any initiative. The inputs and key strategies must be put into place if we expect to see a program or initiative's short-term, intermediate, and long-term outcomes realized. The inputs for the implementation of Foundations of Algebra identified within the logic model (Table 1) included the development of instructional materials and the training of staff (including participation in the Foundations of Algebra PLT). While these inputs were available during 2009-10, the fact that teachers received instructional materials after the course had begun created challenges to implementing the program with fidelity.

Another crucial input required for implementation is training. Although the vast majority of teachers (82%) who received training rated their training sufficient, one in five teachers who responded to the survey had not received training. Eighteen percent of teachers who received training did not see the training as sufficient; thus, one-third of the 22 teachers surveyed reported that they were not adequately trained. If inputs identified as necessary for implementation are not consistently present, or are not provided in a timely fashion, then successful implementation can be a challenge. In turn, measuring the impact of the innovation is more tenuous. It should not be surprising that teachers who received training were more likely to report using the Foundations of Algebra materials as their curriculum resource. Given teachers who reported having received training not only implemented at a higher rate, but also reported greater student engagement and content mastery, teacher training should be more consistently provided.

While 2009-10 was the first year of implementation of Foundations of Algebra, early indications of course enrollment found that within schools offering Foundations of Algebra, students enrolled in Algebra I at a higher rate. Students' Introductory Mathematics grades, however, did not show an initial improvement. In order to strengthen the outcomes for this initiative it is imperative that the implementation be strengthened. Since the student selection criteria was met for approximately two-thirds of Foundations of Algebra students and just over one-fourth of Introductory Mathematics students, student selection practices should be examined to ensure the appropriate placement of students into these mathematics courses. Reasons for the disparities in placement should be requested of schools. Furthermore, based on teacher feedback, other areas for improvement included the availability of materials, smaller more manageable class size, and increased course pace. At this point, we have the following recommendations for improvement.

- ***Provide more consistent training.*** Given one-third of teachers surveyed perceived their training as inadequate, training requirements should be reviewed to ensure training is provided more consistently. Although teacher participation in the Foundations of Algebra PLT was the highest among trainings offered (59%), participation was voluntary. Considering the importance of training when implementing an effort, training availability and requirements for all teachers (including new teachers at existing Foundations of Algebra teachers) should be reviewed. Additional training opportunities and support throughout the year (i.e., electronic resources and video presentations of actual training) could improve implementation. Finding ways to train late hires may be a need.

- ***Examine student selection process.*** While the vast majority of students enrolled in Foundations of Algebra, who had a valid test score, scored a Level I or II (82%) on their grade 8 mathematics EOG, it should be noted that less than two-thirds of these students (63%) scored Level I or low Level II—the program's selection criteria. Among Introductory Mathematics only students 26% of students met the recommended placement criteria—***high*** Level II. Furthermore, 18% of Foundations of Algebra students and 39% of Introductory Mathematics only students scored a Level III on their grade 8 mathematics. There were even a small number of students in both cohorts who scored a Level IV on their grade 8 mathematics EOG. Thus, the selection process may need to be refined to ensure only students who demonstrate academic need participate in these foundational mathematics courses. Since course placement recommendations are often made in advance of the availability of the grade 8 EOG results, school schedulers must review placement decisions once EOG scores are released to determine if students have been appropriately placed. If not, other criteria should be used to make placement decisions.

- ***Limit the class size.*** Limiting class size may be difficult; however, restricting the class to only students meeting the program's selection criteria could serve to ensure the placement of the most appropriate students and to limit the size of the class to students who demonstrate the greatest need. One teacher reporting having a positive experience related to a small class size—"I honestly had the prime setting. My class was first period. It was a small class and I had another teacher to assist." However, other teachers mentioned the challenge they faced with having too many students.

- ***Consider the availability of materials.*** Although the availability of materials was a factor during the initial start up year, it may not present a problem in the future. The challenges reported by teachers should be noted by program staff. With any initiative, to increase the likelihood of implementation with fidelity, implementation should not occur until the materials are available and training can be initiated.

- ***Examine the pace of Foundations of Algebra.*** While only a small portion of teachers responded that the pace of the course was too slow, increasing the pacing flexibility could accommodate classes in which students are able to move more quickly through the concepts. Allowing teachers pacing flexibility within the materials may benefit the overall program. Since one-third of the students enrolled in Foundations of Algebra had a higher grade 8 mathematics EOG Level than suggested by the program's criteria, this may have resulted in students' ability to out pace the curriculum. Thus, adjustments to the flexibility of the course's pacing should be considered with this in mind.

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