Algebra Nation Program Evaluation

Fall 2016 Status Report

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MISSISSIPPI STATE UNIVERSITY™
RESEARCH & CURRICULUM UNIT

Midyear Summary of Findings

- The AN program aligns in both content and rigor to the MS CCRS for algebra.
- Overall, algebra teachers in pilot districts are very satisfied with the content, application, an student outcomes associated with AN.
- Use of AN results in statistically significant improvements (over previous years) in the following areas:
    - Out-of-school student support for algebra
    - Poor-quality textbooks
    - Insufficient textbook numbers
- Teachers who use AN rely much less heavily on textbook usage overall and instead supplement teaching with interactive, more differentiated instruction through the AN program.
- Training sessions held in the fall were extremely effective, with almost three fourths of pilot teachers reporting that they feel well-versed in AN program usage.
- Teachers rely heavily on AN to help them differentiate instruction, and the individualized benefits are continuous even through out-of-school practice.
- As compared to previous or alternative district resources for teaching algebra, pilot teachers compared AN favorably on the following:
    - Covering MS CCRS standards
    - Real-world examples and conceptual development
    - Meeting needs of diverse learners
    - Differentiating instruction
    - Student engagement
    - Quality practice opportunities
- More than 80% of teachers surveyed hope that AN will be available in their districts again next year; almost 90% believe that teachers in other Mississippi districts would use AN too, if it were available.
- Teacher suggestions for improving AN center around additional opportunities for practice, enhanced data tracking, and upgrades to the smartphone app.

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Introduction to Algebra Nation Evaluation

On July 25, 2016, representatives from Mississippi school districts attended the joint-informational meeting hosted by the University of Florida's Lastinger Center, Study Edge, and the Mississippi Department of Education (MDE). Pursuant to that meeting, 31 districts were selected to participate in the Algebra Nation (AN) pilot program for the 2016-17 school year. As part of the pilot adoption, districts received full access to the AN platform, including teacher training, Mississippi College- and Career-Ready Standards (MS CCRS)-aligned workbooks, teacher lesson plans, intervention activities for struggling learners, on-demand support videos, and individualized homework for students. The Research and Curriculum Unit (RCU) at Mississippi State University was contracted to evaluate the pilot program during the school year; the evaluator will collect and analyze several data points to be used by the MDE to evaluate the effectiveness and usage of the AN program.

Program Evaluation Overview and Design

Program evaluation is about collecting information about a program or some aspect of a program in order to make necessary decisions about the program. The reasons for this internal evaluation project include:

- Performance improvement
- Outcome assessment
- Program justification

Over the 2016-17 academic year, RCU evaluators will gather information that informs improvements to AN for Mississippi teachers and students and also lends evidence for adoption decisions by MDE officials. To that end, evaluators have identified the following pilot-program evaluation questions:

Question 1. To what extent does the AN curriculum align with the MS CCRS for algebra?

Question 2. How do pilot-district teachers use the AN program in their classrooms, and what evidence exists that they have implemented the program with fidelity?

Question 3. What are pilot teachers' perceptions of the AN program, and how does it contribute to their instructional practices?

Question 4. How do pilot-district students use the AN program, and what are their perceptions of it?

Question 5. What was the effect of the AN program on algebra state test scores in pilot districts, as compared to those of control (nonexperimental) districts that are matched on previous-year algebra state test scores and free/reduced lunch rates?

The evaluation plan is both formative and summative, providing ongoing feedback for continuous program improvement (formative) and an assessment of the program's effectiveness in improving instructional and student outcomes (summative). Data are gathered and monitored on an ongoing basis to identify the need for any program adjustments.

Table 1. Question/Evidence Crosswalk

EVALUATION QUESTION	EVIDENCE
Q1: To what extent does the AN curriculum align with that of the MS CCRS for algebra?	Content-alignment certification and crosswalk for AN and MS CCRS
Q2: How do pilot-district teachers use the AN program in their classrooms, and what evidence exists that they have implemented the program with fidelity?	Pilot-teacher surveys; control-teacher surveys; Levels of Use interview data and analysis
Q3: What are pilot teachers' perceptions of the AN program, and how does it contribute to their instructional practices?	Pilot-teacher surveys; control-teacher surveys; Levels of Use interview data and analysis
Q4: How do pilot-district students use the AN program, and what are their perceptions of it?	Student-usage questions
Q5: What was the effect of the AN program on algebra test scores in pilot districts, as compared to those of control (nonexperimental) districts that are matched on previous-year algebra test scores and free/reduced lunch rates?	2016-17 Mississippi algebra test-score data for pilot and control (match) districts

Algebra Nation Outcomes Evaluation Logic Model for Pilot Group Study

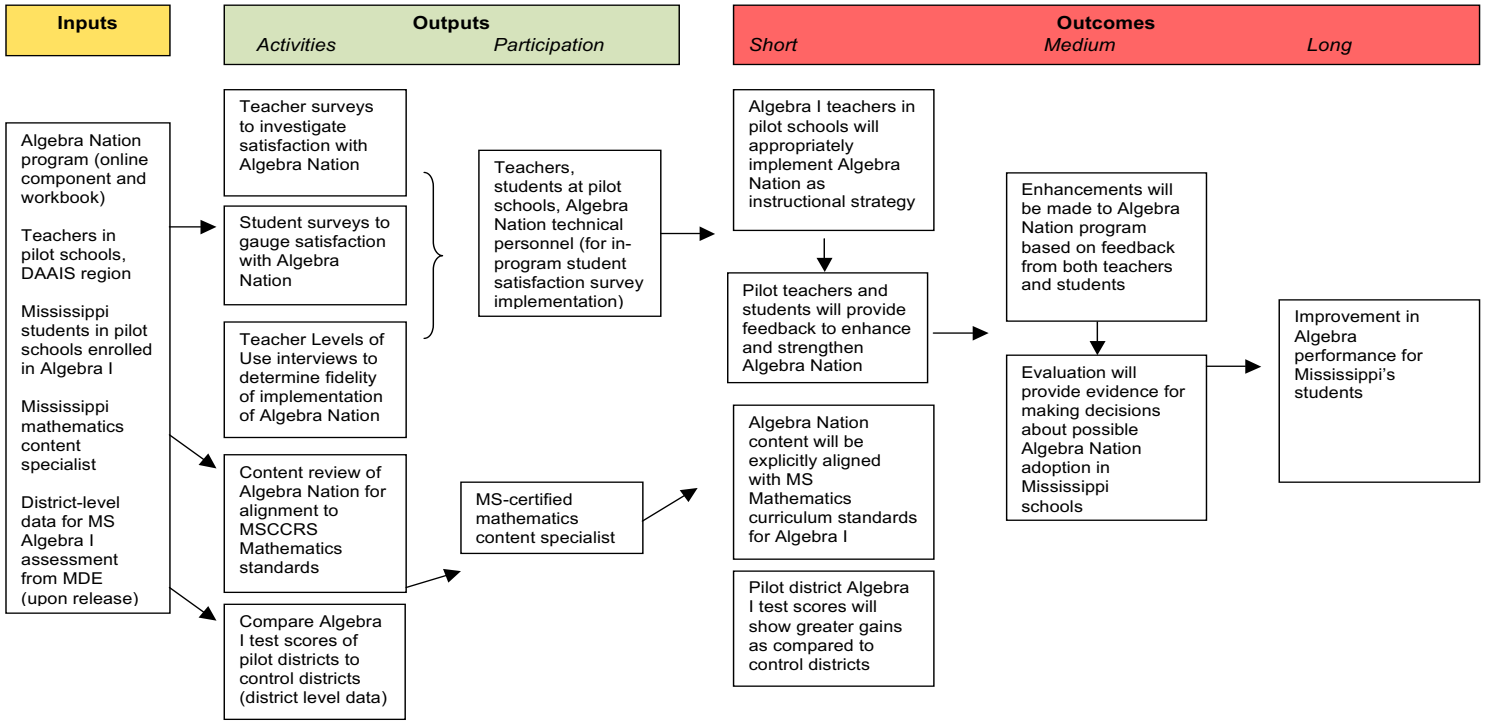

Figure 1. Evaluation Design Model

Table 2. Evaluation Timeline

TIME PERIOD	ACTIVITIES
August 1 to September 30, 2016	✓ Content-alignment certification and crosswalk for AN and MS CCRS ✓ Observation of program-led training for pilot-district teachers and administrators
October 1 to December 31, 2016	✓ Develop student and teacher survey questions and protocols ✓ Pilot-teacher survey data collection and analysis ✓ Data analysis to determine control (match) districts
January 1 to April 30, 2017	• January 13: Midyear report due ☐ Conduct control-district teacher survey ☐ Levels of Use interviews of at least 20 AN teachers
June 2017 TBD 2017	☐ June 15: Final report due ☐ Upon test score data release, end-of-year algebra test scores for pilot and control districts and comparison analyses to be added as addenda to final report

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- Teachers who use AN rely much less heavily on textbook usage overall and instead supplement teaching with interactive, more differentiated instruction through the AN program.
- Training sessions held in the fall were extremely effective, with almost three fourths of pilot teachers reporting that they feel well-versed in AN program usage.
- Teachers rely heavily on AN to help them differentiate instruction, and the individualized benefits are continuous even through out-of-school practice.
- As compared to previous or alternative district resources for teaching algebra, pilot teachers compared AN favorably on the following:
    - Covering MS CCRS standards
    - Real-world examples and conceptual development
    - Meeting needs of diverse learners
    - Differentiating instruction
    - Student engagement
    - Quality practice opportunities
- More than 80% of teachers surveyed hope that AN will be available in their districts again next year; almost 90% believe that teachers in other Mississippi districts would use AN too, if it were available.
- Teacher suggestions for improving AN center around additional opportunities for practice, enhanced data tracking, and upgrades to the smartphone app.

Supporting Data Analysis

This section of the report details the evaluation activity and data analysis that support the findings reported above.

Content-alignment certification and crosswalk for AN and MS CCRS.

To ensure that the use of AN was appropriate for MS CCRS for algebra, Roslyn Miller, who holds a PhD in secondary mathematics education from Mississippi State University, reviewed program content, including videos and practice resources. Miller certified that the instructional frameworks of AN are fully aligned to Mississippi standards and created a content crosswalk for evidence of validation (completed July 2016; see Appendix A).

Observation of program-led training for pilot-district teachers and administrators.

To provide context for survey construction, Dana Seymour attended the training for Monroe County School District teachers and administrators in August 2016. Approximately 26 educators,

including the district superintendent, were in attendance. Led by Chelsea Jones, educators used their own devices to log into AN and explore each of the program's components. Discussions included ways to use the program for classroom instruction and out-of-class enrichment. Teachers were informally questioned after the training and uniformly indicated that they were enthusiastic about the program and how to use it.

Development of student and teacher survey questions and protocols.

A number of existing instruments with strong research bases were examined to inform survey development for this evaluation. In particular, for gauging barriers to best-practice instruction, questions were adapted from the 2015 Trends in International Mathematics and Science Study (TIMSS) survey and the 2007 National Survey of Algebra Teachers for the National Math Panel. Two educator surveys were developed: one for AN pilot teachers and another for teachers in control (match) districts. Both surveys were reviewed by AN representatives and are appended in this report.

Student attitudes are evaluated based on questions taken from the Fennema-Sherman Math Attitudes Scale, which has enjoyed considerable longevity as a reliable measure of mathematics attitudes and has been well-validated by research. With the goal of maximizing both content validity and brevity, a set of three yes/no questions was chosen:

Question 1. I am sure that I can learn algebra.
Question 2. Algebra is a worthwhile, necessary subject.
Question 3. Learning algebra can be enjoyable.

Questions are embedded in the Algebra Nation program, and are designed to minimize distraction from instructional content. Students will be questioned at the beginning and again at the end of the school year to track potential attitude change associated with Algebra Nation use. Questions will appear, one at a time, at established intervals of program use, and in random order per survey period (fall and spring). Data will be analyzed using a repeated measures analysis.

Pilot-teacher survey-data collection and analysis.

Participant Demographics

Using an email list of pilot teachers provided by the AN organization, 231 participants were invited to complete the survey on November 29, 2016. Of these, six responded to say that they had received the invitation in error (because they do not teach algebra, serve as the school instructional coach, etc.). Reminders were sent to contacts who had not completed the survey on December 5, December 12, and December 15, 2016. As of January 4, 2017, 74 respondents had completed the survey. A plurality (39%) are age 30-39, and a majority (73%) are white. More than half (almost 57%) possess AA teaching licensure, indicating the completion of a master's degree. Although half of teachers (53%) have between six and 15 years' experience, only about 23% have taught algebra for that long. Notably, the majority of teachers in this survey (65%) have taught algebra for fewer than five years (Figures 2 and 3). The majority of teachers who participated teach Algebra I (54%), with 39% teaching Foundations of Algebra, and only 7% teaching Algebra I Honors.

Notably, 8% of teachers in the pilot who participated in the survey said that they are not using AN at all in their courses this year; 38% report using the program, but not in all sections they teach. These numbers constitute a significant minority, and this group of teachers will need to be examined fully for possible removal from the matched-scores analysis so as not to bias findings.

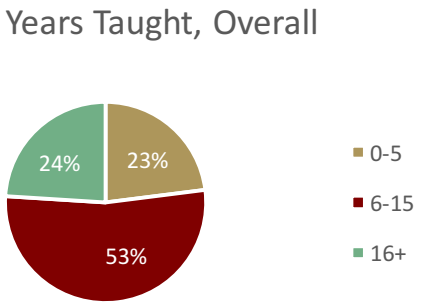

Figure 2. Overall Teaching Experience

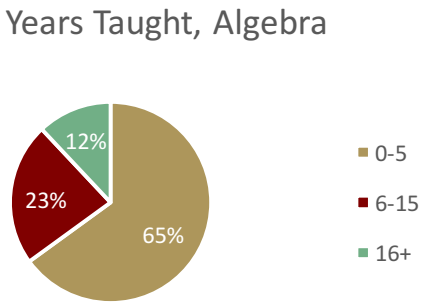

Figure 3. Algebra Teaching Experience

Changes in Teaching Associated with Algebra Nation Use

Pilot participants who have taught algebra for at least two years were asked to compare their teaching practices before using AN and after. Results suggest that the AN program addresses significant pedagogical issues (Figure 4). In particular, problems of out-of-school student support were dramatically reduced, with almost 75% of teachers seeing it as a significant problem before piloting the program and only 28% reporting the same problem after implementation. Additionally, after gaining access to the AN program, teachers relied far less on textbooks (Figure 5) and instead supplemented drill-and-kill textbook practice with instructional videos and rich program resources.

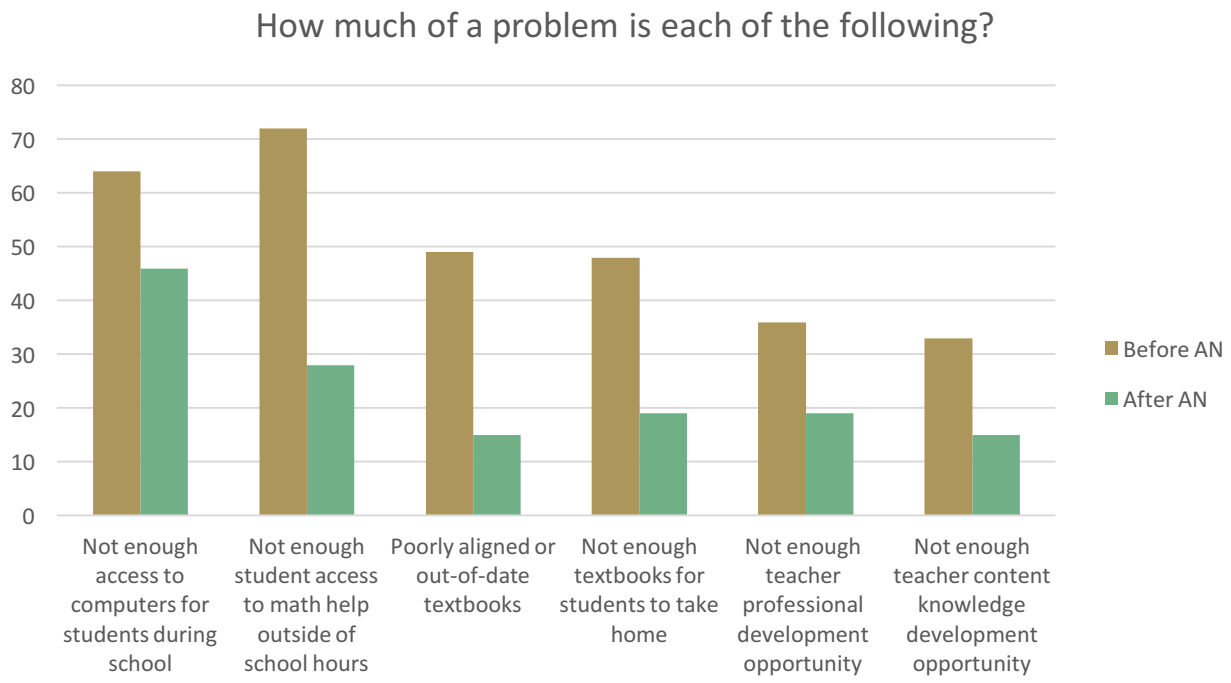

Figure 4. Percentage of Teachers Agreeing

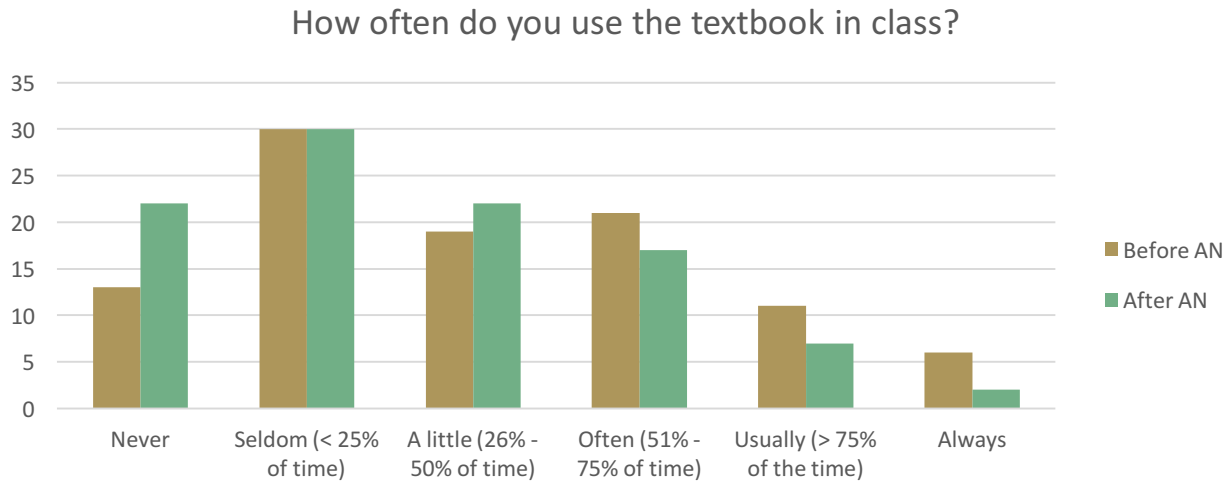

Figure 5. Teacher-Reported Textbook Use

Teacher Attitudes on Training and Technical Support

Overall, teachers were satisfied with the training they received. About 75% of respondents attended an AN-led professional-development session, and 72% reported that they felt Very Good or Good about their understanding of the program and its components after the training. When given the opportunity to answer an open-ended question about the training or technical needs they still have, very few teachers made a suggestion or comment. Responses pertaining to training or technical support are as follows:

- "It would be nice to be able to take the Test Yourself quizzes on a mobile phone. Sometimes that is the only internet-enabled device my students have."
- "Sometimes the videos give us an error message saying that they're unable to view. I end up teaching the materials without the video due to the error message."
- "How should I use the textbooks with my instruction?"
- "We are using EADMS for testing. Would it be possible to create an AN test bank to add to EADMS?"

Algebra Nation Instructional Methods

Teachers were asked a series of questions to help understand how often and how they use the program with students. Figure 6 represents how often teachers use AN in class. Figure 7 details the most common ways the program is used; survey respondents were asked to mark as many choices as they wished to indicate how the program is used. Two participants who chose the Other option specified the following methods:

- "Mini assessments in learning centers"
- "As tests and quizzes"

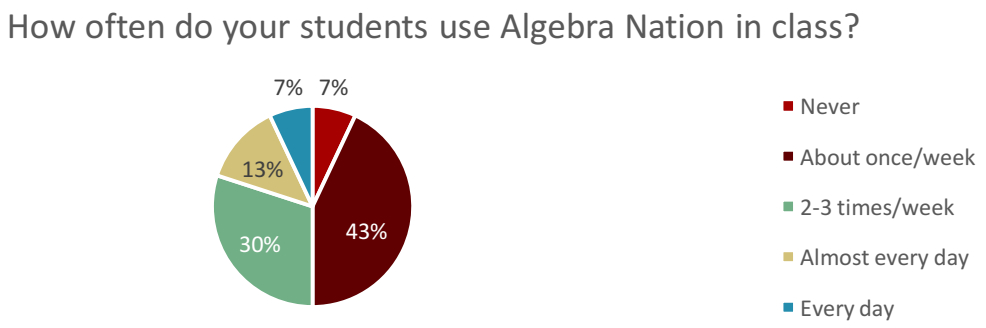

Figure 6. Frequency of AN Use

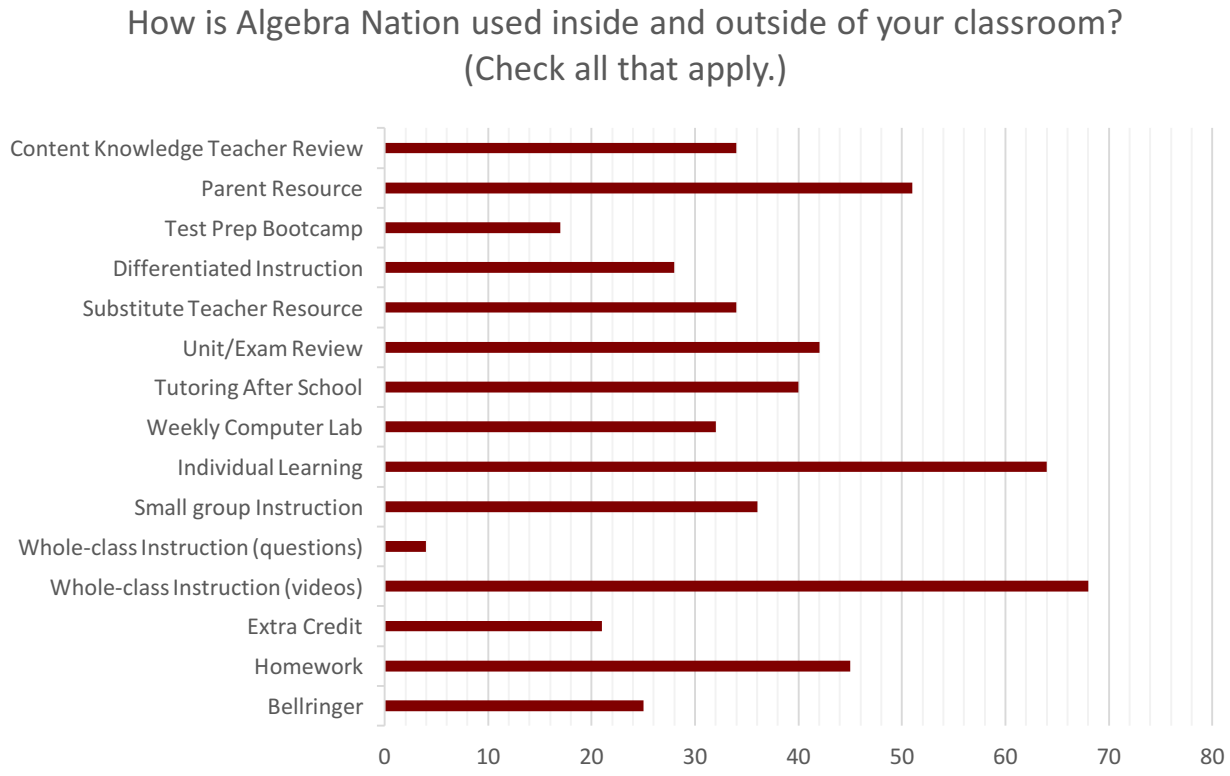

Figure 7. Percent of Teachers Selecting each Instructional Method

Algebra Nation Teacher Satisfaction

The final series of Likert-type items asked teachers to indicate their satisfaction with specific program features and components. To begin, respondents were asked to compare the quality of AN to the other instructional resources used in the district. Responses to these questions clearly indicate that respondents view the program as superior to existing or traditionally used district resources (see Figure 8).

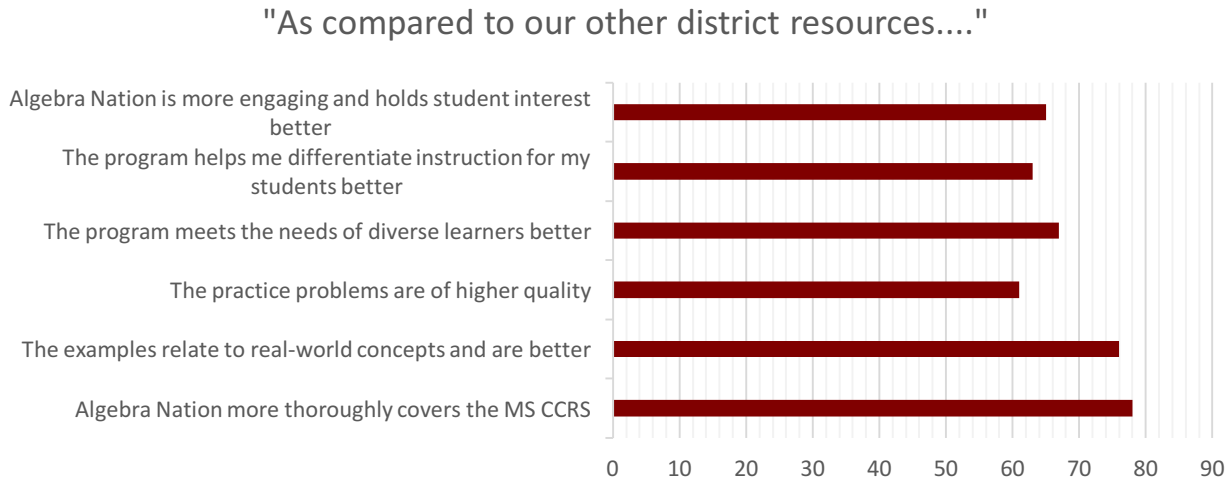

Figure 8. Percent of Teachers Answering Agree or Strongly Agree

To gain a fuller understanding of the particular features teachers appreciated, they were asked to indicate their satisfaction with a specific set of applications and instructional features. Data indicate that teachers are overall very confident that the AN program will help students in their understanding of the content, thereby improving state test scores. Teachers gave lowest ratings to the degree of rigor, indicating that some are worried that the difficulty of the program will decrease student confidence in mathematics. Overall, more than 80% of teachers expressed a desire to have access to AN again next year (see Figure 9).

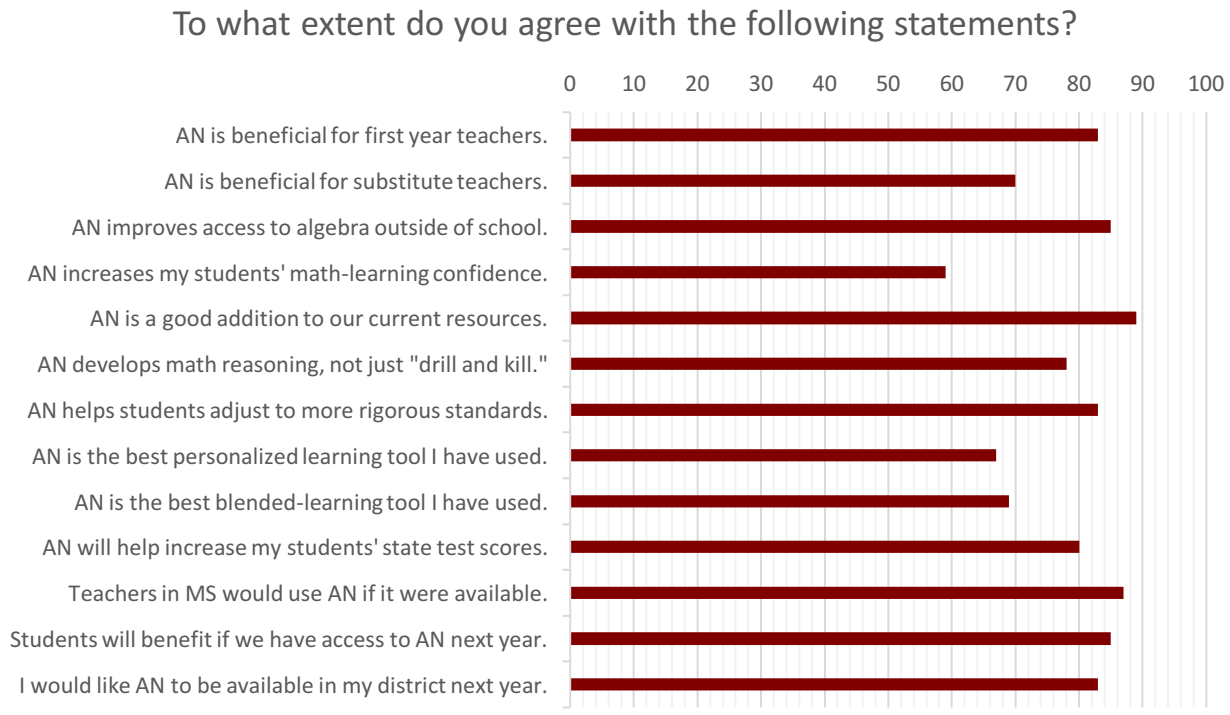

Figure 9. Percentage of Teachers Answering Agree or Strongly Agree

The last page of the survey presented a series of open-ended questions for teachers to reflect on the AN program. We performed qualitative analyses on these items, coding answers into broad themes for reporting. For ease of organization, the trends that emerged from those analyses are represented in Table 3.

Table 3. Open-Ended Item Answer Summary

QUESTION	DOMINANT THEMES (% OF RESPONDENTS)	REPRESENTATIVE COMMENTS
How does AN benefit your students?	Differentiating instruction (37%)	• "After a lesson, I allow each tutor's video to play as my students work cooperatively. I also use 'flipped classroom' techniques, allowing me to spend less time lecturing and more time involved with individuals." • "The program allows students to work independently on essential content knowledge and allows them to choose the method of delivery per standard." • "I use AN as an intervention tool for high school algebra students who have failed state tests. I also use the program in Saturday School tutoring."
	Test scores (14%)	• Students "are given the opportunity to see the rigor and depth they will be expected to perform at for the state assessment."
	Out-of-school access (14%)	• Students "love the videos and extra help at home!" • AN "gives students an after-school resource that is a real person, rather than just a website/YouTube video."
Speak to the impact, if any, of AN on your teaching practice.	Improves algebra pedagogy (32%)	• AN "is a great resource for my teaching. It has also made me more confident in my field. I have even learned a new strategy or two!" • "AN allows me to show my way and then show other ways of solving problems." • "AN helped me see different ways a topic could be taught." • "I feel that AN has made me a stronger, more confident Algebra I teacher."

	Differentiating instruction (28%)	• "AN has allowed me to help my students more individually." • "I find it very beneficial. I have used it on several occasions to reinforce the material that I am teaching and as a tool to help me identify the areas in which my students need extra practice."
My favorite thing about AN is….	Videos/instructors (31%)	• "I LOVE the idea of the student being able to select which instructor to follow." • "Multiple videos for the same lesson." • "The excitement that each instructor brings to learning algebra in his/her own way."
	Interactive features/apps (22%)	• "The On Ramp that assesses where the student should begin and then offers activities for students to begin work." • "The ability to see the solutions to problems that students missed when they take the Test Yourself quizzes."
	Differentiating instruction (20%)	• "Individual opportunity to learn at student's pace; students can pause and replay without being embarrassed." • "Individualized learning and that they [students] can't move on until they have mastered a concept." • AN "allows them [students] to work at their own pace, if necessary, and shows four views of the same lesson."
	Workbook (10%)	• "The workbooks. Without the workbooks, this would be MUCH less appealing and easy to use. I would have to make way too many copies or rely on students to take notes, which realistically isn't a good option." • "The workbooks are terrific! My students would *REALLY* like them better if they were spiral-bound, though."
My STUDENTS' favorite thing about AN is….	Videos/instructors (55%)	• "Different people teaching the same topic, and they get the choice of who to use." • "Seeing a different person teach besides me every day. Variety." • "Darnell."

	Interactive features/apps (22%)	• "The Wall" • "Karma points" • "Earning badges" • "Winning streaks when they get questions right"
What would you or your students like to change about AN?	Wider range of differentiation (to reach very low- or high-performing students) (16%)	• "Shorter videos. I have an extremely smart group of students this semester, and on some of the tasks they just needed a quick refresher, not a 20-minute video (something they could have done in 5-10 minutes to just refresh their memory)." • "Skills-practice worksheets (with no word problems), especially for my very low students…. They see a word problem, and they don't want to even try it. Confidence in working the problems could come first before the word problems are introduced." • "Would like to see some sections for prealgebra, such as working with negative integers and introducing calculator techniques…."
	More practice/problems (14%)	• "Add assignments without answers for students to try. Place independent practice and mini lessons in the workbooks." • "I would like to see more Test Yourself tools. I may not use AN to cover all of the topics in a section at the same time, so it would be useful to have a Test Yourself more frequently than at the end of each section." • "Quizzes halfway through topics would be wonderful, as well as unit tests at the end of each topic, and cumulative unit tests to provide along the way."
What else could AN do to support you or your students?	More practice/problems (20%)	• "Quizzes for each lesson instead of just one per unit." • "Allow my students to practice after a lesson is taught with more than just two examples." • "I love the addition of the independent practices and mini assessments, as I quickly saw a problem of finding supporting

	resources and assignments to accompany AN. Items similar to these would be immensely helpful. For our curriculum needs, we are not using every single topic within a section, so we really can't use the section self-tests. If there was a way to choose which topics are included in a whole-section assessment, that would be awesome."
Teacher data (8%)	• "Provide the teacher with grades to record at the end of the assessments. Provide a quiz at the end of each topic." • "More feedback to share with parents." • "Some form of progress monitoring." • "I'm not sure how to get the reports I need."
Phone app upgrade (6%)	• "I wish the Test Yourself questions were available on the phone app. Most of my students do not have computers and cannot do that part." • "The ability to take the Test Yourself quizzes on mobile phones. Sometimes that is the only internet-enabled device that they [students] have."

Teachers were asked to volunteer "a specific example of a particular student's use or involvement with AN," if they wished to do so. Responses were highly individualized and important; hence, they were not categorized, and all answers are reprinted verbatim:

- "There have been a few 'yes' moments when graphing systems."
- "I have a student who gets stressed asking questions during class. I try to encourage him to come to tutoring, but he doesn't want to ask for help if anyone is in tutoring with him. He has been using AN a lot and watching the different videos if he is unclear about something."
- "I have a student that is absent quite often due to an illness. She is able to watch videos at home and stay up to date with the class."
- "One of our students won the iPad, and we were super excited."
- "I have a student that uses her parent-allotted internet time to work on AN, even when she does not have an assignment."
- "I have an ELL student who struggles due to the language barrier. AN provides her a way to hear instruction more than once and at her own pace."
- "I have students who dread intervention sessions, and they voice their negative opinions. Once I get them started on AN, they do not want to leave the computer session. Students feel they are successful when they are able to watch a video and complete two questions successfully. They like the immediate feedback."

Data analysis to determine control (match) districts.

To determine nearest-neighbor matching for selecting a control group, we used district-level Mississippi Assessment of Progress (MAP) 2015-2016 test-score data for Algebra I. To begin, pilot districts were analyzed for **overall passing percentage** (i.e., students scoring Pass, Proficient, or Advanced) of district test-takers (Table 4).

Table 4. Pilot District Test Data

AN Pilot District	Number of Test-Takers	Not Passing (Minimal and Basic)	Passing (Pass, Proficient, and Advanced)
Aberdeen School District	95	47.4%	52.6%
Bay St. Louis/Waveland School District	178	16.3%	83.7%
Booneville School District	119	30.3%	69.7%
Canton Public School District	335	23.0%	77.0%
Chickasaw Co. School District	34	44.1%	55.9%
Claiborne Co. School District	169	50.3%	49.7%
Greenville Public Schools	520	62.3%	37.7%
Grenada School District	265	29.4%	70.6%
Gulfport School District	337	12.2%	87.8%
Hancock Co. School District	456	21.1%	78.9%
Hinds Co. School District	562	36.5%	63.5%
Hollandale School District	56	19.6%	80.4%
Holly Springs School District	85	51.8%	48.2%
Humphreys Co. School District	160	65.6%	34.4%
Jones Co. School District	973	28.8%	71.2%
Lamar Co. School District	703	23.9%	76.1%
Lauderdale Co. School District	597	34.7%	65.3%
Laurel School District	363	51.0%	49.0%
Leflore Co. School District	260	51.9%	48.1%
Leland School District	91	59.3%	40.7%
Meridian Public School District	545	49.4%	50.6%
Monroe Co. School District	182	24.2%	75.8%
Newton Co. School District	145	24.1%	75.9%
Rankin Co. School District	1698	22.0%	78.0%
Simpson Co. School District	416	50.7%	49.3%
South Tippah School District	187	38.0%	62.0%
Sunflower Co. Consolidated School District	522	56.9%	43.1%
Tishomingo Co. School District	252	38.9%	61.1%
Vicksburg Warren School District	1184	64.5%	35.5%
Winona Separate School District	32	12.5%	87.5%
Yazoo City Municipal School District	222	59.0%	41.0%

Next, district-level passing rate percentages were compared to the control-group pool—Mississippi districts that are not part of the AN pilot. An *a priori* requirement of potential control-group membership was set, using an overall passing percentage difference of no more than .20% on the Algebra I MAP test scores. As expected, the *a priori* assumption considerably reduced the number of possible match-neighbors for each AN pilot district.

Using that new list of potential matches, district passing percentages by proficiency category were used to calculated a weighted score average for each district according to $\bar{x} = \frac{\sum(x \cdot w)}{\sum w}$, with scoring weights as follows: Minimal (x1), Basic (x2), Pass (x3), Proficient (x4), Advanced (x5).

Potential matches were compared using SPSS for independent groups' t-test analysis. In order to be retained as a possible pair, differences between weighted average scores were required to be nonsignificant (p >.05). Results yielded suitable pairings for each pilot district. For districts with more than one possible match, selection was made based on a comparison of free/reduced lunch rates (as a proxy for socioeconomic status), derived from 2010-2011 Kids Count data (the most recent available).

Pilot-control district pairs are summarized as follows, with AN pilot districts in gray (Table 5). The rightmost column indicates the statistical best-matched pairs with an asterisk; test score differences are most likely to yield meaningful inferences, and teachers in these pilot districts are best suited for Levels of Use interviews (to be conducted in the spring).

Table 5. Pilot/Control District Pairs

Pair #	Algebra I District/School	Wtd. Avg.	p-value	% FRL	Best-Matched Pairs
	Aberdeen School District	2.69		97	
1	Lumberton Public School District	2.69	0.557	90	
	Bay St. Louis/Waveland School District	3.29		74	
2	Kosciusko School District	3.26	0.773	66	
	Booneville School District	2.89		49	
3	Pearl Public School District	2.89	0.976	64	
	Canton Public School District	2.87		95	*
4	Wilkinson Co. School District	2.87	0.98	100	
	Chickasaw Co. School District	2.56		79	
5	Amite Co. School District	2.57	0.94	91	
	Claiborne Co. School District	2.56		98	
8	Wayne Co. School District	2.56	0.71	81	

	Greenville Public Schools	2.32		92	
7	Noxubee Co. School District	2.30	0.741	100	
	Grenada School District	3.12		66	
8	Marion Co. School District	3.13	0.914	89	
	Gulfport School District	3.61		71	*
9	Itawamba Co. School District	3.61	0.996	65	
	Hancock Co. School District	3.18		67	*
10	Pearl River Co. School District	3.18	0.942	64	
	Hinds Co. School District	2.90		66	
11	Scott Co. School District	2.90	0.982	76	
	Hollandale School District	3.05		100	
12	Houston School District	3.04	0.903	74	
	Holly Springs School District	2.45		94	*
13	Coahoma Co. School District	2.44	0.98	98	
	Humphreys Co. School District	2.27		96	
14	Copiah Co. School District	2.28	0.89	79	
	Jones Co. School District	2.99		67	*
15	Biloxi Public School District	2.99	0.915	67	
	Lamar Co. School District	3.23		50	
16	Pontotoc Co. School District	3.23	0.978	62	
	Lauderdale Co. School District	2.92		52	
17	Harrison Co. School District	2.94	0.752	68	
	Laurel School District	2.57		90	*
18	West Bolivar Consolidated School District	2.57	0.97	94	
	Leflore Co. School District	2.49		100	*
19	Natchez-Adams School District	2.49	0.944	94	
	Leland School District	2.34		92	
20	Yazoo Co. School District	2.38	0.708	83	
	Meridian Public School District	2.55		85	
21	North Panola Schools	2.53	0.817	97	
	Monroe Co. School District	3.08		57	
22	George Co. School District	3.08	0.992	70	
	Newton Co. School District	3.05		56	
23	Benton Co. School District	3.05	0.97	91	
	Rankin Co. School District	3.19		41	
24	Tupelo Public School District	3.18	0.926	58	
	Simpson Co. School District	2.50		80	
25	South Pike School District	2.50	0.937	90	
	South Tippah School District	2.96		71	
26	Western Line School District	2.96	0.983	88	
27	Sunflower Co. Consolidated School District	2.38	0.972	92	*

	Montgomery Co. School District	2.38		95	
	Tishomingo Co. School District	2.87		67	
28	Picayune School District	2.86	0.928	75	
	Vicksburg Warren School District	2.29		73	
29	East Tallahatchie Consolidated School District	2.28	0.845	90	
	Winona Separate School District	3.19		75	*
30	Columbia School District	3.19	0.978	74	
	Yazoo City Municipal School District	2.32		96	*
31	Holmes Co. School District	2.28	0.502	96	

Planned Evaluation Activity, Spring 2017

Control teachers will be contacted and surveyed beginning in February, to determine challenges and satisfaction levels with current district-held materials for Algebra. To assess teachers' fidelity of implementation of AN, at least 20 teachers in pilot schools will be interviewed using Levels of Use protocol (developed as part of the Concerns Based Adoption Model by SEDL/AIR) beginning mid-spring. Insight gained from resultant qualitative data will be valuable for understanding test score outcomes, especially as compared to control match assessment data. Also in late spring, student math attitudes will be analyzed for change by comparing student survey responses from fall and spring semesters. Final interview and survey analysis will be provided in the June 2017 report, with test score comparison analysis to be completed upon release of assessment data from MDE.

Appendices

Algebra I

Number and Quantity			
The Real Number System (N-RN)			
Use properties of rational and irrational numbers			
		Algebra Nation Section	**Algebra Nation Video Title**
N-RN.3	Explain why: • the sum or product of two rational numbers is rational; • the sum of a rational number and an irrational number is irrational; and • the product of a nonzero rational number and an irrational number is irrational.	**Section 1** Expressions	**Topic 7** Operations with Rational and Irrational Numbers
Quantities (N-Q) *			
Reason quantitatively and use units to solve problems			
N-Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*	**Section 1** Expressions	**Topic 1** Units, Conversions, and Significant Digits
		Section 4 Linear Functions	**Topic 2** Rate of Change of Linear Functions
		Section 4 Linear Functions	**Topic 11** Solution Sets to Inequalities with Two Variables
N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.*	**Section 1** Expressions	**Topic 1** Units, Conversions, and Significant Digits
N-Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*	**Section 1** Expressions	**Topic 1** Units, Conversions, and Significant Digits

Algebra I

Algebra			
Seeing Structure in Expressions (A-SSE)			
Interpret the structure of expressions			
A-SSE.1	Interpret expressions that represent a quantity in terms of its context.* a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*	**Section 1** Expressions	**Topic 2** Using Expressions to Represent Real World Situations
		Section 1 Expressions	**Topic 3** Understanding Polynomial Expressions
		Section 3 Introduction to Functions	**Topic 3** Adding and Subtracting Functions
		Section 3 Introduction to Functions	**Topic 4** Multiplying Functions

Algebra I

A-SSE.2	Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$ thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*	**Section 1** Expressions	**Topic 4** Algebraic Expressions Using the Distributive Property
		Section 1 Expressions	**Topic 5** Algebraic Expressions Using the Commutative and Associative Properties
		Section 1 Expressions	**Topic 6** Properties of Exponents
		Section 2 Equations	**Topic 2** Identifying Properties when Solving Equations
		Section 3 Introduction to Functions	**Topic 3** Adding and Subtracting Functions
		Section 3 Introduction to Functions	**Topic 4** Multiplying Functions
		Section 5 Quadratic Functions – Part 1	**Topic 2** Factoring Quadratic Expressions
		Section 5 Quadratic Functions – Part 1	**Topic 5** Solving Quadratics by Factoring – Special Cases
		Section 5 Quadratic Functions – Part 1	**Topic 6** Solving Quadratics by Taking Square Roots

Algebra I

Write expressions in equivalent forms to solve problems			
A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $[1.15^{1/12}]^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	**Section 5** Quadratic Functions – Part 1	**Topic 2** Factoring Quadratic Expressions
		Section 5 Quadratic Functions – Part 1	**Topic 3** Solving Quadratics by Factoring
		Section 5 Quadratic Functions – Part 1	**Topic 4** Solving Other Quadratics by Factoring
		Section 5 Quadratic Functions – Part 1	**Topic 5** Solving Quadratics by Factoring – Special Cases
		Section 5 Quadratic Functions – Part 1	**Topic 10** Quadratics in Action
		Section 7 Exponential Functions	**Topic 4** Graphs of Exponential Functions – Part 1
		Section 7 Exponential Functions	**Topic 5** Graphs of Exponential Functions – Part 2

Algebra I

Arithmetic with Polynomials and Rational Expressions (A-APR)			
Perform arithmetic operations on polynomials			
A-APR.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	**Section 1** Expressions	**Topic 2** Using Expressions to Represent Real World Situations
		Section 3 Introduction to Functions	**Topic 3** Adding and Subtracting Functions
		Section 3 Introduction to Functions	**Topic 4** Multiplying Functions
		Section 3 Introduction to Functions	**Topic 6** Closure Property
Understand the relationship between zeros and factors of polynomials			
A-APR.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial (limit to 1st- and 2nd-degree polynomials).	**Section 6** Quadratic Functions – Part 2	**Topic 4** Graphing Quadratics Using the Vertex and Intercepts
		Section 8 Polynomial Functions	**Topic 1** Finding Zeros of Polynomial Functions of Higher Degrees
		Section 8 Polynomial Functions	**Topic 3** Multiplicity of Roots in Repeated Factors
		Section 8 Polynomial Functions	**Topic 4** Graphing Polynomial Functions of Higher Degrees

Algebra I

Creating Equations (A-CED) *			
Create equations that describe numbers or relationships			
A-CED.1	Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.**	**Section 2** Equations	**Topic 3** Solving Equations
		Section 2 Equations	**Topic 5** Solving Inequalities – Part 1
		Section 2 Equations	**Topic 6** Solving Inequalities – Part 2
		Section 2 Equations	**Topic 8** Solving Absolute Value Equations and Inequalities
A-CED.2	Create equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*	**Section 2** Equations	**Topic 10** Solution Sets to Equations with Two Variables
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 1
		Section 4 Linear Functions	**Topic 4** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 2
		Section 6 Quadratic Functions – Part 2	**Topic 1** Observations from the Graph of a Quadratic Function

Algebra I

A-CED.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.**	**Section 2** Equations	**Topic 10** Solution Sets to Equations with Two Variables
		Section 3 Introduction To Functions	**Topic 5** Dividing Functions
		Section 4 Linear Functions	**Topic 2** Rate of Change of Linear Functions
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 1
		Section 4 Linear Functions	**Topic 4** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 2
		Section 4 Linear Functions	**Topic 8** Finding Solution Sets to Systems of Equations Using Substitution and Graphing
		Section 4 Linear Functions	**Topic 10** Finding Solution Sets to Systems of Equations Using Elimination
		Section 4 Linear Functions	**Topic 11** Solution Sets to Inequalities with Two Variables

Algebra I

		Section 4 Linear Functions	**Topic 12** Finding Solution Sets to Systems of Linear Inequalities
		Section 5 Quadratic Functions - Part 1	**Topic 1** Real-World Examples of Quadratic Functions
A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.**	**Section 2** Equations	**Topic 9** Rearranging Formulas
Reasoning with Equations and Inequalities (A-REI)			
Understand solving equations as a process of reasoning and explain the reasoning			
A-REI.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	**Section 2** Equations	**Topic 2** Identifying Properties When Solving Equations
		Section 2 Equations	**Topic 3** Solving Equations
		Section 3 Introduction to Functions	**Topic 8** Inverse Functions

Algebra I

Solve equations and inequalities in one variable			
A-REI.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	**Section 2** Equations	**Topic 1** Equations: True or False?
		Section 2 Equations	**Topic 2** Identifying Properties when Solving Equations
		Section 2 Equations	**Topic 3** Solving Equations
		Section 2 Equations	**Topic 4** Solving Equations Using the Zero Product Property
		Section 2 Equations	**Topic 5** Solving Inequalities – Part 1
		Section 2 Equations	**Topic 6** Solving Inequalities – Part 2
		Section 2 Equations	**Topic 7** Solving Compound Inequalities
		Section 2 Equations	**Topic 8** Solving Absolute Value Equations and Inequalities
		Section 3 Introduction to Functions	**Topic 5** Dividing Functions

Algebra I

A-REI.4	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	**Section 5** Quadratic Functions – Part 1	**Topic 3** Solving Quadratics by Factoring
		Section 5 Quadratic Functions – Part 1	**Topic 4** Solving Other Quadratics by Factoring
		Section 5 Quadratic Functions – Part 1	**Topic 5** Solving Quadratics by Factoring – Special Cases
		Section 5 Quadratic Functions – Part 1	**Topic 6** Solving Quadratics by Taking Square Roots
		Section 5 Quadratic Functions – Part 1	**Topic 7** Solving Quadratics by Completing the Square
		Section 5 Quadratic Functions – Part 1	**Topic 8** Deriving the Quadratic Formula
		Section 5 Quadratic Functions – Part 1	**Topic 9** Solving Quadratics Using the Quadratic Formula
		Section 5 Quadratic Functions – Part 1	**Topic 10** Quadratics in Action
		Section 6 Quadratic Functions – Part 2	**Topic 2** Nature of the Solutions of Quadratics

Algebra I

Solve systems of equations			
A-REI.5	Given a system of two equations in two variables, show and explain why the sum of equivalent forms of the equations produces the same solution as the original system.	**Section 4** Linear Functions	**Topic 9** Using Equivalent Systems of Equations
A-REI.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	**Section 4** Linear Functions	**Topic 6** Introduction to Systems of Equations
		Section 4 Linear Functions	**Topic 8** Finding Solution Sets to Systems of Equations Using Substitution and Graphing
		Section 4 Linear Functions	**Topic 9** Using Equivalent Systems of Equations
		Section 4 Linear Functions	**Topic 10** Finding Solution Sets to Systems of Equations Using Elimination

Algebra I

Represent and solve equations and inequalities graphically			
A-REI.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**Section 2** Equations	**Topic 10** Solution Sets to Equations with Two Variables
		Section 4 Linear Functions	**Topic 2** Rate of Change of Linear Functions
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 1
		Section 4 Linear Functions	**Topic 4** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 2
		Section 4 Linear Functions	**Topic 6** Introduction to Systems of Equations
		Section 4 Linear Functions	**Topic 8** Finding Solution Sets to Systems of Equations Using Substitution and Graphing

Algebra I

A-REI.11	Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, rational, absolute value, and exponential functions.*	**Section 4** Linear Functions	**Topic 5** Direct and Indirect Variations
		Section 4 Linear Functions	**Topic 7** Graphing Calculator Skills
		Section 4 Linear Functions	**Topic 8** Finding Solution Sets to Systems of Equations Using Substitution and Graphing
		Section 6 Quadratic Functions – Part 2	**Topic 9** Finding Solution Sets to Systems of Equations Using Tables of Values and Successive Approximations
A-REI.12	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	**Section 4** Linear Functions	**Topic 11** Solution Sets to Inequalities with Two Variables
		Section 4 Linear Functions	**Topic 12** Finding Solution Sets to Systems of Linear Inequalities

Algebra I

Functions

Interpreting Functions (F-IF)

Understand the concept of a function and use function notation

F-IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).	**Section 3** Introduction to Functions	**Topic 1** Input and Output Values
		Section 3 Introduction to Functions	**Topic 2** Representing, Naming, and Evaluating Functions
		Section 3 Introduction to Functions	**Topic 11** Understanding Piecewise-Defined Functions
F-IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**Section 3** Introduction to Functions	**Topic 1** Input and Output Values
		Section 3 Introduction to Functions	**Topic 2** Representing, Naming, and Evaluating Functions
		Section 3 Introduction to Functions	**Topic 11** Understanding Piecewise-Defined Functions
		Section 8 Polynomial Functions	**Topic 1** Finding Zeros of Polynomial Functions of Higher Degrees

Algebra I

F-IF.3	Recognize that sequences are functions whose domain is a subset of the integers.	**Section 4** Linear Functions	**Topic 1** Arithmetic Sequences
		Section 7 Exponential Functions	**Topic 1** Geometric Sequences
		Section 7 Exponential Functions	**Topic 2** Real-World Examples of Arithmetic and Geometric Sequences

Algebra I

Interpret functions that arise in applications in terms of the context			
F-IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.**	**Section 3** Introduction to Functions	**Topic 9** Key Features of Graphs of Functions–Part 1
		Section 3 Introduction to Functions	**Topic 10** Key Features of Graphs of Functions–Part 2
		Section 5 Quadratic Functions – Part 1	**Topic 1** Real-World Examples of Quadratic Functions
		Section 6 Quadratic Functions – Part 2	**Topic 1** Observations from the Graph of a Quadratic Function
		Section 7 Exponential Functions	**Topic 4** Graphs of Exponential Functions–Part 1
		Section 7 Exponential Functions	**Topic 5** Graphs of Exponential Functions–Part 2
		Section 7 Exponential Functions	**Topic 7** Comparing Linear, Quadratic, and Exponential Functions–Part 1
		Section 7 Exponential Functions	**Topic 8** Comparing Linear, Quadratic, and Exponential Functions–Part 2
		Section 8 Polynomial Functions	**Topic 2** End Behavior of Graphs of Polynomials

Algebra I

F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.**	**Section 3** Introduction to Functions	**Topic 2** Representing, Naming, and Evaluating Functions
		Section 3 Introduction to Functions	**Topic 8** Inverse Functions
		Section 3 Introduction to Functions	**Topic 10** Key Features of Functions – Part 2
		Section 3 Introduction to Functions	**Topic 11** Understanding Piecewise-Defined Functions
		Section 6 Quadratic Functions – Part 2	**Topic 1** Observations from the Graph of a Quadratic Function
		Section 7 Exponential Functions	**Topic 7** Transformations of Exponential Functions
		Section 7 Exponential Functions	**Topic 8** Comparing Linear, Quadratic, and Exponential Functions – Part 1
		Section 8 Polynomial Functions	**Topic 1** Finding Zeros of Polynomial Functions of Higher Degrees

Algebra I

F-IF.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*	**Section 4** Linear Functions	**Topic 2** Rate of Change of Linear Functions
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 1
		Section 4 Linear Functions	**Topic 4** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 2
		Section 4 Linear Functions	**Topic 8** Finding Solution Sets to Systems of Equations Using Substitution and Graphing
		Section 7 Exponential Functions	**Topic 7** Comparing Linear, Quadratic, and Exponential Functions–Part 1
		Section 7 Exponential Functions	**Topic 8** Comparing Linear, Quadratic, and Exponential Functions–Part 2
		Section 8 Polynomial Functions	**Topic 2** End Behavior of Graphs of Polynomials
		Section 8 Polynomial Functions	**Topic 5** Average Rate of Change over an Interval

Algebra I

Analyze functions using different representations			
F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* a. Graph functions (linear and quadratic) and show intercepts, maxima, and minima. b. Graph square root and piecewise-defined functions, including absolute value functions.	**Section 3** Introduction to Functions	**Topic 11** Understanding Piecewise-Defined Functions
		Section 6 Quadratic Functions – Part 2	**Topic 3** Graphing Quadratics Using a Table
		Section 6 Quadratic Functions – Part 2	**Topic 4** Graphing Quadratics Using the Vertex and Intercepts
		Section 6 Quadratic Functions – Part 2	**Topic 5** Graphing Quadratics Using Vertex Form – Part 1
		Section 6 Quadratic Functions – Part 2	**Topic 6** Graphing Quadratics Using Vertex Form – Part 2
		Section 8 Polynomial Functions	**Topic 2** End Behavior of Graphs of Polynomials

Algebra I

F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	**Section 5** Quadratic Functions – Part 1	**Topic 10** Quadratics in Action
		Section 6 Quadratic Functions – Part 2	**Topic 1** Observations from the Graph of a Quadratic Function
		Section 6 Quadratic Functions – Part 2	**Topic 4** Graphing Quadratics Using the Vertex and Intercepts
		Section 6 Quadratic Functions – Part 2	**Topic 5** Graphing Quadratics Using Vertex Form – Part 1
		Section 6 Quadratic Functions – Part 2	**Topic 6** Graphing Quadratics Using Vertex Form – Part 2
F-IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*	**Section 6** Quadratic Functions – Part 2	**Topic 6** Graphing Quadratics Using Vertex Form – Part 2
		Section 7 Exponential Functions	**Topic 7** Comparing Linear, Quadratic, and Exponential Functions – Part 1
		Section 7 Exponential Functions	**Topic 8** Comparing Linear, Quadratic, and Exponential Functions – Part 2

Algebra I

Building Functions (F-BF)			
Build a function that models a relationship between two quantities			
F-BF.1	Write a function that describes a relationship between two quantities.* a. Determine an explicit expression or steps for calculation from a context.	**Section 4** Linear Functions	**Topic 1** Arithmetic Sequences
Build new functions from existing functions			
F-BF.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	**Section 3** Introduction to Functions	**Topic 12** Transformations of Functions
		Section 6 Quadratic Functions – Part 2	**Topic 7** Transformations of the Dependent Variable of Quadratic Functions
		Section 6 Quadratic Functions – Part 2	**Topic 8** Transformations of the Independent Variable of Quadratic Functions
		Section 7 Exponential Functions	**Topic 6** Transformations of Exponential Functions
		Section 3 Introduction to Functions	**Topic 7** Recognizing Even and Odd Functions

Algebra I

Linear, Quadratic, and Exponential Models (F-LE) *			
Construct and compare linear, quadratic, and exponential models and solve problems			
F-LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.* a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	**Section 7** Exponential Functions	**Topic 2** Real-World Examples of Arithmetic and Geometric Sequences
		Section 7 Exponential Functions	**Topic 3** Exponential Functions
		Section 7 Exponential Functions	**Topic 4** Graphs of Exponential Functions – Part 1
		Section 7 Exponential Functions	**Topic 5** Graphs of Exponential Functions – Part 2
		Section 7 Exponential Functions	**Topic 6** Growth and Decay Rate of Exponential Functions
		Section 7 Exponential Functions	**Topic 7** Comparing Linear, Quadratic, and Exponential Functions–Part 1
		Section 7 Exponential Functions	**Topic 8** Comparing Linear, Quadratic, and Exponential Functions–Part 2

Algebra I

F-LE.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*	**Section 4** Linear Functions	**Topic 1** Arithmetic Sequences
		Section 4 Linear Functions	**Topic 2** Rate of Change of Linear Functions
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real-World Context – Part 1
		Section 7 Exponential Functions	**Topic 1** Geometric Sequences
		Section 7 Exponential Functions	**Topic 3** Exponential Functions
		Section 7 Exponential Functions	**Topic 4** Graphs of Exponential Functions – Part 1
		Section 7 Exponential Functions	**Topic 5** Graphs of Exponential Functions – Part 2
		Section 7 Exponential Functions	**Topic 6** Growth and Decay Rate of Exponential Functions
		Section 7 Exponential Functions	**Topic 7** Transformations of Exponential Functions
		Section 7 Exponential Functions	**Topic 8** Comparing Linear, Quadratic, and Exponential Functions - Part 1

Algebra I

Interpret expressions for functions in terms of the situation they model			
F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.*	**Section 7** Exponential Functions	**Topic 2** Real-World Examples of Arithmetic and Geometric Sequences
		Section 7 Exponential Functions	**Topic 3** Exponential Functions
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real-World Context – Part 1
		Section 4 Linear Functions	**Topic 4** Interpreting Rate of Change and y-Intercept in a Real World Context – Part 2
		Section 4 Linear Functions	**Topic 5** Direct and Inverse Variation
		Section 4 Linear Functions	**Topic 7** Graphing Calculator Skills
		Section 4 Linear Functions	**Topic 12** Finding Solution Sets to Systems of Linear Inequalities
		Section 5 Quadratic Functions – Part 1	**Topic 1** Real-World Examples of Quadratic Functions

Algebra I

		Section 5 Quadratic Functions – Part 1	**Topic 10** Quadratics in Action
		Section 6 Quadratic Functions – Part 2	**Topic 1** Observations from the Graph of a Quadratic Function
		Section 6 Quadratic Functions – Part 2	**Topic 4** Graphing Quadratics Using the Vertex and Intercepts
		Section 6 Quadratic Functions – Part 2	**Topic 6** Graphing Quadratics Using Vertex Form – Part 2

Algebra I

Statistics and Probability *			
Interpreting Categorical and Quantitative Data (S-ID)			
Summarize, represent, and interpret data on a single count or measurement variable			
S-ID.1	Represent and analyze data with plots on the real number line (dot plots, histograms, and box plots).*	**Section 9** One Variable Statistics	**Topic 1** Dot Plots
		Section 9 One Variable Statistics	**Topic 2** Histograms
		Section 9 One Variable Statistics	**Topic 3** Box Plots – Part 1
		Section 9 One Variable Statistics	**Topic 4** Box Plots – Part 2
S-ID.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.*	**Section 9** One Variable Statistics	**Topic 5** Measures of Center and Shapes of Distributions
		Section 9 One Variable Statistics	**Topic 6** Measures of Spread – Part 1
		Section 9 One Variable Statistics	**Topic 7** Measures of Spread – Part 2
		Section 9 One Variable Statistics	**Topic 8** The Empirical Rule
S-ID.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*	**Section 9** One Variable Statistics	**Topic 9** Outliers in Data Sets

Algebra I

Summarize, represent, and interpret data on two categorical and quantitative variables			
S-ID.5	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.*	**Section 10** Two Variable Statistics	**Topic 1** Relationship between Two Categorical Variables – Marginal and Joint Probabilities – Part 1
		Section 10 Two Variable Statistics	**Topic 2** Relationship between Two Categorical Variables – Marginal and Joint Probabilities – Part 2
		Section 10 Two Variable Statistics	**Topic 3** Relationship between Two Categorical Variables – Conditional Probabilities

Algebra I

S-ID.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.* a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	**Section 10** Two Variable Statistics	**Topic 4** Scatter Plots and Function Models – Part 1
		Section 10 Two Variable Statistics	**Topic 5** Scatter Plots and Lines of Best Fit
		Section 10 Two Variable Statistics	**Topic 6** Residuals and Residual Plots – Part 1
		Section 10 Two Variable Statistics	**Topic 7** Residuals and Residual Plots – Part 2
		Section 10 Two Variable Statistics	**Topic 8** Examining Correlation

Algebra I

Interpret linear models			
S-ID.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*	**Section 4** Linear Functions	**Topic 2** Rate of Change of Linear Functions
		Section 4 Linear Functions	**Topic 3** Interpreting Rate of Change and y-Intercept in a Real-World Context – Part 1
		Section 4 Linear Functions	**Topic 4** Interpreting Rate of Change and y-Intercept in a Real-World Context – Part 2
		Section 10 Two Variable Statistics	**Topic 4** Scatter Plots and Function Models – Part 1
		Section 10 Two Variable Statistics	**Topic 5** Scatter Plots and Lines of Best Fit
S-ID.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.*	**Section 10** Two Variable Statistics	**Topic 8** Examining Correlation
S-ID.9	Distinguish between correlation and causation.*	**Section 10** Two Variable Statistics	**Topic 8** Examining Correlation

* Modeling Standards

Appendix B. Algebra Nation Teacher Survey

Demographics

* 1. Please select your school district.

Other (please specify)

* 2. School name:

* 3. What is your age?

- 20-29
- 30-39
- 40-49
- 50-59
- 60 or older

4. Which race/ethnicity best describes you? (Please choose only one.)

- American Indian or Alaskan Native
- Asian / Pacific Islander
- Black or African American
- Hispanic
- White / Caucasian
- Multiple ethnicity / Other (please specify)

* 5. What type of teaching license do you have?

- ◯ A
- ◯ AA
- ◯ AAA
- ◯ AAAA
- ◯ Emergency/temporary license

* 6. NOT COUNTING THIS YEAR, how many years have you taught total?

- ◯ 0-2
- ◯ 2-5
- ◯ 6-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21+

* 7. NOT COUNTING THIS YEAR, how many years have you taught Algebra I or Foundations of Algebra?

- ◯ 0-2
- ◯ 2-5
- ◯ 6-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21+

Teaching Practices

* 8. Think about your algebra classes LAST YEAR. How much of a problem was each of the following?

	Not a problem	A minor problem	A moderate problem	A serious problem	I did not teach algebra last year.
Not enough access to computers for my students during school time.	○	○	○	○	○
Not enough student access to math help outside of school hours.	○	○	○	○	○
Poorly aligned or out-of-date textbooks and/or workbooks.	○	○	○	○	○
Not enough textbooks for students to take home at night.	○	○	○	○	○
Not enough opportunities for teachers for professional development (informal or formal).	○	○	○	○	○
Not enough opportunities for teachers to develop content knowledge (informal or formal).	○	○	○	○	○

* 9. Think back to LAST YEAR. About what percentage of the time did you use a textbook to teach your typical algebra class?

- ○ I didn't use a textbook at all
- ○ Seldom (less than 25% of the time)
- ○ A little (about 25% to 50% of the time)
- ○ Often (about 51% to about 75% of the time)
- ○ Usually (more than 75% of the time)
- ○ I always used the text
- ○ N/A--I didn't teach algebra last year

* 10. What describes the majority of your algebra classes THIS year?

- ◯ Algebra 1 Honors (or advanced class)
- ◯ Algebra 1
- ◯ Foundations of Algebra

* 11. THIS YEAR, what type of access do students have to technology? Check all that apply.

- ☐ They have 1-to-1 devices in the classroom.
- ☐ They are able to bring their own mobile devices for use in the classroom.
- ☐ They have access to computers in the classroom (but not enough for 1-to-1).
- ☐ They have computers in other rooms (e.g. computer labs, library, etc.).
- ☐ They have decent access to the Internet.
- ☐ They have poor access to the Internet.

Algebra Nation

* 12. Are you using the Algebra Nation program this year to teach algebra?

- ◯ No.
- ◯ I'm using Algebra Nation in SOME (but not all) of my algebra sections.
- ◯ Yes, in all the algebra sections I teach.

Training

* 13. Where did you first hear about Algebra Nation?

- ◯ My math supervisor or other administrator told me about it
- ◯ Another teacher told me about it
- ◯ I heard about it at a professional development session I went to
- ◯ Other word of mouth
- ◯ Press/media
- ◯ Other (please specify)

* 14. I was trained to use Algebra Nation by.... (Check all that apply.)

- ☐ School or district colleagues
- ☐ Algebra Nation trainers
- ☐ Self-trained by using the program
- ☐ No training

* 15. How would you rate the effectiveness of that training?

- ◯ Very good--I felt that I had a good understanding of Algebra Nation when I left the training.
- ◯ Mostly good--I felt that I had the basics and could figure the rest out.
- ◯ Okay--I still had a few questions for my colleagues.
- ◯ Not great--I had a lot of questions.
- ◯ N/A--I did not receive any trainings.

Usage

* 16. How often do your students use Algebra Nation in class?

- ◯ Never
- ◯ About once per week
- ◯ 2-3 times per week
- ◯ Almost every day
- ◯ Every day

* 17. Now that you've received access to Algebra Nation, about what percentage of the time do you use a (non-Algebra Nation) textbook to teach your typical algebra class?

- ◯ I don't use a textbook at all
- ◯ Seldom (less than 25% of the time)
- ◯ A little (about 25% to 50% of the time)
- ◯ Often (about 51% to about 75% of the time)
- ◯ Usually (more than 75% of the time)
- ◯ I always use the text

* 18. NOW that you have received access to Algebra Nation, how much of a problem is…

	Not a problem	A minor problem	A moderate problem	A serious problem
Not enough access to computers for my students during school time.	○	○	○	○
Not enough student access to math help outside of school hours.	○	○	○	○
Poorly aligned or out-of-date textbooks and/or workbooks.	○	○	○	○
Not enough textbooks for students to take home at night.	○	○	○	○
Not enough opportunities for teachers for professional development (informal or formal).	○	○	○	○
Not enough opportunities for teachers to develop content knowledge (informal or formal).	○	○	○	○

* 19. Rate how much you agree or disagree with the following statements about Algebra Nation:

	Strongly disagree	Mostly disagree	Neutral	Mostly agree	Strongly agree	Not Applicable OR Don't Know
Algebra Nation thoroughly covers the Mississippi College and Career Readiness Standards.	○	○	○	○	○	○
The examples in Algebra Nation are good, relate to real-world concepts, and are better than most of our other resources.	○	○	○	○	○	○
The practice problems are of better quality than most of our other resources.	○	○	○	○	○	○
The program meets the needs of diverse learners better than most of our other resources.	○	○	○	○	○	○
The program helps me differentiate instruction for my students better than most of our other resources.	○	○	○	○	○	○
Algebra Nation is engaging and holds student interest better than other resources.	○	○	○	○	○	○

* 20. Rate how much you agree or disagree with the following statements.

	Strongly disagree	Mostly disagree	Neutral	Mostly agree	Strongly agree	Not applicable OR Don't know
Algebra Nation is beneficial for first-year teachers.	○	○	○	○	○	○
Algebra Nation is beneficial for substitute teaching.	○	○	○	○	○	○
Algebra Nation makes algebra more accessible to my students outside of school hours.	○	○	○	○	○	○
Algebra Nation increases my students' confidence in their ability to learn math.	○	○	○	○	○	○

	Strongly disagree	Mostly disagree	Neutral	Mostly agree	Strongly agree	Not applicable OR Don't know
Algebra Nation is a very good addition to the current resources we have to support our efforts of improving Algebra 1 mastery as well as statewide test scores.	○	○	○	○	○	○
Algebra Nation helps my students develop their mathematical reasoning skills, not just 'drill and kill.'	○	○	○	○	○	○
Algebra Nation is beneficial for helping students adjust to our new, more rigorous standards.	○	○	○	○	○	○
Algebra Nation is the best differentiated instruction and personalized learning tool that I have used.	○	○	○	○	○	○
Algebra Nation is the best blended-learning tool that I have used.	○	○	○	○	○	○
I believe that using Algebra Nation will help increase my students' test scores on statewide assessments.	○	○	○	○	○	○
I believe many other teachers in the state would use Algebra Nation and/or recommend it to their students/parents if it were available statewide.	○	○	○	○	○	○
My students will benefit if we have access to Algebra Nation again next year.	○	○	○	○	○	○
I would like Algebra Nation to be available in my district next year.	○	○	○	○	○	○

21. How is Algebra Nation used inside and outside your classroom? (Check ALL that apply.)

- [ ] Bell-ringers to start lessons
- [ ] Assignment as homework
- [ ] Assignment as extra credit
- [ ] Whole-class instruction (project Algebra Nation videos on a screen)
- [ ] Whole-class instruction (project Algebra Nation questions on a screen)
- [ ] Small group instruction
- [ ] Individual learning (students working independently on Algebra Nation)
- [ ] Once a week in computer lab
- [ ] Tutoring after school
- [ ] Review at end of units / before unit exams
- [ ] When there is a substitute teacher in my class
- [ ] Targeted for certain groups of students (advanced learners, struggling learners, etc.)
- [ ] As part of our test prep bootcamp program
- [ ] As a resource for parents to help their students
- [ ] As a resource for myself to improve content knowledge
- [ ] Other (please specify)

Satisfaction

* 22. How does Algebra Nation benefit your students?

23. Speak to the impact, if any, of Algebra Nation on your teaching practice.

24. Is there a specific example of a particular student's use or involvement with Algebra Nation that you would like to share?

* 25. My favorite thing about Algebra Nation is....

* 26. My STUDENTS' favorite thing about Algebra nation is....

* 27. What would you or your students like to change about Algebra Nation?

* 28. What else could Algebra Nation do to support you or your students?

* 35. Think about the program or instructional materials your school uses to teach algebra, such as textbooks, workbooks, etc. How do you feel about each of the following statements?

	Strongly disagree	Mostly disagree	Neutral	Mostly agree	Strongly agree	Not applicable OR Don't know
The program or materials are beneficial for first-year teachers.	○	○	○	○	○	○
The program or materials are beneficial for substitute teachers.	○	○	○	○	○	○
The program increases my students' confidence in their ability to learn math.	○	○	○	○	○	○
The program helps my students develop their mathematical reasoning skills, not just 'drill and kill.'	○	○	○	○	○	○
The program is beneficial for helping students adjust to our new, more rigorous standards.	○	○	○	○	○	○

36. My favorite thing about the instructional materials or program I currently use to teach algebra is....

37. The biggest problem I have with my current program or materials is....

Appendix C. Matched-Control Teacher Survey

Demographics

* 1. Please select your school district.

Other (please specify)

* 2. School name:

* 3. What is your age?

- 20-29
- 30-39
- 40-49
- 50-59
- 60 or older

4. Which race/ethnicity best describes you? (Please choose only one.)

- American Indian or Alaskan Native
- Asian / Pacific Islander
- Black or African American
- Hispanic
- White / Caucasian
- Multiple ethnicity / Other (please specify)

* 5. What type of teaching license do you have?

- ◯ A
- ◯ AA
- ◯ AAA
- ◯ AAAA
- ◯ Emergency/temporary license

* 6. NOT COUNTING THIS YEAR, how many years have you taught total?

- ◯ 0-2
- ◯ 2-5
- ◯ 6-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21+

* 7. NOT COUNTING THIS YEAR, how many years have you taught Algebra I or Foundations of Algebra?

- ◯ 0-2
- ◯ 2-5
- ◯ 6-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21+

Teaching Practices

* 8. Think about your algebra classes LAST YEAR. How much of a problem was each of the following?

	Not a problem	A minor problem	A moderate problem	A serious problem	I did not teach algebra last year.
Not enough access to computers for my students during school time.	○	○	○	○	○
Not enough student access to math help outside of school hours.	○	○	○	○	○
Poorly aligned or out-of-date textbooks and/or workbooks.	○	○	○	○	○
Not enough textbooks for students to take home at night.	○	○	○	○	○
Not enough opportunities for teachers for professional development (informal or formal).	○	○	○	○	○
Not enough opportunities for teachers to develop content knowledge (informal or formal).	○	○	○	○	○

* 9. Think back to LAST YEAR. About what percentage of the time did you use a textbook to teach your typical algebra class?

- ○ I didn't use a textbook at all
- ○ Seldom (less than 25% of the time)
- ○ A little (about 25% to 50% of the time)
- ○ Often (about 51% to about 75% of the time)
- ○ Usually (more than 75% of the time)
- ○ I always used the text
- ○ N/A--I didn't teach algebra last year

* 10. What describes the majority of your algebra classes THIS year?

- ◯ Algebra 1 Honors (or advanced class)
- ◯ Algebra 1
- ◯ Foundations of Algebra

* 11. THIS YEAR, what type of access do students have to technology? Check all that apply.

- ☐ They have 1-to-1 devices in the classroom.
- ☐ They are able to bring their own mobile devices for use in the classroom.
- ☐ They have access to computers in the classroom (but not enough for 1-to-1).
- ☐ They have computers in other rooms (e.g. computer labs, library, etc.).
- ☐ They have decent access to the Internet.
- ☐ They have poor access to the Internet.

Control Curriculum

* 32. THIS YEAR, about what percentage of the time do you use a textbook to teach your typical algebra class?

- ○ I don't use a textbook at all
- ○ Seldom (less than 25% of the time)
- ○ A little (about 25% to 50% of the time)
- ○ Often (about 51% to about 75% of the time)
- ○ Usually (more than 75% of the time)
- ○ I always use the text

* 33. THIS YEAR, how much of a problem is…

	Not a problem	A minor problem	A moderate problem	A serious problem
Not enough access to computers for my students during school time.	○	○	○	○
Not enough student access to math help outside of school hours.	○	○	○	○
Poorly aligned or out-of-date textbooks and/or workbooks.	○	○	○	○
Not enough textbooks for students to take home at night.	○	○	○	○
Not enough opportunities for teachers for professional development (informal or formal).	○	○	○	○
Not enough opportunities for teachers to develop content knowledge (informal or formal).	○	○	○	○

* 34. Think about the program or instructional materials your school uses to teach algebra, such as textbooks, workbooks, etc. How do you feel about each of the following statements?

	Strongly disagree	Mostly disagree	Neutral	Mostly agree	Strongly agree	Not Applicable OR Don't Know
The program thoroughly covers the Mississippi College and Career Readiness Standards.	○	○	○	○	○	○
The examples in our current materials are good and relate to real-world concepts.	○	○	○	○	○	○
The practice problems are of high quality.	○	○	○	○	○	○
The program meets the needs of diverse learners.	○	○	○	○	○	○
The program helps me differentiate instruction for my students.	○	○	○	○	○	○
The program we use is engaging and holds student interest better than other resources.	○	○	○	○	○	○

* 35. Think about the program or instructional materials your school uses to teach algebra, such as textbooks, workbooks, etc. How do you feel about each of the following statements?

	Strongly disagree	Mostly disagree	Neutral	Mostly agree	Strongly agree	Not applicable OR Don't know
The program or materials are beneficial for first-year teachers.	○	○	○	○	○	○
The program or materials are beneficial for substitute teachers.	○	○	○	○	○	○
The program increases my students' confidence in their ability to learn math.	○	○	○	○	○	○
The program helps my students develop their mathematical reasoning skills, not just 'drill and kill.'	○	○	○	○	○	○
The program is beneficial for helping students adjust to our new, more rigorous standards.	○	○	○	○	○	○

36. My favorite thing about the instructional materials or program I currently use to teach algebra is....

37. The biggest problem I have with my current program or materials is....