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Learning About New Demands in Schools: Considering Algebra Policy Environments (LANDSCAPE)

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Abstract

The past three decades in mathematics education policy and research have seen a considerable focus on algebra and its place in secondary schools. Access to and success in the first high school course, most often termed Algebra I, has been framed as a civil rights issue, a harbinger of college success, and a lynchpin to global competitiveness. Policymakers have targeted access to Algebra I through universal enrollment policies at specific grade levels, while educational researchers and policy analysts have investigated the efficacy of such policies in improving student outcomes.

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Learning About New Demands in Schools:
Considering Algebra Policy Environments (LANDSCAPE) Findings from a National Survey

RESEARCH REPORT

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About the Learning About New Demands in Schools: Considering Algebra Policy Environments (LANDSCAPE) Project

The *Learning About New Demands in Schools: Considering Algebra Policy Environments* (LANDSCAPE) is an NSF-funded study designed to learn from school districts across the United States about their policies, practices, and perceptions related Algebra I. This study involved a mixed-method design, with two related components. In order to understand the broad landscape of how pressures to increase participation in algebra are interpreted and influenced local policy and practices, we sampled both broadly (Component 1: The Universal Early Algebra Landscape) and intensively (Component 2: Case Studies of Opportunities to Learn Algebra). Component 1 involved a national survey of 993 district mathematics leaders, or those responsible for district-wide decision making related to Algebra I. This component was aimed at uncovering trends in how early algebra pressures are perceived and acted on. Component 2 probed further within this algebra landscape, with 12 case studies of selected districts in four states. The two components of the study, together, allow us to make broad generalizations related to universal early algebra in the U.S. as well as provide nuanced, deeper understandings of these efforts and their related challenges in the context of specific cases.

The LANDSCAPE project and the work on this report is supported by the National Science Foundation under Grant No. 1108828 and 1108833. Any opinions, findings, conclusions, or recommendations expressed in this paper are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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Executive Summary

The past 3 decades in mathematics education policy and research have seen a considerable focus on algebra and its place in secondary schools. Access to and success in the first high school course in algebra, most often termed Algebra I, has been framed as a civil rights issue, a harbinger of college success, and a lynchpin to global competitiveness. Policymakers have targeted access to Algebra I through universal enrollment policies at specific grade levels, while educational researchers and policy analysts have investigated the efficacy of such policies in improving student outcomes. This sometimes-heated debate often focuses on outcomes in a single school, district, or state, as no clear picture exists of national policy and practice related to Algebra I enrollments. In 2012, the Learning About New Demands in Schools: Considering Algebra Policy Environments [LANDSCAPE] project conducted a survey of a nationally-representative sample of school districts in the United States to investigate the nature of algebra policy and practice related to five dimensions of systemic opportunity to learn: organization and sequencing of courses, curriculum resources, human resources, assessment, and supports for students.

The purpose of this technical report is to compile and summarize survey findings, making them available to the field. We have done so around the following questions:

1. What requirements and policies do districts have in place for mathematics in general and Algebra I in particular?
2. What is the place of Algebra I in mathematics instruction in districts and what resources are used to teach it?
3. Who takes Algebra I, and when, and how do districts determine whether students are successful?
4. What teacher support and development resources do districts deploy related to mathematics and Algebra I?
5. How do district policies and perspectives address issues related to resource allocation, access, and readiness for Algebra I?

A headline finding of the study is that, in contrast to previous policy analyses and rhetoric, we found no evidence of an emphatic national push to enroll more students in Algebra I in the 8^{th} grade through the use of policy levers. Eighth grade enrollment in Algebra I accounts for only 25% of the student population nationally, and taking Algebra I in 9^{th} grade remains the normative practice for most students in most US districts. With respect to the organization and sequencing of courses, assessment, and supports for students, we find that districts tend to maintain local control and implement flexible and adaptive approaches to the systemic structures around Algebra I. Districts use state policy as a starting point, but often craft locally tailored policies for the offering of Algebra I. Criteria for student inclusion in Algebra I, as well as measures of successful completion, rely largely on locally produced measures. Systemic opportunities to learn related to curriculum and human resources paint an interesting picture. Teacher professional development is cited as a significant factor by districts in determining policy and practice around Algebra I. The curriculum materials landscape is dominated by traditional publisher-authored curricula that are not likely to meet the rigorous reasoning and problem solving demands of the Common Core or other similar state standards for mathematics teaching and learning. The average US teacher has access to less than 2 days per year of mathematics-specific professional development. Together, these two factors suggest that significant change in the teaching and learning of Algebra I is not likely on a national scale.

Finally, while districts cite access to Algebra I as an important aspect of students' future successes, conflicting beliefs and outdated conceptions related to student capacity to learn exist. As districts report that early access to Algebra I is important and that efforts to improve student outcomes must focus on professional development and curriculum, district decision makers do not hold consistent beliefs that all students can learn algebra and cling to outdated notions of developmental readiness as a key factor in student success. It is clear from these findings that investments in professional development, curricular change, and a shifting of beliefs about teaching and learning of algebra are required for meaningful change in student outcomes related to Algebra I.

Problem Statement

The teaching and learning of algebra in secondary schools has been a keen focus of educational policy and research in the United States over the past 30 years. Algebra represents a key foundation that shapes the trajectory of students' future opportunities to learn mathematics. Its importance has been argued from the perspectives of civil rights (e.g., Moses & Cobb, 2001), global competitiveness (e.g., National Mathematics Advisory Panel, 2008), and college and career readiness (e.g., United States Department of Education, 1998). Points of contention in policy and practice center on how to offer access to algebra, which students to offer it to, and when to offer it.

A particular focal point in this debate has been the existence, wisdom, and effectiveness of policies that mandate the successful completion of Algebra I[1] in some particular way. These mandates range from universal algebra (UA) policies, in which all students are required to complete Algebra I or an equivalent course by a particular grade (usually 8th or 9th), to selective policies that strive to assess student readiness to take Algebra I in a wide variety of ways. Some studies suggest that UA policies have served as levers for positive change to student access to Algebra I (see Stein, Kaufman, Sherman, & Hillen, 2011 for a review), while other analyses suggest that UA policies damage educational opportunities for specific groups of students who may be unprepared for such an experience (Loveless, 2008).

Specifically, Stein and colleagues reviewed 19 research studies from districts and states in which a UA policy was in place and analyzed the effects of such policies on enrollment patterns, pass rates, and student achievement (Stein et al., 2011). Findings were mixed: UA policies significantly increased students' access to Algebra I, particularly for traditionally underserved populations, but some implementations led to a decline in pass rates and mixed achievement gains. An important secondary finding from this review is that districts with stronger supports for struggling students tended to show increases in student achievement. As such, the ways in which a district chooses to invest in and focus on particular facets of students' opportunities to learn, such as adopting particular kinds of curriculum, providing professional development for teachers, or putting in place supports for struggling students, may have an effect on the success or failure of policy initiatives such as UA.

Loveless (2008), in a widely cited policy brief, analyzed associations between states' 8th-grade scores on the National Assessment of Educational Progress (NAEP) and students' self-reported course enrollment. Using these data, the report contends that there was a sharp rise in the number of students taking advanced mathematics courses (Algebra I, Geometry, or Algebra II) in 8th grade between 2000 and 2005, and that this rise correlates with an increase in low achievers on

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[1] We use a capitalized form of Algebra I when referring to the first high school course in the content of algebra. When referring to the mathematical topic of algebra, we use a lowercase a.

the NAEP who indicated enrollments in these advanced courses. Loveless uses this relationship to argue that universal policies are pushing more students at the 8th grade or earlier into Algebra I before they are ready to be successful in such courses.

The studies analyzed by Stein et al. (2011) represent small-scale case studies of UA policies and programs implemented in schools or districts. Loveless's (2008) large-scale analysis of NAEP scores links policy and student performance at the state level to draw conclusions about the potential influence of policy on the performance of student groups on a national assessment. On the surface, these two reports may seem to present contradictory results with respect to the effectiveness of UA policies; we contend, however, that the Stein et al. review identifies specific policy instances that are seen as novel, and that Loveless positions policy as the hidden cause for the phenomenon under examination. What remains unaddressed by either analysis is the nature of the landscape of Algebra I policies and practices at the district level. Specifically, what policies exist in districts that structure students' opportunities to engage with Algebra I content, and in what ways do these policies shape or enable districts' practices with respect to the teaching and learning of algebra?

The purpose of the Learning about New Demands in Schools: Considering Algebra Policy Environments (LANDSCAPE) Project is to investigate the policies and practices that school districts across the United States use, as reported by district-level decision makers, that influence students' opportunities to learn algebra. Because wide disparities in Algebra I enrollment exist for minority and low-income student populations (e.g., Anderson & Tate, 2008), moves to promote access to algebra for greater numbers of students are aligned with equity efforts to increase educational opportunities for marginalized populations. In this project, we refer to initiatives that seek to ensure that all students complete Algebra I (or its equivalent) at or before Grade 9 as *universal algebra enrollment by 9th grade policies (or UA9)*.[2] We use the phrase *selective algebra enrollment policies* to refer to policies that make use of some form of student screening (teacher/guidance recommendation, local or standardized assessment, prior achievement, etc.) to determine eligibility for a first-year algebra course.

Study Overview

The LANDSCAPE study uses a mixed methods design with two separate but related research components. Component 1 is a survey of a nationally representative sample of curriculum leaders, conducted in 2012, aimed at understanding trends in how pressures related to algebra are perceived and acted upon in policy and practice. Component 2, also conducted in 2012,

[2] We designate universal algebra policies in this report using the abbreviation UA. We also use the abbreviations UA9 to indicate universal algebra policies specifically at 9th grade, and UA8 to indicate universal algebra policies specifically at 8th grade.

encompasses 12 case studies that look more deeply at opportunities to learn algebra in four regions of the United States. This report disseminates findings from the Component 1 survey. Specifically, we make use of the survey data to address the following questions:

1. What requirements and policies do districts have in place for mathematics in general and Algebra I in particular?
2. What is the place of Algebra I in mathematics instruction in districts and what resources are used to teach it?
3. Who takes Algebra I, and when, and how do districts determine whether students are successful?
4. What teacher support and development resources do districts deploy related to mathematics and Algebra I?
5. How do district policies and perspectives address issues related to resource allocation, access, and readiness for Algebra I?

The Component 1 survey provides new and critical insight into Algebra I policy and practice for two reasons. First, the survey data reflect a nationally representative sample that directly reports on districts' policies and other information concerning Algebra I, including percentages of students enrolled at each grade level, course offerings related to Algebra I across the middle and high school grades, overall pass rates, instructional materials usage, teacher professional development, and assessment strategies. Second, the dataset captures an important moment in time for districts. Because the survey was administered during the early stages of the rollout of the Common Core State Standards, an adoption that initially affected 46 US states and territories, the results have the potential to illuminate the influence of a large-scale curricular shift in school mathematics on the teaching and learning of Algebra I in secondary schools.

In this report, we briefly describe how the survey was developed, administered, and analyzed. We then present the results of the survey, organized using the five questions above. In our analysis, we explore dimensions of the opportunities to learn Algebra I that are represented by our survey results.

The construct of *opportunity to learn* (OTL) has traditionally referred to time devoted to specific topics in the classroom (Floden, 2002). Hiebert (2003) argued that the nature and quality of that time must be taken into account, as well as the supports and structures that frame engagement with given tasks. Cohen, Raudenbush, and Ball (2003) suggest that examining instructional improvement through an OTL lens requires taking into account how a school system's resources are deployed and the supports that facilitate progress toward learning goals, rather than focusing on the garnering of resources. Because the algebra-related policies this report seeks to understand operate at the system level, the nature of their deployment and influence on classroom teaching and student learning depend on the system's strategic use of resources to support and foster progress toward the policy goal.

We frame our analysis using five dimensions of systemic opportunity to learn: (a) organization and sequencing of courses, (b) curriculum resources, (c) human resources, (d) assessment, and (e) supports for students. We argue that within a school district, students' opportunities to learn are shaped by the interaction of these dimensions. The *organization and sequencing of courses* refers to how algebra instruction and courses are packaged, including how they are structured, sequenced, and made available. *Curriculum resources* refers to the print and electronic curriculum materials and programs, including instructional tools, that are used, as well as how they are employed; these resources are a key component of the content that is offered in the name of Algebra I. *Human resources* refers to how professional expertise is deployed, including the use of external expertise and the development of internal capacity. *Assessment* refers to the approaches and tools used to assess students in relation to algebra learning, including how readiness or placement decisions are made, how progress is monitored, and how successful completion is determined. In addition, this dimension includes how students are expected to demonstrate knowledge and the kinds of understanding that are prioritized. Finally, *supports for students* captures the ways that districts mobilize resources (which may include human resources, curriculum, assessment tools, and the structure of learning opportunities) for the specific task of providing supports for students in relation to algebra learning. These supports may include just-in-time interventions for students as they take an algebra course, specific strategies for special populations (such as English language learners), remediation and differentiation strategies, and approaches to repeating algebra for students who are not successful.

The five dimensions of opportunity to learn examined in this research were identified based on their prominence in the policy and mathematics education literature. Historically, policy debates related to algebra have focused largely on the first OTL dimension—issues of course structure and offering (e.g., Biddle, 2013; Loveless, 2008). Research has investigated the effects of different grouping strategies (Burris, Heubert, & Levin, 2004, 2006; Slavin, 1990), scheduling formats (Lawrence & McPherson, 2000; Nomi & Allensworth, 2009; Skrobarcek et al., 1997), and acceleration into algebra and the criteria for doing so (Loveless, 2008; Stein et al., 2011). Findings are mixed, with recent studies suggesting that heterogeneous grouping has positive effects on student achievement in algebra. Increased time for a first algebra course has unclear results. A wider body of research has focused on the second dimension of OTL—the intersection of algebra and curriculum—with findings suggesting the importance of an approach to algebra rich in real-world mathematical tasks and multiple mathematical representations (e.g., Chazan & Yerushalmy, 2003; National Council of Teachers of Mathematics and the Mathematical Sciences Education Board, 1998).

Teacher quality and, in particular, teacher knowledge—the third dimension we take up in our analysis—is seen as a critical variable in OTL by both policy and educational researchers, especially in cases where algebra instruction takes place before 9th grade (e.g., Leinhardt, Zaslavsky, & Stein, 1990; National Mathematics Advisory Panel, 2008). Research has found important relationships between teacher knowledge and student achievement, which has prompted several corresponding efforts to provide professional development specifically targeted for algebra teachers (e.g., Driscoll, 1999; Hill & Dalton, 2013). The OTL dimension of assessment, especially high-stakes assessment, frequently influences what happens in the classroom and can drive curricular and pedagogical decisions (Au, 2007). Algebra has long been a focal point of assessments at the national level, alongside more recent initiatives to abandon minimum-competency exams in favor of end-of-course exams at district and state levels to measure successful student completion of a first algebra course (Center on Education Policy, 2008). Finally, the fifth OTL dimension—the ways in which districts mobilize supports for the teaching and learning of algebra—was identified as a key factor in the success or failure of algebra policy initiatives (Stein et al., 2011).

These five OTL categories are interrelated and, in some cases, overlapping. When considered together, they provide a rich, multidimensional portrait of the relationships between districts' priorities with respect to opportunities to learn and their policies and practice around a first course in algebra. Given that districts operate in a resource-constrained environment, it is likely that decisions are made about which aspects of opportunities to learn to invest in based on a district's priorities, population, policy, and practice. At the close of this report, we return to the five opportunities to learn and reflect on what the survey data suggest about the intersection of opportunity to learn and Algebra I policy.

Survey Design

The survey was created using total survey design (Fowler, 2002) with the goal of minimizing measurement error by considering all aspects of the survey design process at the beginning, and writing survey questions with end-analyses in mind. Drawing on literature in mathematics education and educational policy, we sought to identify aspects of Algebra I policy and practice related to the five opportunity-to-learn categories that a district leader would best be able to clearly identify and discuss. The design involved five phases, shown in Figure 0.1.

FIGURE 0.1. DEVELOPMENT PROCESS FOR THE LANDSCAPE SURVEY

Phase 1: Math Curriculum Leader Interviews

Interview 12 district math leaders representing a range of policy contexts

Phase 2: Survey Questions Development

Develop survey questions with fixed-response choices

Phase 3: Expert Review and Revision

Revise survey questions based on feedback from project advisory board and external evaluator

Phase 4: Survey Pilot with Representative Sample

Identify and recruit representative sample to pilot the survey (163 districts sampled, 38 responses)

Phase 5: Cognitive Interviews

Conduct cognitive interviews with 10 districts from the pilot sample to explore response meanings

Following these five phases, we made final revisions and then administered the survey using Qualtrics online survey software.[3] The final survey included six main categories:

A. Mathematics Requirements and Course Offerings in Your District
B. Algebra Requirements and Course Structure
C. Early Algebra Completion
D. Professional Development
E. District Demographics
F. Respondent Demographics

Sampling and Data Collection

Our goal in determining sample design was to create a sample that was as representational as possible with respect to three key features of school districts: policy grouping, district size, and population density.

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[3] Specific questions are included in the results sections of this report.

To begin this process, we first needed to identify our population. We used the Common Core of Data (National Center for Education Statistics [NCES], 2011) to collect contact and demographic information about all public school districts in the United States. The US Department of Education identifies school districts[4] by seven different categorizations, only three of which we included in our population: local school district, local school district component of supervisory union, and supervisory union administrative center. We did not include charter school, a category identified as school districts by the US Department of Education, or other specialized school districts such as juvenile detention centers. We also removed the smallest 2.5% of school districts. These districts all had fewer than 42 students. The remaining school districts are our population, and the Common Core dataset acted as the foundation for our sampling frame. To complete the sampling frame, we identified district leaders along with e-mail addresses using publicly available information.

Policy Grouping

Notably, despite the growing national consensus about the importance of algebra, there has been no mechanism for taking stock of how states and local districts are responding to pressures for universal Algebra I. Since these pressures can most readily be seen by examining states' efforts to set graduation requirements in mathematics, we organized states into four different policy categories. Table 0.1 identifies differences among states in terms of their adoption of what the American Diploma Project (Achieve, 2009) termed "college- and career-ready curriculum" (CCRC), or 4 years of challenging mathematics. Given the timing of our survey in the fall of 2012, CCRC "By 2011" represents districts in the process of implementing new policy. CCRC "By 2015" represents districts planning for an upcoming transition.

TABLE 0.1 STATE POLICIES FOR GRADUATION REQUIREMENTS: ACHIEVE'S AMERICAN DIPLOMA PROJECT

All students must enroll in CCRC[a]		Plans to increase rigor of graduation requirements	Has no plans to increase rigor of graduation requirements
By 2011	By 2015		
Policy Grouping 1: AR, DC, DE, IN, MI, NY, OK, SD, TX (3,509 districts total)	*Policy Grouping 2*: AL, AZ, GA, KY, LA, MN, MS, NC, NM, OH, TN, WA (2,468 districts total)	*Policy Grouping 3*: CT, FL, HI, MD, NJ, RI, UT, WI (1,324 districts total)	*Policy Grouping 4*: AK, CA, CO, IA, ID, IL, KS, MA, ME, MO, MT, ND, NE, NH, NV, OR, PA, SC, VA, VT, WV, WY (5,774 districts total)

[a]Some of these states have or will include an opt-out provision. Given the newness of these policies, however, we are skeptical that the process for opting out will be defined enough that there will be a pervasive use of that option. Thus, we group together the states that require enrollment in CCRC.

[4] Our sampling included some unified districts that comprised only K-8 or 9-12 schools. In situations where districts comprised only K-8 or 9-12 schools, respondents were asked to answer the questions relevant to their district to the best of their knowledge.

District Size

Larger districts tend to have more administrative layers and, as a result, more capacity in terms of central administration. To account for this important difference, we separated districts into "large" and "small" districts based on enrollment, using a cut-off of 4,000 students to demarcate size. Based on this demarcation, large districts account for 19% of districts nationwide, and small districts account for 81% (NCES, 2011).

Urbanicity

We use the term *urbanicity* to describe the population density of the community in which a school district is located. This term is based on the NCES construct of Urban-Centric Locale Codes (NCES, 2011). NCES categorizes the community in which a school district is located into four large-grain categories: urban, suburban, town, and rural. Because the categories of suburban and town have similar population densities, we combined them to simplify our analysis.

Creating the Sample

Our sampling process yielded three sampling strata: state algebra policy grouping, district size, and urbanicity grouping. We sampled disproportionately from the first two strata and proportionately from the third, as described below.

Sampling from Algebra policy grouping

Because algebra policy was a main focus of the study, we wanted to have enough respondents in each grouping to make arguments about the relationships between state algebra policy and district algebra policies.

Sampling from district size grouping

The natural occurrence of large to small districts is 19% to 81%. We decided to sample a larger proportion of large districts because they represent a greater proportion of students. We shifted the proportion in our sample to 40% large districts and 60% small districts.

Sampling from urbanicity grouping

Urban districts comprise only about 6% of the total population from which we would draw our sample, and we considered urban districts as likely to differ in important ways regarding Algebra I policy and practice. As such, we investigated the necessity of oversampling urban districts. The disproportionate sampling based on district size helped achieve this goal of oversampling urban districts. To ensure that we did get enough urban districts, however, we stratified based on population density. This was done into three groups: urban, suburban/town, and rural. We sampled *proportionately* from these three groups.

Distribution and Response Rate

We sought to administer the survey to the individual within a school district most clearly responsible for decisions in mathematics education. Our reasoning for this decision was that this person would be well equipped to answer both data-oriented and philosophical questions regarding Algebra I policy and practice. We identified this person by searching the website of the school district as well as state databases. In larger districts, the decision maker tended to be a mathematics coordinator or an assistant superintendent for curriculum and instruction. In smaller districts, this person tended to be a superintendent, principal, or teacher. The person we selected was asked to confirm that he or she was the individual responsible for district policies concerning Algebra I, and to pass the invitation on to the appropriate person if we erred in our original identification. Throughout this report, we refer to this person as the *district leader* or *district decision maker.*

An initial sample of 2,800 school districts was drawn and then divided into six replicates of approximately 467 school districts each. This was to account for potentially low response rates. Three replicates were randomly chosen in the spring of 2012 and invited to participate in the survey ($N = 1{,}400$). A five-points-of-contact strategy was used to incentivize participation. Due to a low response rate, we randomly selected two additional replicates and sent them invitations in the fall of 2012. In total, we invited 2,332 school districts to participate in the survey. Our efforts solicited 1,192 responses over a 6-month period. Following data cleaning to account for incomplete and duplicate responses, the final dataset contained survey responses from 993 school district decision makers, yielding an overall response rate of 43%. The distribution of the districts with respect to state policy grouping and urbanicity was statistically representative of our intended sample, showing no evidence of response bias by policy grouping[5] or by urbanicity.[6] Our response rate with respect to district size, however, was skewed in favor of larger districts.[7] Although our sample is not biased in relation to policy grouping or urbanicity, it is biased in relation to district size, and thus we do not extrapolate from findings related to this factor. In sum, we find that our actual sample was representative of the intended sample (with the exception noted of district size), which in turn was designed to be representative of the nation. Findings in the report, as such, can be taken as nationally representative with the exception of district size. Additional technical information about the sample can be found in Appendix B, including a specific demographic breakdown of the respondents.

Data Analysis

In the chapters that follow, we describe the results of the survey, arranged by sets of survey items that present different aspects of the landscape of Algebra I policy and practice. We present both descriptive and inferential statistics where appropriate to describe the nature of Algebra I policy and practice at a national level. Our unit of analysis is the school district. All data were analyzed

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[5] X^2 (3) = .721, p>.05
[6] X^2 (2) = 3.994, p>.05
[7] X^2 (1) = 26.439

using SPSS 22, and the data were weighted to be representative of a simple random sample of all school districts in the United States. The Complex Samples Modules was employed to produce unbiased standard error estimates. As we used weighted data, we often report only the percentages of respondents rather than actual frequencies. Because our sample is largely reflective of the nation, we present weighted data in all figures in tables unless otherwise noted. Percentage of respondents reported is thus intended to be representative of percentage of districts in the nation (with the possible exception of the demographic of district size). We relied on cross tabulations to describe the distribution of the data and chi-square tests to identify analytical categories where district response patterns differed significantly at the p =.05 level for categorical items. For continuous items, we relied on descriptive statistics (e.g., means) and the general linear model to test for significant differences at the p =.05 level. Standard errors were used with both categorical and continuous data to build 95% confidence intervals around statistics to determine if there were statistically significant group differences.

Chapter 1
The Place of Algebra I: District Requirements and Policies

In this chapter, we report findings related to state and district mathematics graduation policies. The findings come from two sets of questions in the survey. The first set inquired about state and district policies related to the number of high school-level mathematics courses required for graduation. The second set inquired about state and district policies related to Algebra I requirements for graduation. Both sets of questions followed a similar course, probing respondents about state policies, the alignment between state and district policies, the age of district policies, and plans for changes to those policies.

The main findings are summarized below.

State policies mandate mathematics to graduate.

–Most states require a certain number of math courses and the passing of Algebra I.
–State mandates are usually met, but not exceeded, by districts.

Most districts have rigorous math course requirements.

–Most districts require three or more math courses to graduate, including Algebra I.
–The majority of math policies were over 5-years-old at the time of the survey.

There are few mandates for 8th-grade Algebra I.

–Most districts require Algebra I for graduation, but not by a certain grade.
–Few districts have 8th-grade Algebra I policies.
–Very few have plans to change 8th-grade Algebra I policies in coming years.

States Mandate Mathematics

Across the United States, high school graduation requirements with respect to mathematics tend to be uniformly regulated at the state level, and local school districts tend not to deviate from the state policy. These requirements include both the number of high school-level mathematics courses required for graduation as well as whether Algebra I, specifically, is identified as being required. Local school districts have the authority to determine how these mandates are met in setting local policies.

The vast majority of districts, 93.8% (*SE* = 1.1), reported that their states mandated a minimum mathematics requirement for graduation. An additional 4.7% (*SE* = 1.0) of districts indicated they were in states that recommended, but did not require, a minimum number of mathematics credits for graduation. Only 1.5% (*SE* = 0.6) of districts reported being in states that do not mandate or recommend mathematics graduation requirements. These data reveal that states are almost universally the entity responsible for setting mathematics graduation minimums across the nation.

Looking at district accordance with state policies, we see that a majority of districts tend to match state policies. Of the 93.8% of districts reporting that their states mandate minimum mathematics requirements for graduation, 84.8% (*SE* = 1.5) reported that they match the mandate, meaning that only 15.2% (*SE* = 1.5) of those districts reported exceeding the mandate. Of the 4.7% of districts in states with minimum mathematics recommendations, about half reported matching state recommendations and half reported exceeding those recommendations. Finally, of the 1.5% of districts without state mandates or recommendations, 78.4% (*SE* = 15.7) reported having minimum mathematics requirements. When looking across all state and school district policies, an estimate of only 0.3% of districts in the United States—21.6% (*SE* = 15.7) of the 1.5% of districts in states without mandates or recommendations—do not have minimum mathematics requirements for graduation. Looking across the data presented here, we see that a large majority of district policies mirror state policies, and that nearly all districts have state minimum requirements for graduation. The data are summarized in Table 1.1.

We find nearly the same trends when looking at district policies related to Algebra I requirements for graduation. The vast majority of districts, 87.2% (*SE* = 1.4), reported that their state had a mandated Algebra I policy for graduation, with an additional 9.9% (*SE* = 1.4) reporting that their state recommends but does not mandate Algebra I completion.[8] Again, a very small percentage of districts report that their states have no mandate or recommendation. Like minimum mathematics requirements, we find that nearly all districts are in states that set an Algebra I requirement for graduation, though there is a slightly higher chance that the policy is a recommendation rather than a mandate as compared with the minimum mathematics policies.

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[8] A note about the interpretation of these results. While it may seem that it should be straightforward to determine which states mandate Algebra I for graduation and which do not, state policy is often murky. For example, one large Mid-Atlantic state requires a certain number of mathematics courses for graduation but does not specifically name Algebra I as a requirement. Their assessment practices, however, include an Algebra I end-of-course exam for all students. As such, a district leader may or may not interpret Algebra I as a requirement. Because our focus in this report is to understand policy in practice, we argue that district leaders' interpretation of state policy is more relevant than the gestalt of the policy itself, as district leaders' interpretation is likely to be what guides district practice.

TABLE 1.1 DISTRICT POLICIES IN RELATION TO STATE REQUIREMENTS

	% of all districts	*SE*	% of districts w/n group	*SE*
State mandate	93.8%	1.1		
Match mandate			84.8%	1.5
Exceed mandate			15.2%	1.5
State recommendation	4.7%	1.0		
Less than recommended			1.8%	1.4
Match recommended			43.3%	10.8
Exceed recommended			54.9%	10.8
No state mandate/recommendation	1.5%	0.6		
Has requirement			78.4%	15.7
No requirement			21.6%	15.7

District-reported accordance with state Algebra I policies also matches the trends found with state mathematics course requirements (see Table 1.2). Of the districts reporting that they are in states with a mandated Algebra I requirement, 91.9% (*SE* = 1.3) reported that their policies match the state mandate. Of the districts that reported being in states with Algebra I recommendations, only 57.7% (*SE* = 7.6) match the state recommendation. Most of the districts in states without mandates or recommendations related to Algebra I completion still require completion at the district level. A small percentage of all districts, 1.6% (7.9% of the 9.9% with state recommendations and 29.2% of the 2.9% of districts with no state recommendation or mandate), reported having no Algebra I requirement for graduation. Given that Algebra I tends to be the first high school-level mathematics course and that 99.7% of districts have a minimum mathematics requirement, Algebra I is probably required, de facto, in all of these districts.

TABLE 1.2 DISTRICT ALGEBRA I POLICIES IN RELATION TO STATE REQUIREMENTS

	% of all districts	*SE*	% of districts w/n group	*SE*
State mandate	87.2%	1.4		
Match mandate			91.9%	1.3
Exceed mandate			8.1%	1.3
State recommendation	9.9%	1.4		
No requirement			7.9%	3.6
Less than recommended			0.7%	0.7
Match recommended			57.7%	7.6
Exceed recommended			33.7%	7.4
No state mandate/recommendation	2.9%	0.7		
Has requirement			70.8%	12.2
No requirement			29.2%	12.2

Rigorous Expectations

We next look at whether Algebra I is required for graduation and, if so, whether any time constraints are imposed. We found that districts overwhelmingly require Algebra I for graduation. Districts overwhelmingly do not, however, require Algebra I to be completed by 8th grade, and a majority of districts do not require Algebra I to be completed by any grade. Second, we found that while the requirement of four high school–level mathematics courses for graduation is not the norm, most districts have policies that require three or more mathematics courses. In other words, while most districts are not meeting the high standard set by Achieve (2009) and others, most do require something approaching that high standard.

We found that 37.7% (*SE* = 1.7) of districts reported requiring a college- and career-ready mathematics curriculum of four or more challenging mathematics courses for graduation and that an additional 53.4% (*SE* = 1.8) reported requiring three mathematics courses for graduation. Together, that is an impressive 91.1% of districts in the United States reporting that they require three or more mathematics courses for graduation. Rounding out the districts that reported requiring fewer courses for graduation, 6.8% required two, 0.4% required one, and 1.6% had no minimum mathematics requirements.

We also asked district decision makers about the grade levels in which enrollment in a mathematics course was required. Our findings are very similar to those concerning mathematics course requirements, with 39.1% of districts requiring enrollment in mathematics courses throughout all of high school, and a total of 83.6% of districts requiring mathematics for either 3 or 4 years (see Table 1.3). Captured in a different way, the vast majority of districts require a strong mathematics sequence that is approaching, but has not yet arrived at, the college- and career-ready mathematics curriculum.

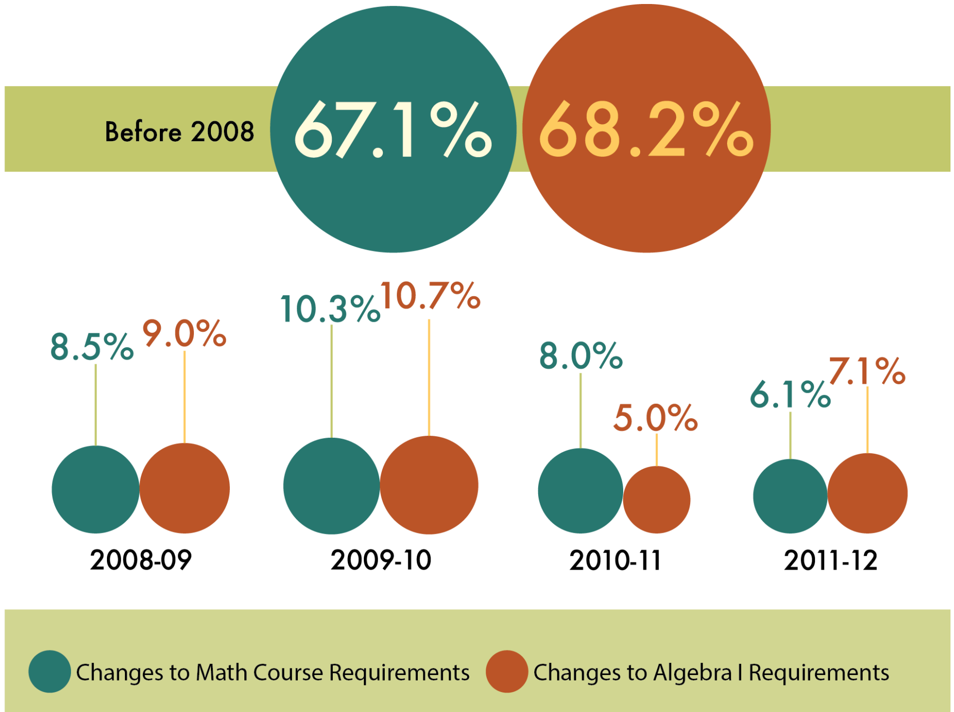
TABLE 1.3 MATHEMATICS GRADE-LEVEL ENROLLMENT REQUIREMENTS

	% of districts	*SE*
No requirements	4.4%	0.9
9th grade only	2.7%	0.8
Up to 10th grade	9.4%	1.2
Up to 11th grade	44.5%	2.1
Up to 12th grade	39.1%	1.9

Static Graduation Policies

A large majority of school districts reported implementing their current mathematics course requirements and Algebra I requirements during or before the 2007–2008 school year (see Figure 1.1).

FIGURE 1.1. CHANGES TO MATHEMATICS AND ALGEBRA I REQUIREMENTS BY YEAR



At the time of the survey, completed in the fall of 2012, 67.1% (*SE* = 1.8) of districts' mathematics course requirements were from the 2007–2008 school year or earlier. Additionally, 68.2% (*SE* = 1.9) of districts' Algebra I policies were from the same era. In other words, two thirds of all districts had mathematics course requirements and Algebra I policies that were at least 5 years old. The implementation of mathematics course requirements and Algebra I policies for the remaining districts policies were somewhat evenly spread over the 4 years leading up to the survey, with a slight increase in policies being implemented in the 2009–2010 school year.

Few Districts Require 8th-Grade Algebra I

Most school districts in the United States, 91.7% (*SE* = 1.2), have a local policy requiring Algebra I for graduation. This finding is not surprising given data previously presented relating to state mandates. What is surprising is that just over half of those districts (52.2%, *SE* = 2.1) do not require Algebra I to be completed by a specific grade, as shown in Table 1.4 Out of all districts, 22.1% (*SE* = 1.6) reported requiring Algebra I to be completed by the end of 9th grade. Very few districts, only 6.4% (*SE* = 1.0), report having policies requiring students to complete Algebra I by the end of 8th grade, and the majority of these respondents were from Minnesota, the only state at the time of the survey to require that Algebra I be completed by all students by the end of 8th grade.

TABLE 1.4. DISTRICTS REQUIRING ALGEBRA I COMPLETION BY A CERTAIN GRADE

	Estimate	Standard Error
The end of 8th grade	6.4%	1.0%
The end of 9th grade	22.1%	1.6%
The end of 10th grade	7.5%	1.2%
The end of 11th grade	1.4%	0.6%
The end of 12th grade	10.4%	1.3%
My district does not have a requirement for when students complete Algebra I	52.2%	2.1%
Total	100.0%	0.0%

Of the districts with Algebra I graduation policies that do not require completion by 8^{th} grade, only 8.5% (*SE* = 1.2) reported having a plan to implement an 8^{th}-grade requirement. Of those districts that reported they were planning to implement an 8^{th}-grade Algebra I policy, 91.7%, planned to do so within the 3 years following the survey. Of the 8.3% of districts that reported having no Algebra I graduation policy, only 22.6% (*SE* = 6.2) planned to implement one in the 5 years following the survey, and only 22.5% (*SE* = 13.1) of those districts planned to require all students to complete Algebra I by the end of 8^{th} grade. All combined, this group planning to require Algebra I by the end of 8^{th} grade makes up roughly 0.4% of our sample.

Key Takeaways

State policies mandate mathematics to graduate.

–Most states require a certain number of math courses and the passing of Algebra I.

–State mandates are usually met, but not exceeded, by districts.

Our first finding is not surprising. According to our respondents, course requirements concerning high school–level mathematics and Algebra I tend to be mandated by state policies. Most school districts do not exceed these state policies. What are possible explanations for this? Are state policies robust enough that districts do not feel the need to exceed them? Are state policies so responsive to national conversations about movements like the Common Core State Standards that districts do not see the need to make changes on their own? Regardless of the answers to these questions, given that state policies set minimum requirements for most school districts in the country, and that districts tend not to exceed these state minimums, it appears that change in local district policies may be best pursued at the state level.

Most districts have rigorous math course requirements.

–Most districts require three or more math courses to graduate, including Algebra I.
–The majority of math policies were over 5-years-old at the time of the survey.

The LANDSCAPE study was created to look into the purported recent phenomenon of Algebra I enrollment being pushed earlier in schools. That push has been accompanied by increased expectations for students by the time they graduate high school, such as the college- and career-ready curriculum (Achieve, 2009) that includes 4 years of challenging high school–level mathematics. We found that 37.7% of districts have a college- and career-ready curriculum in mathematics and that 91.1% reported requiring three or four math classes for graduation. Indeed, districts are meeting, or approaching, the rigorous level set by Achieve. An important caveat, however, is that we have little information about what these courses might be. For example, do districts award high school credit for pre-Algebra I mathematics content, such as a consumer mathematics course focused on arithmetic-centric tasks?

Most districts report that their mathematics graduation policies have not changed in the past 5 years. This reported policy status contrasts with the ongoing policy discussions and recent papers suggesting that more challenging policy contexts are the driving force pushing more students into Algebra I too early (Loveless, 2008). While enrollment in early Algebra I may have been increasing, this increase does not appear to be connected to changes in district graduation policies. Roughly one third of districts report enacting new mathematics course requirements and Algebra I policies within the 5 years leading up to the survey. Overall, however, a majority of districts report maintaining policies that are over 5-years-old, indicating that most districts were not making changes in their policies during a time when mathematics requirements and early Algebra I were staples in the national dialogue.

There are few mandates for 8th-grade Algebra I.

–Most districts require Algebra I for graduation, but not by a certain grade.
–Few districts have 8th-grade Algebra I policies.
–Very few have plans to change 8th-grade Algebra I policies in coming years.

This finding challenges, at some level, reports concerning the heightened enrollment of students in 8th-grade Algebra I (e.g., Loveless 2008, 2013). While Algebra I is required for graduation, the majority of districts do not require Algebra I to be completed by any grade. Furthermore, only 6.4% of districts require Algebra I to be completed by 8th grade. In sum, the trend of more students enrolling in Algebra I in 8th grade appears to be unrelated to any policy requiring Algebra I completion by a certain grade.

One possible explanation for the lack of 8th-grade Algebra I policies and the lack of changes in district mathematics policies is that policy does not necessarily dictate practice. District practices may include students taking four high school-level mathematics courses before graduating even though they are not required to do so. Similarly, district practices may include students taking Algebra I early even though no such requirement is in place. In other words, district policies might not be keeping up with the national conversation around these issues, but district practices might be.

A second possible explanation draws from across our findings. A large majority of districts require three or more mathematics courses for graduation, and most of these policies were more than 4-years-old at the time of the survey. This means that most districts were already requiring a robust high school mathematics curriculum before the American Diploma Project set its slightly higher standard of four mathematics courses. Districts, and the states that overwhelmingly influence district policies through mandates, could have changed their policies toward the beginning of the national conversation about increasing the number of mathematics courses required for graduation. Alternatively, they might have felt that their requirements were close enough and so did not warrant changing. As for policies concerning 8th-grade Algebra I, while most districts may not require students to complete Algebra I by 8th grade, the current requirements for most high school mathematics curricula necessitate that Algebra I be taken by 9th grade or possibly earlier to ensure that all students complete enough required high school–level mathematics courses by the end of 12th grade.

In sum, the fact that 91.1% of districts require at least three mathematics courses for graduation can help us to understand both why districts have not changed their mathematics policies recently and how this might also lead to higher enrollments in early Algebra I.

Chapter 2
Mathematics Instruction in Secondary Schools and the Place of Algebra I in a Mathematics Sequence

In this chapter, we present survey findings regarding Algebra I offerings—the nature and organization of the first-year algebra course, the ways in which students are afforded access to it, how students are grouped within course sections, and the amount of time afforded to the teaching and learning of Algebra I. Next, we identify the dominant patterns in districts' primary and supplemental curriculum selection for Algebra I at the middle and high school levels. The chapter closes with a brief analysis of district leaders' perspectives on current trends and future changes to course and class structures that relate to Algebra I.

The chapter's main findings are summarized below.

The organization of math content changes in secondary grades.

–Integrated approaches are more strongly represented in middle grades.

–At 8th grade, there is a strong shift to content specificity (algebra, geometry).

Heterogeneous grouping starts dominant and fades over time.

–6th and 7th grade are largely heterogeneously grouped.

–Starting in 8th grade, there is a near-even split in grouping strategies.

Time for mathematics declines from Grade 6 to 10.

–Students on average experience 7 fewer minutes per day between Grades 6 and 10.

Publisher-authored curricula dominate the landscape.

–Majority were more than 5-years-old at the time of the survey.

–No single support material is dominant to help struggling learners.

–Curriculum is seen as a primary resource for change in instruction.

Mathematics in Secondary Schools: Content Organization and Student Grouping

We set the stage for our analysis of Algebra I course offerings and curriculum with a high-level portrait of how districts organize courses and students in secondary mathematics. We consider the entire mathematics spectrum, both to examine changes and trends at the nexus of middle and high school and to acknowledge that structure and grouping in Algebra I do not occur in a vacuum; rather, they often are a consequence of school- or district-level practices in mathematics.

Organizing Mathematics Courses: Content Focused versus Integrated

Historically, mathematics content in high schools has been most commonly organized by topic—Algebra I, Geometry, Algebra II, Trigonometry/Precalculus, and Calculus—and frequently in that order. Some recent curriculum development projects, however, have reorganized content in a more integrated way, similar to conventions in many other countries (e.g., Grouws et al., 2013; Senk & Thompson, 2003). Middle grades mathematics have most commonly featured courses that are not focused on specific topics (e.g., math 7, math 8), with the exception of pre-algebra and Algebra I offerings that are often restricted to students who qualify to take them. Question A10 (Figure 2.1) of our survey asked about how districts organized course offerings in Grades 6–10 with respect to content.

FIGURE 2.1. QUESTION REGARDING DISTRICT COURSE OFFERING ORGANIZATION

A10. At each grade level, please select the structure that most closely matches how your district's mathematics classes are structured.
Classes that are structured by content are separated by topic, such as Algebra, Geometry, Algebra II, etc. Classes that are integrated feature aspects of different content areas in a single class, and are sometimes named Integrated I, II, III or Math I, II, and III. Select both if your district offers students the option of either a content-structured or integrated track.

	Content	Integrated	Both
6th grade	❍	❍	❍
7th grade	❍	❍	❍
8th grade	❍	❍	❍
9th grade	❍	❍	❍
10th grade	❍	❍	❍

Table 2.1 shows a general trend from a balance of content-focused and integrated mathematics in Grade 6 to the dominance of a content-focused organization by high school. A clear transition is evident in Grade 8, where content-focused and integrated offerings are present in nearly a quarter of districts. It is likely that this transition, which appears to begin in Grade 7, marks the offering of pre-algebra and algebra-focused courses for a portion of the student population. It is also clear that content-focused course organization continues to dominate the high school landscape, with only about 14% of districts offering integrated mathematics or an integrated option in Grades 9 and 10. Very few districts offered a complete set of integrated mathematics course experiences for students; 33 districts (unweighted count) responded that they offered integrated mathematics at each grade from 6 through 10.

TABLE 2.1 PERCENT OF DISTRICTS ORGANIZING MATHEMATICS CONTENT IN DIFFERENT WAYS (*SE*)

	Content	Integrated	Both	No knowledge
6th grade	46.9% (2.0)	42.4% (1.9)	9.3% (1.3)	1.4% (0.5)
7th grade	50.3% (2.0)	36.0% (1.9)	12.7% (1.4)	1.0% (0.4)
8th grade	57.4% (2.0)	17.8% (1.5)	23.8% (1.7)	1.0% (0.4)
9th grade	84.8% (1.5)	4.1% (0.7)	9.3% (1.3)	1.8% (0.6)
10th grade	83.8% (1.5)	3.8% (0.6)	10.6% (1.3)	1.8% (0.6)

Organizing Mathematics Students: Heterogeneous versus Homogeneous Grouping

A wide array of research has studied the deleterious effects of tracking (i.e., grouping of students based on perceptions of ability) on students' mathematical achievement (see Boaler, 2011; Oakes, 2005 for a summary). But we have little systematic knowledge of how and when districts begin tracking students, whether or not tracking procedures shift over time, or the extent to which districts have abandoned tracking practices. Question A11 (Figure 2.2) asked district leaders to characterize their tracking practices for Grades 6–10.

FIGURE 2.2. QUESTION REGARDING STUDENT GROUPING STRATEGIES

A11. At each grade level, select the way in which students are grouped within classes that best matches your district's practice.

	Heterogeneous (Mixed Ability)	Homogeneous (Similar Ability)
6th grade	❍	❍
7th grade	❍	❍
8th grade	❍	❍
9th grade	❍	❍
10th grade	❍	❍

Table 2.2 shows district reports of their grouping practices. Similar to the data regarding content organization, Grade 8 represents a transition point, where districts shift toward homogeneous grouping.

TABLE 2.2 MATHEMATICS GROUPING STRATEGIES IN GRADES 6–10 (*SE*)

	Heterogeneous	Homogeneous	No knowledge
6th Grade	82.5% (1.4)	16.1% (1.4)	1.4% (0.4)
7th Grade	70.3% (1.7)	28.4% (1.7)	1.3% (0.4)
8th Grade	56.3% (1.9)	42.3% (1.9)	1.3% (0.4)
9th Grade	55.4% (1.9)	43.0% (1.9)	1.6% (0.5)
10th Grade	55.5% (1.9)	42.9% (1.9)	1.6% (0.5)

We investigated this phenomenon further by categorizing districts according to whether or not they changed their grouping strategies from one to the other between Grades 6 and 10; results are shown in Table 2.3. Of districts that changed, the plurality moved to a homogeneous grouping strategy. Looking across the two tables, nearly all districts that used a homogeneous grouping strategy maintained that strategy consistently across middle school and early high school grades.

TABLE 2.3 CHANGES IN GROUPING STRATEGIES ACROSS GRADES 6–10 (*SE*)

	Percentage of Districts
All heterogeneous	45.4% (1.9)
All homogeneous	11.2% (1.2)
Changes to homogeneous	30.8% (1.9)
Changes to heterogeneous	9.7% (1.2)
Other	3.0% (0.7)

Investigating district interpretation of heterogeneous and homogeneous. While we attempted to define what we meant by heterogeneous and homogeneous grouping, we do not know where district leaders may have drawn the line between a mixed-ability and a similar-ability grouping strategy. For example, how might a district leader categorize a middle school in which a small, select group of students (less than 10%) took Algebra I, but all other students took a heterogeneously grouped Math 8 course? To interpret response patterns more accurately, we examined our 12 in-depth case studies alongside their survey responses to determine what a district leader might "count" as heterogeneous.

In general, districts indicated they used heterogeneous grouping if there were no more than two pathways at any grade level through mathematics, and if at least 75% of students were included in the main pathway. For example, one district that reported using heterogeneous grouping enrolled approximately 20 to 25 8th graders in Algebra I; this group represented one out of seven or eight 8th-grade mathematics sections offered each year. One of the 12 districts did report a single track, which was attributed to being a small district and not being able to hire staff to teach

Algebra I courses prior to high school. Although such an arrangement is not strictly heterogeneous in that not every student had an equally likely chance of being in one section or another, this response seems to reflect how districts might interpret the idea of heterogeneous grouping. In contrast, districts that indicated their grouping was homogeneous offered on average three separate tracks for students, with a maximum of five tracks offered by one district at a particular grade level. In sum, the examination of the case study responses suggests that when districts selected heterogeneous grouping, they meant no or minimal ability grouping or tracking. When they selected homogeneous grouping, they meant significant ability grouping or tracking, usually with three or more tracking choices for students in Grades 6–12.

Time Spent in Mathematics Courses

To better understand similarities and differences between mathematics course offerings, we asked districts how mathematics courses were organized within the school year—as full-year, semester, trimester, or quarterly offerings—and the average number of minutes per day devoted to mathematics (see Table 2.4).[9]

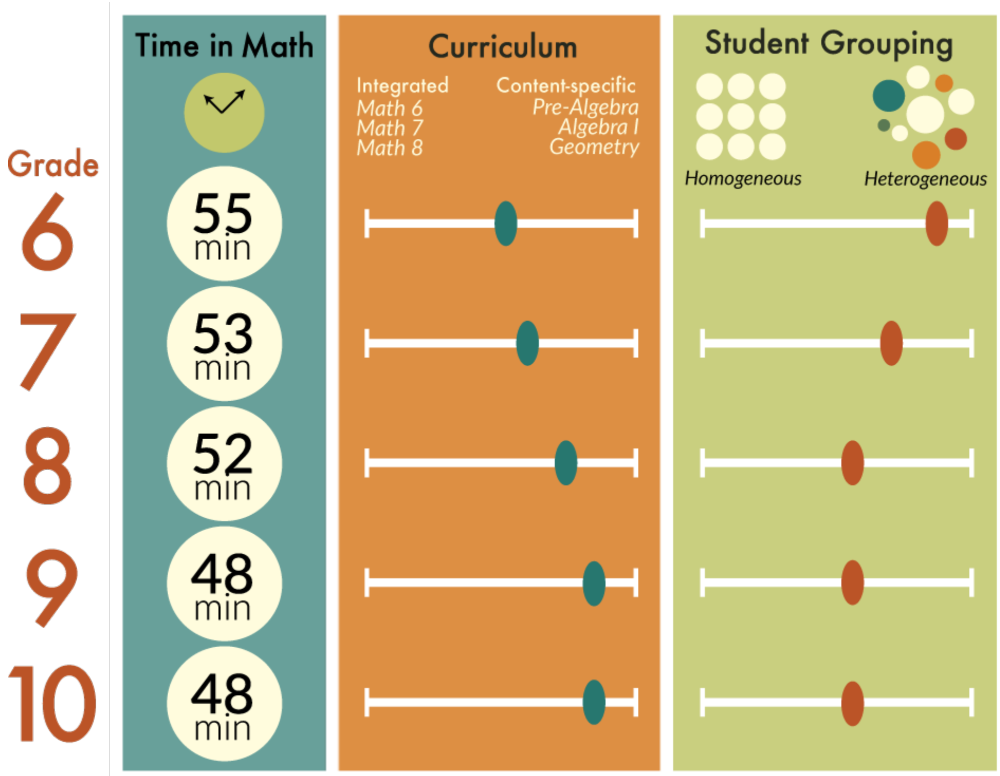
TABLE 2.4 MATHEMATICS COURSE OFFERING DURATIONS, GRADES 6–10 (*SE*)

	Average Daily Minutes	Full Year	Semester	Quarter	Trimester
6th Grade	55.4	98.7% (0.4)	0.6% (0.3)	0	0.7% (0.4)
7th Grade	52.7	98.5% (0.5)	0.7% (0.3)	0	0.7% (0.4)
8th Grade	52.2	97.4% (0.7)	1.4% (0.5)	0.3% (0.3)	0.9% (0.4)
9th Grade	48.2	84.5% (1.5)	12.1% (1.3)	0	3.4% (0.8)
10th Grade	48.0	83.5% (1.5)	12.9% (1.4)	0	3.6% (0.8)

We use these data sources to compile a portrait of the typical mathematics class students will experience in Grades 6–10 by time, content organization, and student grouping (Figure 2.3). This portrait is purely descriptive, meant to paint a picture of the typical mathematics class rather than to identify specific differences from one grade level to the next.

[9] The survey also asked districts whether they offered mathematics on a daily or nondaily (alternating A/B or similar) schedule. Based on the data we obtained, there appear to have been significant problems with question interpretation. Because of this confusion, we restricted our analysis of mathematics class time to districts with daily mathematics offerings. Districts with nondaily math schedules represented about 12% of the sample.

FIGURE 2.3. A PORTRAIT OF A TYPICAL MATHEMATICS CLASS BY TIME, CURRICULUM, AND STUDENT GROUPING



Curriculum Materials for Teaching and Learning Algebra

Just as course structure provides a structural frame for students' opportunities to learn mathematics, curriculum materials provide a content frame for students' opportunities to learn. The past 20 years have seen the emergence of two contrasting curricular approaches—commercial publisher-authored curricula, which represent a traditional organization of content and support (explicitly or implicitly) more teacher-driven pedagogies; and project-authored reform curricula, frequently authored by research groups or educational foundations, focused on problem solving and sense making using rich instructional tasks (see Stein, Remillard, & Smith, 2007, for a review). Curriculum implementation research has strongly indicated that reform curricula provide similar student learning outcomes to publisher-authored curricula on procedural measures, and stronger outcomes on conceptual measures (e.g., Grouws et al., 2013; Senk & Thompson, 2003). With this in mind, we asked districts to identify the textbooks used in their middle and high schools for the teaching and learning of algebra. We also asked what support and online materials were being used in conjunction with the primary curriculum resources.

Textbook Use: A Story of the Status Quo

Most districts responding to the survey were using traditionally structured textbooks authored by publishers to teach Algebra I, both in middle school and high school.[10] When districts were asked to identify their core text for the teaching of algebra in high school (*n*=543), the four most prevalent responses were Pearson Prentice-Hall Algebra I (18.6%), Glencoe McGraw Hill Algebra I (17.5%), Algebra 1 McDougall Littell (14.5%), and Holt Algebra I (11.6%). Results at the middle school level were similar, with a notable exception (*n*=546). The five most popular programs were Glencoe McGraw Hill Algebra I (16.1%), Pearson Prentice-Hall Algebra I (13.1%), Connected Mathematics (10.0%), Holt Algebra I (9.3%), and Algebra 1 McDougall Littell (8.8%). The presence of Connected Mathematics on this list is notable, both because it is the only middle school–specific curriculum in the list of most popular series identified in our sample, and because it is the only series appearing that is not commercially developed. An analysis of middle and high school pairings suggests a strong consistency in the teaching of algebra from middle to high school; the four most frequent pairs of middle and high school curriculum were the four publisher-branded curricula named earlier (Glencoe McGraw Hill, Pearson Prentice-Hall, McDougal Littell, and Holt).

At the middle and high school levels, few supplemental/remedial (*n*=114 high school, *n*=117 middle school) or online (*n*=302) resources were identified as in use by districts. No dominant patterns were discernable, although Khan Academy and Study Island were the most frequently identified supplemental programs, but these were noted as in use as either online or remedial resources by fewer than 4% of all responding districts. Overall, 97% of responding districts indicated using some sort of calculator at the middle and high schools, with 71% of those districts reporting using graphing calculators.

These data suggest that with respect to curriculum resources, opportunities to learn are dominated by publisher-branded curriculum and marked by a relatively strong consistency from middle school to high school in terms of program brand. Few online, supplemental, or remedial resources were explicitly identified by districts, although graphing calculator use is relatively common across districts.

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[10] Complete responses to the set of survey questions on core and supplementary instructional resources were rare; thus, the percentages reflect the number of responses provided. The number of districts reporting is given in parentheses.

Looking Forward: Curriculum and Course Structure Changes Anticipated by Districts

Two sets of questions sought to capture factors that districts felt were likely to influence algebra instruction, and where they felt they could make changes. Questions C6 and C7 (Figure 2.4) asked district leaders to identify areas of algebra instruction that *should* be changed by the district, and areas they felt districts were *most able* to change. Three responses captured aspects of curriculum and course structure: Curriculum (Choice 1), Student grouping practices (Choice 3), and How we staff mathematics classes (Choice 5). We present an overview of the response patterns for these questions and then examine specific factors that districts might consider in making changes to curriculum and course structure.

FIGURE 2.4. QUESTIONS ABOUT AREAS DISTRICTS SHOULD CHANGE AND ARE MOST ABLE TO CHANGE

C6. In your opinion, in which of the following areas SHOULD your district make the most changes related to algebra instruction?

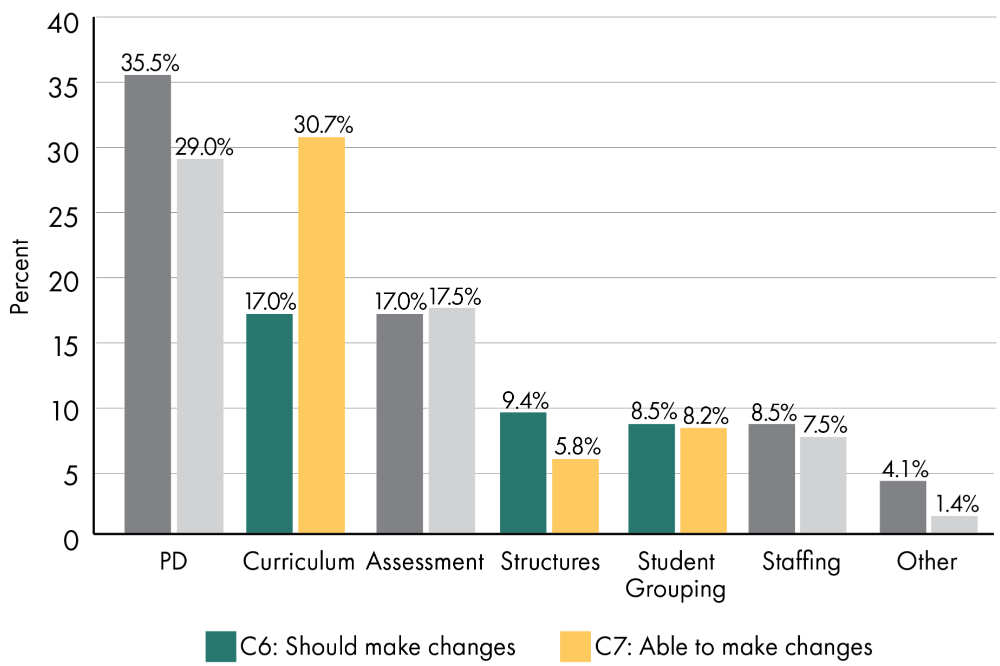
- Curriculum
- Professional development
- Student grouping practices
- Structures for offering mathematics classes (e.g., content vs. integrated)
- How we staff mathematics classes
- Assessment (formative or summative)
- Other (please specify) ____________________

C7. In your opinion, in which of the following areas is your district MOST ABLE to make changes related to algebra instruction?

- Curriculum
- Professional development
- Student grouping practices
- Structures for offering mathematics classes (e.g., content vs. integrated)
- How we staff mathematics classes
- Assessment (formative or summative)
- Other (please specify) ____________________

Of response options related to curriculum and course structure (Figure 2.5), changes to curriculum dominated districts' responses to these two questions. Notable in the responses is the disparity with respect to curriculum: while only 17% of districts thought that they should make changes in curriculum with respect to algebra instruction, nearly twice that number—30.7%—felt that this was the area in which they were most able to make changes. Changes to course structures and student grouping were rarely seen as either necessary or possible in the responses to these questions. However, the disparity with respect to structures is worth noting—of the small number that felt this was the area in which they *needed* to make changes (9.4%), only just over half of those districts felt that they *would* be able to make changes to course structures (5.8%).

FIGURE 2.5. AREAS TO CHANGE INFLUENCING ALGEBRA INSTRUCTION

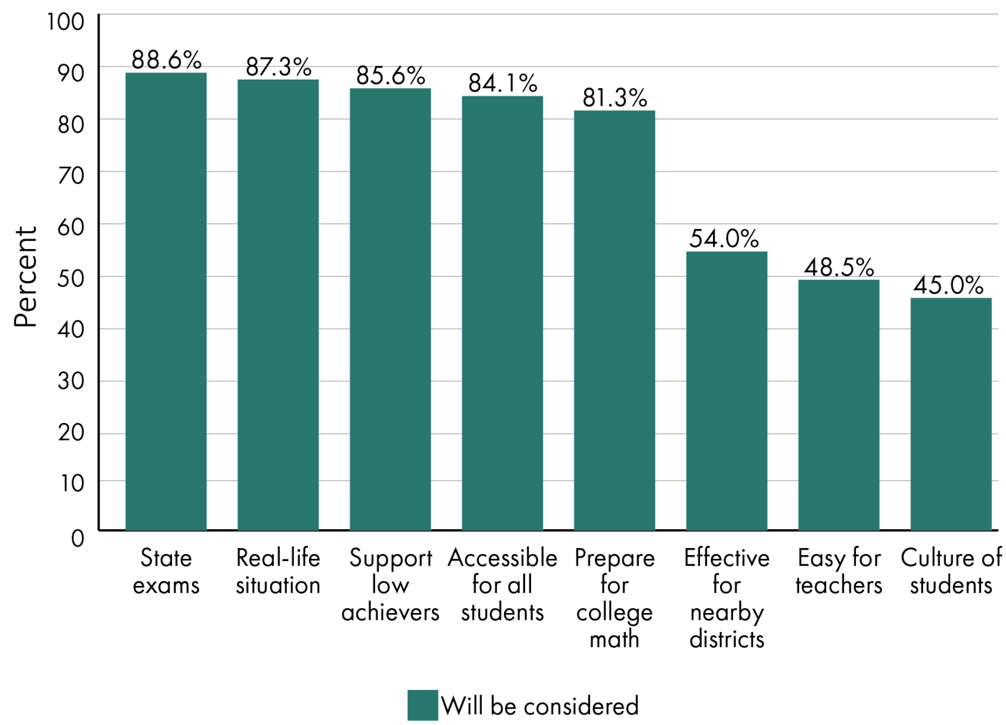


A follow-up question, C8, asked districts what factors would or would not be considered in making a change to curriculum. The factors we asked districts to respond to were:

- Problems in the materials are relevant to real life situations.
- Materials represent the culture of the students who are in our district.
- Materials have been effective for districts nearby or that are like our district.
- Materials will help students do well on the state exams or other achievement tests.
- Materials will prepare students for university-level mathematics courses.
- Materials will support our lower-achieving students in being able to take more courses beyond Algebra I.
- Materials will be easy for our teachers to implement.
- Materials will be accessible for all students taking the course.

Figure 2.6 shows a summary of whether or not those factors would be considered as districts made curricular decisions.

FIGURE 2.6. FACTORS CONSIDERED WHEN CHOOSING A CURRICULUM



These data show a clustering of a wide variety of factors that districts overwhelmingly would consider when choosing a curriculum. The availability of real-life situations in the curriculum, effectiveness in supporting state exam performance, preparation for collegiate mathematics, support for low achievers, and accessibility for all students were identified as factors to consider by over 80% of districts. Only one other factor—effectiveness of the curriculum for nearby districts—broke 50%, with ease of use for teachers and the culture of the students the district serves falling below 50%. These factors suggest that, in general, student factors are at the heart of the considerations a district is likely to make when choosing a curriculum, with specific attention to two subpopulations: college-intending students who are likely to pursue mathematics courses at that level, and low-achieving mathematics students. The extent to which the curriculum is easily usable for teachers is a consideration for far fewer districts, which raises interesting and important questions about how districts might view the interactions between teachers and curriculum as a factor in students' mathematical learning.

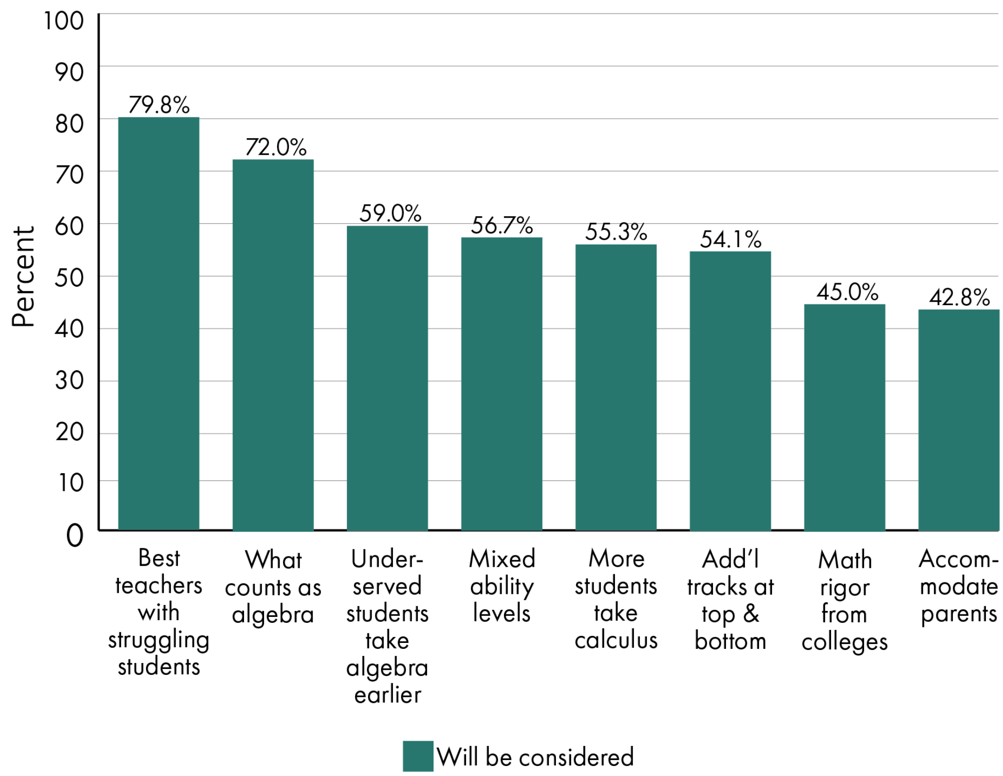
We also asked districts what factors would or would not be considered in making a change to class structure (Question C9). The factors we asked districts to respond to were:

- Ways to ensure that our best teachers worked with our most struggling students.
- Feedback from colleges and universities about the rigor of our math offerings.
- Making changes to what we are teaching under the title of algebra.
- Combining students of multiple ability levels in a single class.

- Creating additional tracks for students at the top or bottom of the achievement curve.
- Parental requests for more students to take algebra earlier.
- Ways to get more students to and through calculus.
- Ways to encourage underserved populations to take algebra earlier.

Figure 2.7 shows a summary of whether or not those factors would be considered as districts made curricular decisions.

FIGURE 2.7. FACTORS CONSIDERED RELATED TO CLASS STRUCTURE



In contrast to the factors districts identified related to curriculum, there are fewer clear trends in the factors districts might consider related to class structure. Being able to pair better teachers with struggling students and reconsidering what counts as algebra are the factors that are likely to be considered by 70% or more of districts. These are interesting factors, as they tend to run counter to some of the conventional beliefs about how teachers are assigned to courses—that better teachers are more likely to be assigned to upper-division mathematics classes and sections that serve traditionally high-achieving students. Similarly, the two least-cited factors—feedback from colleges and universities on the rigor of mathematics classes and parental requests—are frequent topics of conversation among teachers and districts. These data show that, from a district perspective, these two factors are less likely to influence what mathematics courses are offered and which students are afforded access to those courses.

Key Takeaways

The organization of math content changes in secondary grades.

–Integrated approaches are more strongly represented in middle grades.

–At 8th grade, there is a strong shift to content specificity (algebra, geometry).

Together, the results about mathematics course structure describe significant transitions taking place around 8th and 9th grade, when most students take their first secondary algebra course. Prior to this turning point, the organization of mathematics content tends to be more integrated, with strands of algebra, number and quantity, geometry, and statistics covered in a single year. Following this marker, it is more likely that content is segregated by mathematical strand in a single year. This likely represents the traditional Algebra I–Geometry–Algebra II (AGA) sequence that is the historic norm in US high schools.

Heterogeneous grouping starts dominant and fades over time.

–6th and 7th grade are largely heterogeneously grouped.

–Starting in 8th grade, there is a near-even split in grouping strategies.

Districts report a relatively strong use of heterogeneous grouping, although this result must be interpreted cautiously. Prior to the $8^{th}/9^{th}$-grade landmark, most grouping tends to be heterogeneous. From this point forward, more homogeneous grouping strategies are used. It is important to note that heterogeneous does not necessarily mean that all students have a single mathematics option. As seen in our case studies, districts that told us that they group heterogeneously may still offer a different mathematics option for up to a quarter of their student population.

Time for mathematics declines from Grade 6 to 10.

–Students on average experience 7 fewer minutes per day between Grades 6 and 10.

Time for mathematics decreases between Grades 6 and 10, with most students experiencing 55 minutes of mathematics per day in early middle grades, and 48minutes per day by 10^{th} grade. This situation—both the average times and the decrease as students progress—may work against calls to engage students in richer, deeper mathematical experiences in secondary schools. Given that the average US classroom spends 15% of time on homework review and 21% of time on assessment and administration, the average 10^{th} grader is likely to, at best, experience 30 minutes of new instruction in mathematics each day in school (International Association for the Evaluation of Educational Achievement, 2001).

Publisher-authored curricula dominate the landscape.

–Majority were more than 5-years-old at the time of the survey.
–No single support material is dominant to help struggling learners.
–Curriculum is seen as a primary resource for change in instruction.

The curriculum landscape is similarly dominated by tradition, in the form of publisher-produced textbooks. These textbooks offer fewer opportunities for students to engage in rich mathematical experiences, particularly related to algebra. Notable is the inclusion of one significant student-centered curriculum in middle school—Connected Mathematics—but with no corresponding follow-up high school curriculum that matches its philosophy evident in our data. This might suggest that students who do get a richer middle grades experience through a student-centered curriculum in middle school do not have a consistent experience in high school.

Districts see curriculum as the place where they are most able to make changes related to algebra teaching and learning, even if it is not identified as the place where change is needed. Districts tend to consider issues of student performance, both present and in their futures beyond high school, and support and access for students as important factors in adopting a curriculum. Ease of use by teachers and student culture do not rank highly in the considerations a district might make in changing a curriculum. Fewer clear trends exist as districts consider making changes to course structure, but empowering teachers to support struggling students is one prominent factor that connects well with the factors that might be considered as districts change curriculum. In sum, the content organization and curricular landscapes represent a relatively traditional conception of teaching mathematics, as does the time allotted for the task. Districts seem to group students heterogeneously a significant portion of the time, even while other facets of their mathematics and algebra learning experiences remain more traditional in nature.

The picture painted by the survey data shows a relatively traditional and static model of algebra instruction. Beginning at the 8th grade, students are likely to experience a content-specific set of mathematics courses supported by commercially published textbooks that present a largely procedural view of mathematics.

Chapter 3
Algebra I Participation: Access, Enrollment, Completion, and Support

This chapter reports findings on actual participation in the introductory algebra course, typically Algebra I or its equivalent, across the districts in our sample. It also considers practices that influence participation. Given the national debates and some research findings on the appropriateness of, and challenges associated with, expanding participation in Algebra I among 8^{th}-grade students (see Loveless, 2008; Stein et al., 2011), we wanted to examine participation and completion rates reported by districts and whether these rates might reflect efforts in the district to increase, monitor, or support students enrolled in Algebra I, especially in 8^{th} grade. In Chapter 1, we indicated that a relatively small proportion of districts (22.1%) had adopted universal algebra enrollment policies by 9^{th} grade (UA9) and only 6.4% had universal 8^{th}-grade (UA8) policies in place. The questions we asked on the survey allowed us to consider actual patterns in enrollment and their relationships to district policies. For example: Is Algebra I in 8^{th} grade "the new normal," as asserted by Loveless (2013)? And how do universal policies influence algebra enrollments and pass rates? The survey also allowed us to consider trends in district practices related to managing Algebra I enrollments, asking questions such as: What other practices influence Algebra I enrollment? What other policies and practices are districts putting in place to monitor and manage Algebra I participation?

In the survey, we asked districts to report the proportion of students enrolled in Algebra I at different grade levels and pass rates. We also asked respondents to provide information on how selections into Algebra I were determined and how progress and completion were measured, monitored, and supported. As with many of the topics on the survey, we asked the respondent to identify district trends related to algebra participation, including recent changes in enrollments or completion and anticipated future changes. The findings are organized in three sections. First, we present findings on who takes Algebra I at various grade levels. Second, we report findings on how access and entry to Algebra I are managed by district practices. Finally, we present findings on districts' strategies used to monitor and manage students' progress in and successful completion of Algebra I.

The main findings presented in this chapter are summarized below.

Algebra I at 9th grade is still the norm.

– Half of districts enroll below 35% of 8th graders in Algebra I.
– Half of districts enroll 70% or more 9th graders in Algebra I.

Districts report increases in 8th-grade Algebra I enrollment.

– UA policies and higher SES are associated with increased Algebra I enrollments.
– Lower pass rates are not associated with UA policies.
– Districts report increased support and monitoring for students in Algebra I.

Algebra I enrollment reflects demographics and policy.

– Districts with UA policies have higher 8th-grade enrollments.
– Low poverty correlates with 8th-grade enrollments.
– Correlations between enrollments and UA policy differ with respect to poverty.

Teachers determine entry and criteria for success.

– Course grades and teacher recommendations are principal criteria for entry.
– Successful completion of Algebra I is determined by course grade and performance.
– Local math faculty are primarily responsible for assessment and monitoring.

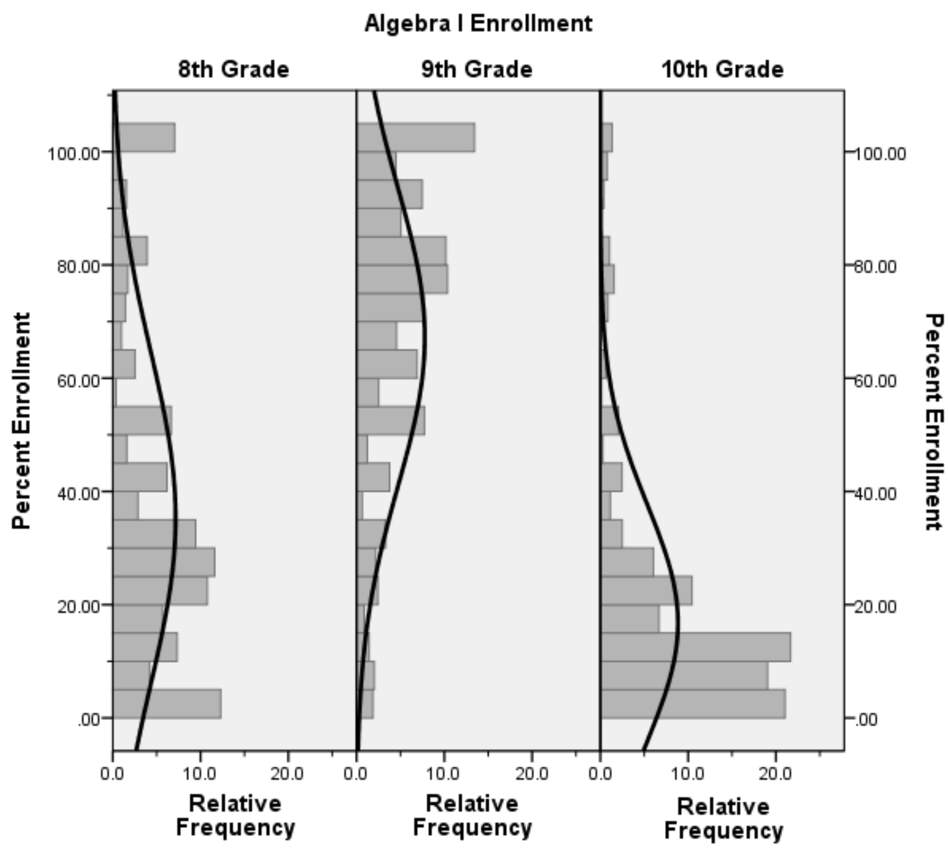
Who Takes Algebra I When?

Claims about who takes Algebra I at which grade vary somewhat, although there is general agreement that the overall number of students taking Algebra I has increased substantially over the last 15 years. In their review of the existing research, Stein et al. (2011) summarized reports of Algebra I enrollments in 8th grade across the United States, by state and, in some cases, by specific demographic categories. The studies reported the percentage of students enrolled in Algebra I in 8th grade to be close to 30% in 2009. This percentage varied substantially across states, with some states enrolling 21% of 8th-grade students (e.g., North Dakota, New York, and Mississippi) and California enrolling close to 59%.

When Students Take Algebra I

When treating the school district as the unit of analysis and collecting data from a nationally representative sample of districts, we found similar trends, but also much greater variation in enrollment percentages. Figure 3.1 shows the relative frequency of Algebra I enrollment for 8th through 10th grade as reported by each district in response to the survey item: "Indicate the percentage of students that are currently enrolled in Algebra I or its equivalent at each of the described [6–10] grade levels." The 8th-grade distribution is multimodal and positively skewed. The lowest bar in 8th grade represents close to 12.3% of districts that reported enrolling 0% to <5% of their 8th graders in Algebra I (most common response). Just under a third of our sample, 31.8%, reported enrolling from 20% to <35% of their 8th graders in Algebra I. On the top end of the 8th-grade column, 7% of districts reported enrolling 100% of their 8th graders.[11] Overall, 72% of districts reported enrolling less than 50% of 8th graders in Algebra I. The 9th-grade distribution is closer to normal, but negatively skewed. We found 9th grade to be the most common placement for Algebra I; 58.6% of districts in our sample reported enrolling at least 70% of 9th graders in Algebra I, including 13.4% of districts that reported 100% enrollment. As expected, the 10th-grade distribution was positively skewed. Sixty percent (60.5%) of the districts reported enrolling less than 10% of 10th graders in Algebra I. These data indicate that although only 26% of districts require Algebra I to be taken at or before 9th grade, most students are nevertheless enrolled in Algebra I by that time.

FIGURE 3.1. DISTRICT-REPORTED ENROLLMENT IN ALGEBRA I (AS A PERCENTAGE OF COHORT) IN GRADES 8, 9, AND 10



[11] The top bar represents the number of responses at exactly 100%. No responses were included above 100%.

Rising Enrollments in 8th- and 9th-Grade Algebra I

In accord with the analyses summarized by Stein and colleagues (2011), we found enrollments in Algebra I in 8th grade to be increasing in many districts. When asked about shifts in enrollment over the past 5 years (2007–2012), 23.4% (*SE* 1.7) of districts indicated that they experienced "a great deal" of increase in Algebra I course taking in 8th grade, while 33.3% (*SE* 1.9) reported "somewhat" of an increase. A substantial number of districts also reported increases in Algebra I enrollments in 9th grade. Eighteen percent (18.3%) of districts (*SE* 1.6) reported seeing "a great deal" of increase in Algebra I enrollment in 9th grade over the previous 5 years and 24.3% (*SE* 1.8) indicated seeing "somewhat" of an increase. In Chapter 1, we reported that 68.2% (*SE* 1.9) of districts reported that their Algebra I policies had been in place for 5 or more years, and only 12.1% (*SE* 1.1) reported policy changes in the previous 2 years. In other words, more districts reported experiencing increases in Algebra I enrollments than reported changes in enrollment policies.

Our analysis allowed us to consider whether reported increases in Algebra I enrollments were associated with district enrollment polices, state policy initiatives, and district characteristics (such as size, urbanicity, or poverty). We found that districts with universal algebra enrollment policies requiring all students to enroll in Algebra I by 8th or 9th grade (UA8 or UA9 policies) were more likely to report increases in the proportion of students taking Algebra I in 8th grade than districts without such policies, but we found no such difference in 9th grade. Using ordinal regression models, we estimated that districts with a UA8 or UA9 policy were 1.52 times more likely than those without them to report an increase in Algebra I enrollments in 8th grade. The odds ratio of 1.52 was statistically significant at .05. The odds ratio associated with increases in 9th-grade Algebra I enrollments was insignificant. (See Appendix C.1 for model estimates.) Comparisons between Algebra I enrollments and poverty levels also yielded a statistically significant odds ratio. Districts in FRL quartiles 1 and 2 (indicating districts with lower proportions of students qualifying for FRL) were 1.87 and 1.52 times, respectively, more likely to report increases in 8th-grade Algebra I enrollments than those in quartiles 3 and 4. The only statistically significant odds ratio predicting the greater increases in 9th-grade Algebra I enrollments was FRL Quartile 1, and that was quite small (.5).

Factors Associated with Early Algebra I Enrollments

Using linear regression, we also tested for correlations between Algebra I enrollment in 8th and 9th grades, district policies, state policy initiatives, and district characteristics (such as size, urbanicity, and poverty). Again, the presence of UA8 or UA9 policies and being in the top half of the poverty distribution was positively associated with higher percentages of enrollment in Algebra I at 8th grade. Algebra I enrollments in 8th grade were estimated to be 15.7 percentage points higher in districts that have UA policies compared with those that do not. Compared with districts in FRL Quartile 4 (the greatest proportion of students eligible for FRL), 8th-grade Algebra I enrollments were estimated to be 16.2 percentage points higher in districts in FRL

Quartile 1, and 8.5 percentage points higher in districts in FRL Quartile 2. Interestingly, 8th-grade Algebra I enrollments in districts committed to increasing graduation requirements to meet career- and college-ready standards by 2012 were estimated to be 12.9 percentage points lower than districts with no plans to increase standards. (See Appendix C.2 for model estimates.)

Less consistency was found when looking at factors associated with 9th-grade Algebra I enrollments. (See Appendix C.3 for model estimates.) Rural districts were estimated to have 9th-grade enrollments in Algebra I that were 5.18 percentage points higher than suburban districts. And districts planning to increase graduating requirements by 2012 (CCRC by 2012 policy grouping) had 9th-grade Algebra I enrollments that were 7.56 percentage points higher than districts with no plans to increase graduation requirements. Districts in the top two FRL quartiles (fewer students on FRL) had 9th-grade enrollments that were 10.2 (Quartile 1) and 6.7 (Quartile 2) lower than districts in Quartile 4. The lack of consistency with the 8th-grade results is not unexpected, as a district's 8th-grade enrollment necessarily influences 9th-grade enrollment.

Relationship between UA Policies, Algebra I Enrollments, and District Characteristics

Given that 25% of districts reported having universal algebra enrollment policies that required all students to enroll in Algebra I by 8th or 9th grade, we were able to explore associations between these policies and Algebra I enrollments in different types of districts. We added interaction terms to the regression models (Model 2 in Appendix C.2) and found significant interactions between district urbanicity and poverty level, and the UA policy indicator. Although 8th-grade Algebra I enrollment tended to be higher for UA districts than for non-UA districts in every urbanicity category, the difference was considerably larger among urban and rural districts than among suburban districts. The adjusted mean difference in enrollment between districts with and without a UA policy was about 18 percentage points higher for urban than for suburban districts, and about 16 percentage points higher for rural than for suburban districts. The mean differences in enrollment between districts with and without UA policies was 16, 20, and 14 percentage points higher for districts in FRL quartiles 1, 2, and 3, respectively, than for districts in FRL Quartile 4 (shown in Table 3.1, right column). These differences indicate that enrollment in 8th-grade Algebra I tended to be higher for districts with, rather than without, UA policies at each poverty level, and the enrollment differences between UA and non-UA districts was much lower among the poorest districts (FRL Quartile 4). In other words, the strength of the relationship between UA policies and 8th-grade Algebra I enrollment was diminished in the poorest districts.

It is important to emphasize that the set of districts having UA polices is comprised of all districts having policies requiring universal enrollment in Algebra I by or before 9th grade (UA9). Only 6.4% of these districts required Algebra I enrollment by 8th grade; the rest required it by 9th grade. Regardless of whether the policy specified 8th or 9th grade, it was associated with higher levels of enrollments in 8th grade for all but FRL Quartile 4.

TABLE 3.1 ADJUSTED MEANS OF DISTRICT ENROLLMENT PERCENTAGES BY UA9 POLICY AND ANALYTICAL LENS FOR GRADES 8 AND 9[A]

8th grade	UA9 policy	No UA9 policy	Difference
Urbanicity			
Urban	57.44	33.92	23.52
Suburban	38.61	33.04	5.57
Rural	46.71	25.42	21.29
Poverty Level			
FRL Quartile 1	60.42	39.76	20.66
FRL Quartile 2	54.50	30.53	23.97
FRL Quartile 3	42.38	24.17	18.21
FRL Quartile 4	33.05	28.73	4.32
9th grade	**UA9 policy**	**No UA9 policy**	**Difference**
Urbanicity			
Urban	60.86	62.22	-1.36
Suburban	69.55	63.48	6.07
Rural	64.38	73.04	-8.66
Poverty Level			
FRL Quartile 1	63.20	59.14	4.06
FRL Quartile 2	54.42	67.10	-12.68
FRL Quartile 3	66.34	72.45	-6.11
FRL Quartile 4	75.76	66.30	9.46

Sources: Urbanicity, FRL quartile, and size from Common Core of Data (2011). CCRC requirements from Achieve (2009). [a]n = 836

We took a similar approach to explore the relationship between UA policy and 9th-grade Algebra I enrollment across different district characteristics. The interactions in the 9th-grade model were disordinal—some UA policies have positive relationships with 9th-grade Algebra I enrollment in some types of districts but negative relationships with enrollment in others. Specifically, among suburban districts, 9th-grade Algebra I enrollment tended to be higher in UA than in non-UA districts, but among rural districts, 9th-grade enrollment tended to be higher in non-UA than UA districts. Little difference in 9th-grade Algebra I enrollment proportions occurs between UA and non-UA districts in urban areas.

The pattern of adjusted mean differences in enrollment percentage between districts with and without UA policies across the FRL quartiles suggests an interaction that is counterintuitive on the surface; districts in FRL Quartile 4 have higher mean differences in 9th-grade Algebra I enrollment if they have UA policies than if they do not have such policies than districts in FRL quartiles 2 and 3 (shown in lower section of Table 3.1). Put another way, UA policies appear to be negatively associated with 9th-grade enrollment levels in districts in the middle two quartiles of the poverty range, but positively associated with 9th-grade enrollment levels in districts in the highest and lowest poverty quartiles. We speculate on possible explanations for these patterns at the close of this chapter.

Relationship between UA Policies and Pass Rates

Some commentators and educators have voiced concern that increased enrollments in Algebra I would lead to increases in failure rates and students repeating the course in greater numbers (e.g., Allensworth, Nomi, Montgomery, & Lee, 2009; Loveless, 2013). Our survey asked district officials to report Algebra I pass rates and to indicate whether these rates had changed in the last 5 years. Overall, we found that districts reported Algebra I pass rates that averaged 85.4% (*SE* 0.5). When asked about increases in students repeating Algebra I over the past 5 years, only 2.0% (*SE* 0.5) reported having "a great deal" of increases and 17.9% (*SE* 1.5) noted "somewhat" of an increase. We recognize that these indicators lack precision with respect to specific quantitative pass rate trends. Nevertheless, the statistics suggest that the movement toward students enrolling in Algebra I in 8th grade in greater numbers does not appear to be associated with substantial increases in failure rates.

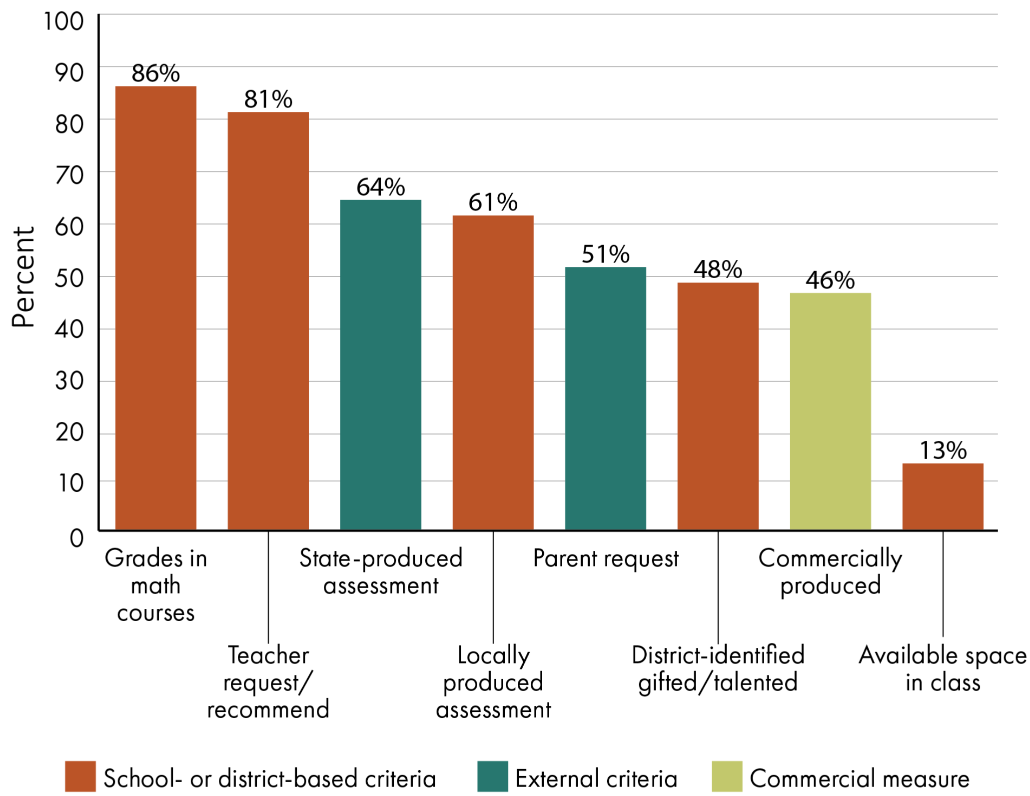
In order to explore whether reported Algebra I pass rates differed between districts with UA8 or UA9 policies and those without, we conducted a linear regression of the UA policy indicator and all the analytical lenses on pass rates. We found that UA policy had no bearing on districts' reported Algebra I passing rates [$t = 0.26$; $p = .792$]. (See Appendix C.4 for model estimates.) Using both overall omnibus F-tests and t-tests, we found that compared with larger districts, controlling for other factors, small districts reported Algebra I pass rates that were 5.7 percentage points greater than large districts [$F(1, 781) = 30.81$, $p < .001$]. Algebra I pass rates were also found to be inversely related to the proportion of students eligible for FRL [$F(3, 779) = 22.30$, $p < .001$]. Specifically, districts in FRL quartiles 3, 2, and 1 reported pass rates that were 4, 6, and 12 percentage points (respectively) higher than pass rates reported by districts in FRL Quartile 4 (the greatest proportion of FRL-eligible students). Finally, using omnibus F-tests, we found that pass rates were positively associated with urbanicity [$F(2, 780) = 3.28$, $p = .038$] and CCRC policy grouping [$F(3, 779) = 2.93$, $p = .033$]. Though these results suggest relationships between Algebra I course pass rates and district demographics, pass rates could be seen as a problematic indicator of successful learning of the content of Algebra I. In some cases, Algebra I courses could be watered down with respect to content or the criteria for a passing grade could vary from one district to the next.

How Early Entry Is Determined

As reported in Chapter 1, the majority of districts represented in the survey relied on what Stein et al. (2011) refer to as *selective* policies, rather than *universal* policies, to place students in Algebra I. Selective policies allow districts and schools to differentiate among students by determining which students are ready for Algebra I in 8th grade. This approach has a number of supporters. Scholars have discussed the drawbacks of enrolling students in an algebra course before they are prepared to be successful in the course (e.g., Loveless, 2008; Steen, 1999; Stephany, 2011). On the other hand, Stein et al. (2011) found that selective policies often rely on subjective or inconsistent mechanisms to determine Algebra I placements and result in reducing the proportion of minority and low-income students enrolled in Algebra I in 8th grade. In a study that explored the accuracy of teacher- and school-based placements into Algebra I, researchers found a state-administered standardized test to be a far better predictor of Algebra I success in 8^{th} grade than teacher recommendations or grades (Thomas, Butler, & Kapinsky, 2013).

In order to understand the criteria used by districts to determine Algebra I placements in 8^{th} grade, we asked the following question: How often are each of the following criteria used by your district to determine a student's readiness or eligibility to take Algebra I early? The survey listed eight criteria and asked the respondent to select one of the following variables for each: very prominent, somewhat prominent, minor factor, not used at all. Each district reported using multiple criteria; respondents selected an average of 4.5 criteria from a list of eight. Figure 3.2 provides the percentages of districts that indicated each criterion as either very or somewhat prominent. The two most commonly selected criteria were students' course grades (86%) and teacher recommendation and request (81%), suggesting that priority is given to assessments made by individual teachers over more objective or standardized indicators. State- and locally-produced assessments were indicated by 64% and 61% of district leaders, respectively. Parent requests were indicated by 51% of respondents.

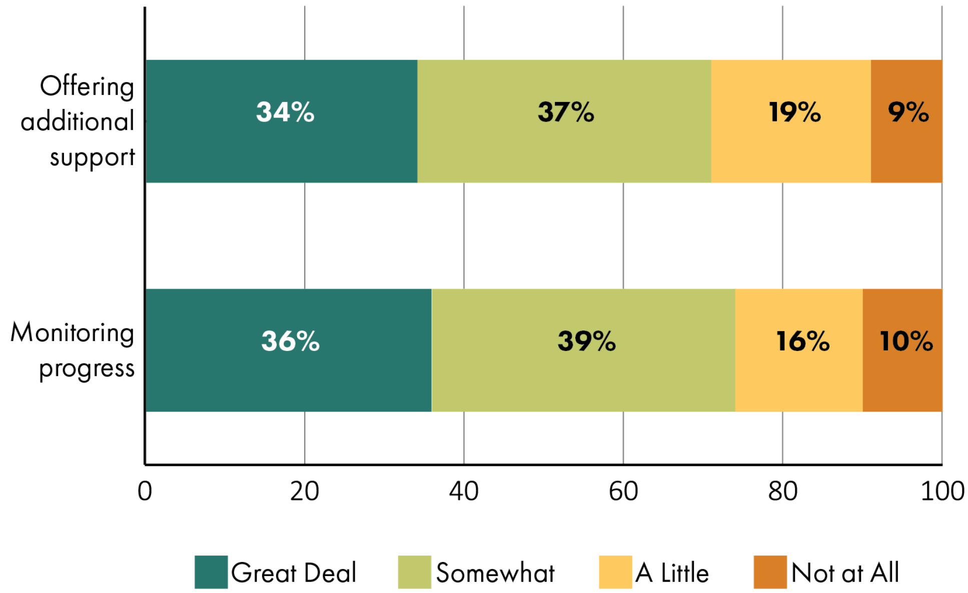
FIGURE 3.2. CRITERIA USED TO DETERMINE STUDENT READINESS TO TAKE ALGEBRA I



Assessment and Monitoring Progress and Success in Algebra I

We asked respondents to indicate the extent to which their district had experienced changes in offering additional support to students in Algebra I or in monitoring progress of those students. Thirty-four percent reported that their district had increased its offerings of additional support for students in Algebra I a “great deal.” Another 37% reported experiencing “somewhat” of an increase. In response to the prompt about increased monitoring of student progress in algebra, 36% said a “great deal” and 39% reported “somewhat” of an increase (see Figure 3.3). These statistics together suggest that students are enrolling Algebra I in increasing number, and that districts, likewise, are extending additional support and monitoring for this group.

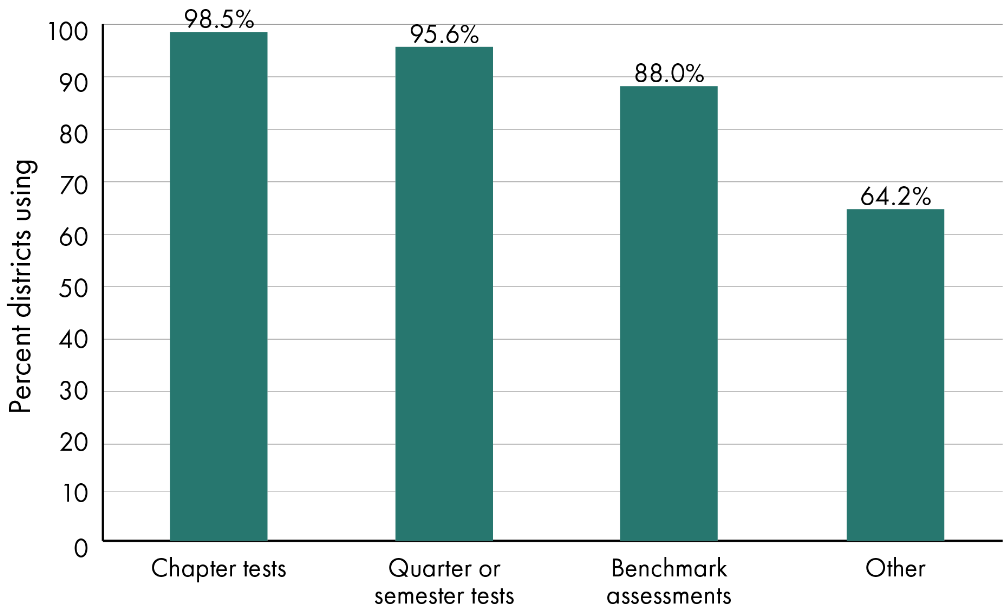
FIGURE 3.3. EXTENT TO WHICH DISTRICTS REPORT INCREASES IN ADDITIONAL SUPPORT AND MONITORING RELATED TO ALGEBRA I



Monitoring and Assessment Practices

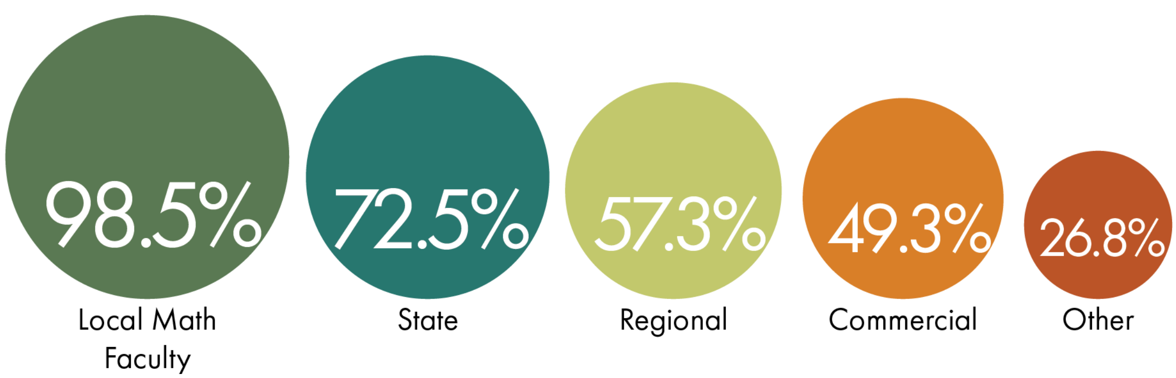
In order to look more closely at districts' monitoring practices, we asked respondents to identify the types of assessments used to monitor students' progress while taking Algebra I. As shown in Figure 3.4, quizzes, chapter tests, and quarterly or semester tests were all ranked very highly. Benchmark assessments, at 88%, were 10 percentage points lower than quizzes and tests but were still used by a large proportion of districts.

FIGURE 3.4. ASSESSMENTS USED BY TEACHERS TO MONITOR PROGRESS IN ALGEBRA I



We also asked who was responsible for developing the assessments used for Algebra I. Figure 3.5 shows the results, ordered from sources most local to a district to the most distal. Unsurprisingly, close to 100% of districts indicated that math department faculty developed assessments. The second most common response, the state, indicated by 72.5% of districts, was a little more surprising, particularly since the district was indicated less frequently, at 57.3%.

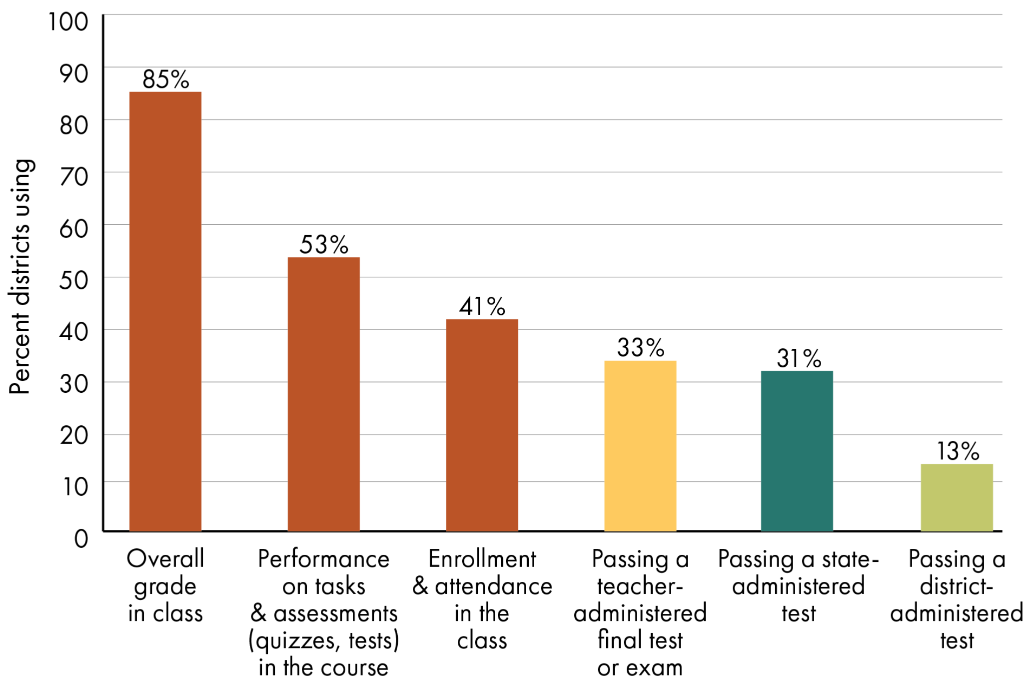
FIGURE 3.5. GROUP RESPONSIBLE FOR DEVELOPING ASSESSMENTS BEING USED FOR ALGEBRA I



Algebra I Completion

We were also interested in examining the mechanisms used by school districts to determine successful completion of Algebra I. We asked districts to indicate which from a list of six criteria were used to determine successful completion of Algebra I. Respondents were asked to check "yes" or "no" for each criterion. Figure 3.6 provides the percentages of districts that indicated use of each criterion. The most commonly used criterion, overall grade in course (85%), is unsurprising. In fact, it is worthy of note that 15% of respondents indicated that this was not a criterion. The top four criteria used are all related to course participation and assessments, as noted in red and orange (grade, tests, quizzes, attendance). The two criteria selected least frequently are tests administered by the state (31%) and district (13%), noted in dark and light green.

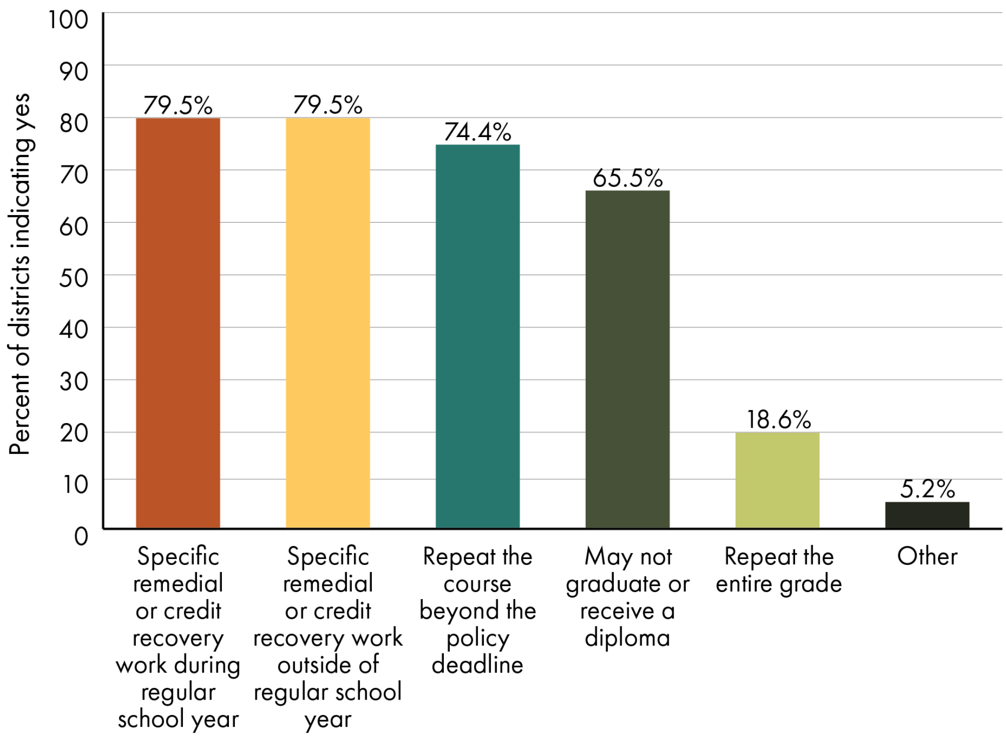
FIGURE 3.6. CRITERIA USED TO DETERMINE SUCCESSFUL COMPLETION OF ALGEBRA I



The data from this question, together with several previous questions, suggest that individual teachers play an important role in determining what students gain early entrance into Algebra I, how students are assessed, and whether students successfully complete the requirement.

Finally, we asked districts to indicate possible outcomes students would face if they failed to successfully complete Algebra I. The responses are listed in order of frequency in Figure 3.7. It appears that the majority of districts provide opportunities for students to receive remedial or credit-recovery coursework.

FIGURE 3.7. POSSIBLE OUTCOMES FOR STUDENTS FAILING TO COMPLETE ALGEBRA I



A significant majority of districts provide credit-recovery options during or immediately after the year in which the student fails to complete Algebra I. The nature of an Algebra I policy, however, is called into question in the middle bar, as nearly three fourths of districts allow students to repeat the course beyond the deadline. In contrast, the dark green bar suggests that in some districts, the stakes are quite high with respect to the Algebra I policy—not meeting it in some way can jeopardize students' abilities to receive a high school diploma.

Key Takeaways

Algebra I at 9th grade is still the norm.

–Half of districts enroll below 35% of 8th graders in Algebra I.

–Half of districts enroll 70% or more 9th graders in Algebra I.

The most important conclusion from our examination of who takes Algebra I and when they take it is that the districts in our sample still overwhelmingly reported that taking Algebra I in the 9th grade is the norm. Most districts have a strong majority of their 9th-grade students enrolled in Algebra I. Algebra I in the 8th grade remains a tangible phenomenon, and districts do report increased enrollment in the past 5 years. Still, over half of districts reported 35% or less of 8th graders enrolled in Algebra I, and over 10% reported enrolling between 0% and 5%.

Districts report increases in 8th-grade Algebra I enrollment.

- UA policies and higher SES are associated with increased Algebra I enrollments.
- Lower pass rates are not associated with UA policies.
- Districts report increased support and monitoring for students in Algebra I.

Algebra I enrollment reflects demographics and policy.

- Districts with UA policies have higher 8th-grade enrollments.
- Low poverty correlates with 8th-grade enrollments.
- Correlations between enrollments and UA policy differ with respect to poverty.

The nature of a district interacts with Algebra I enrollments in complex ways. Districts adopting universal algebra (UA) policies generally saw higher 8th-grade algebra enrollments, but these effects are more pronounced in urban districts. The differences between UA and non-UA districts are lessened among the poorest districts, suggesting that poverty may indeed be a limiting factor on the effects of an enrollment policy. At the 9th-grade level, suburban districts again see higher algebra enrollment in the presence of a UA policy as compared with urban districts, and the relationship inverts for rural districts. UA policies appear to have negative effects on 9th-grade enrollment for districts in the middle two quartiles of the poverty range but positive effects in the highest and lowest poverty districts. These interactions are counterintuitive in places and merit further investigation. However, it is important to recognize that 8th- and 9th-grade enrollments are not independent, and positive changes in enrollment in the 8th grade among districts with certain demographics may cause what look like negative interactions at the 9th grade, as more students will have completed Algebra I prior to high school. Similarly, the mechanics of school scheduling likely come into play here as well, particularly related to rural districts. A single Algebra I section in a small rural district encompasses a significantly larger portion of the student population compared with a suburban or urban district, as districts do not typically run dedicated sections of a class for a very small number of students. Conversely, rural districts frequently face staffing challenges that may constrain their ability to offer multiple mathematics offerings at a single grade level.

Reported pass rates for Algebra I are strong, with a mean of 85.4% and few districts reporting increases in the number of students repeating the course. Data on assessment strategies indicate an overwhelming majority of districts employing either just-in-time or post-course credit recovery strategies, suggesting that significant attention is being paid to supporting student success in Algebra I in ways that do not impede students from progressing through the mathematics sequence across their high school experience.

Teachers determine entry and criteria for success.

–Course grades and teacher recommendations are principal criteria for entry.
–Successful completion of Algebra I is determined by course grade and performance.
–Local math faculty are primarily responsible for assessment and monitoring.

Local decision making is a final strong theme that emerges from the data in this chapter. Criteria used to determine Algebra I, assessment mechanisms used to determine successful completion of the course, and the data used to monitor progress all lie largely in the hands of local teachers and their classrooms rather than at the district or state level. While a significant number of districts report using a state-designed assessment as part of the determination of Algebra I success, the data on completion criteria suggest that such assessments are just a small part of a larger formula dominated by local measures. In sum, the determination of which students take Algebra I and the approaches districts take to monitoring progress toward successful completion are overwhelmingly localized endeavors, placed in the hands of the professionals working with students on a daily basis.

Chapter 4
District Priorities and Decision Making for Algebra Professional Development

Enrollment in an Algebra I course itself does not guarantee student success (e.g., Jacobs, Franke, Carpenter, Levi, & Battey, 2007; Loveless, 2008; Silver, 1997). Returning to our framing of opportunities to learn, the ways that districts make use of human resources in the enactment of those courses is important. By human resources, we are referring to how professional expertise is deployed, including the use of external expertise and the development of internal capacity through professional development. Ongoing, meaningful teacher professional development (PD) is recognized as one of the key tools districts can use to improve algebra teaching and learning. Studies of PD note that a focus on specific academic subject matter content is correlated with higher probabilities that the work of the PD would be implemented in practice (e.g., Garet, Porter, Desimone, Birman, & Yoon, 2001). Providing opportunities for teachers to engage in PD related to mathematics and algebra is important for developing effective instructional practices, improving student learning, and changing the beliefs and expectations about who can be successful in early algebra. Moreover, PD researchers have clearly indicated that self-contained, one-shot workshops are ineffective in supporting teacher learning and improving teacher practice; rather, PD must be sustained, ongoing, and focused on the tasks in which teachers regularly engage in their classrooms (e.g., Smith, 2001).

In this chapter we report findings from our national survey related to how much time districts allocate to algebra-related PD each year, who participates in PD, and districts' priorities for making changes to PD. These findings provide a current picture of district PD offerings and illuminate districts' priorities in making decisions about PD.

The chapter's main findings are summarized below.

Professional development opportunities are modest.

–Less than half of PD hours are mathematics specific.

–Algebra-related PD accounts for an average of 7.6 hours annually.

PD that exists involves diverse stakeholders.

–Administrators, coaches, and specialists are usually involved.

PD is viewed as a significant lever for change.

–A plurality of districts indicated changes to PD are necessary to support algebra instruction.

–Teacher knowledge of algebra and support for students are seen as important facets of PD.

District Professional Development Profile

We begin our analysis of district PD with findings that offer a portrait of how much time districts plan for annual PD activities, who participates in those activities, and who conducts them. Specifically, we compare findings related to content-general PD with PD that specifically concerns mathematics or algebra.

Hours Devoted to District Professional Development

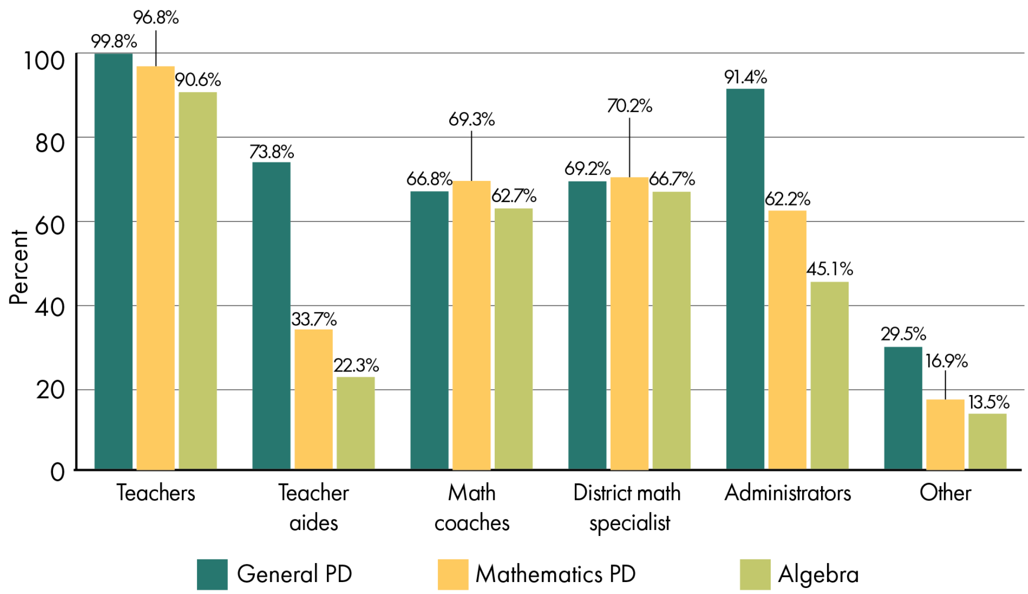
District mathematics leaders reported the number of hours of PD their district implemented for the school year across three categories: general district PD, mathematics-related PD, and algebra-related PD.

The data indicate that while districts were offering an average of 29 hours of general PD activities, they generally offered less than half that number of hours for mathematics-related (14) or algebra-related (7) PD. It was relatively uncommon for a district to offer only 10 or fewer hours of general PD, but relatively common in the case of mathematics- and algebra-related PD. For example, 13.1% of districts offered 10 or fewer hours of general PD (6.0% offered no general PD), but 58.1% of districts offered 10 or fewer hours of mathematics-related PD, and 19.1% offered no mathematics-related PD. District opportunities for algebra-related PD were even more rare: 80.2% of districts offered 10 or fewer hours of algebra PD and 36.5% offered none at all.

Participants in District Professional Development

District leaders reported data on who in the district participated in the different types of district PD. In this question, district respondents chose between “yes” or “no” to indicate whether different types of district professionals participated in each type of PD. Thus, each percentage reported in Figure 4.1 should be interpreted as the percent of districts that indicated that the particular group of professionals participated in their district PD.

FIGURE 4.1. PARTICIPANTS IN DISTRICT PD

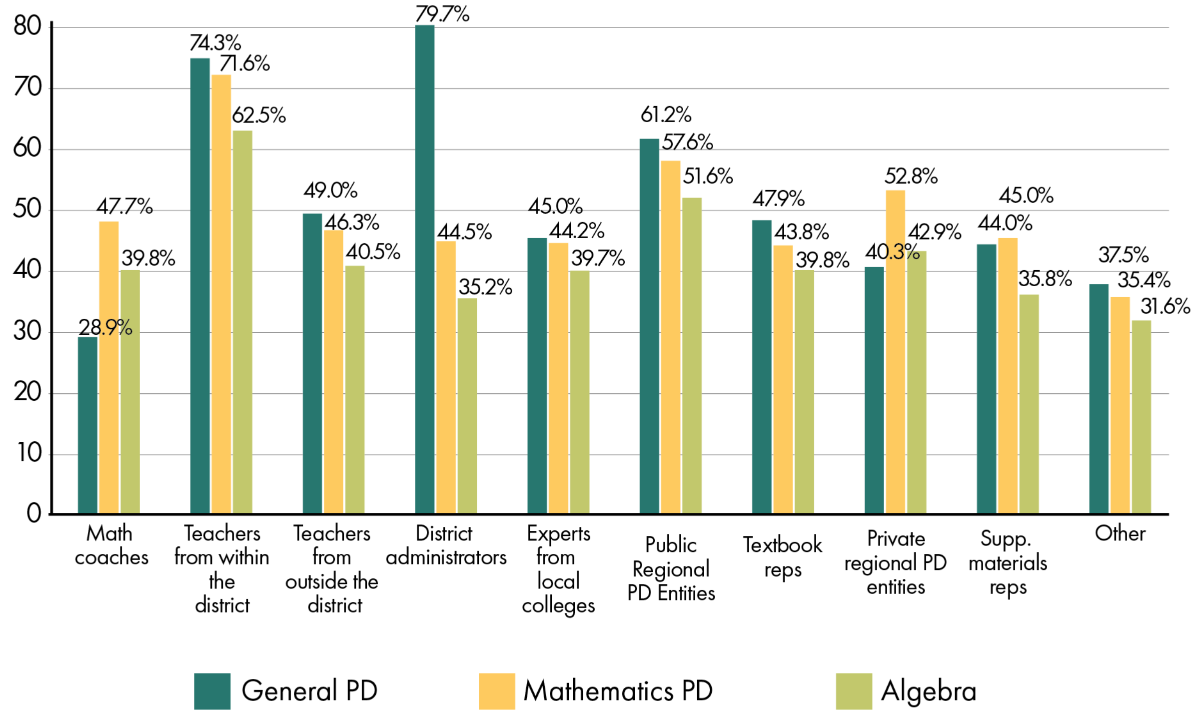


As expected, these data indicate that teachers are the most common district participants in all types of PD activities. These findings also reveal that the administration in 91.4% of districts participate in PD activities, along with mathematics specialists, coaches, and teacher aides. When PD activities narrow in focus to mathematics or algebra, a smaller proportion (62.2% and 45.1%) of districts report administration participating.

Facilitators of District Professional Development

District leaders also reported which professionals generally conducted each type of PD activities in their districts. Respondents chose "yes" or "no" to indicate whether or not different types of professionals conducted each type of PD. Thus, each percentage reported in Figure 4.2 should be interpreted as the percent of districts that indicated that a particular type of professional facilitated PD activities in their district.

FIGURE 4.2. FACILITATORS OF DISTRICT PD

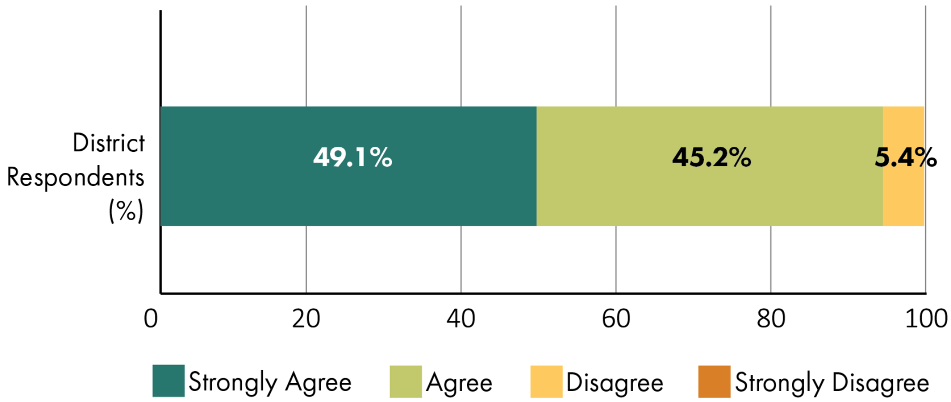


These findings indicate that district PD has been conducted by a wide variety of professionals. Facilitation of content-general PD is dominated by local district administrators, teachers, and regional providers. As PD offerings become more content specific, however, facilitators are increasingly likely to come from teachers within the district, regional PD providers, and textbook representatives. These data suggest that districts are relying on local and regional professionals to facilitate their PD when possible. In the cases of mathematics- and algebra-related PD, where content-specific knowledge is likely to be needed, districts are relying less on administration and more heavily on teachers, professionals from public regional PD centers, and textbook representatives.

District Priorities for Professional Development

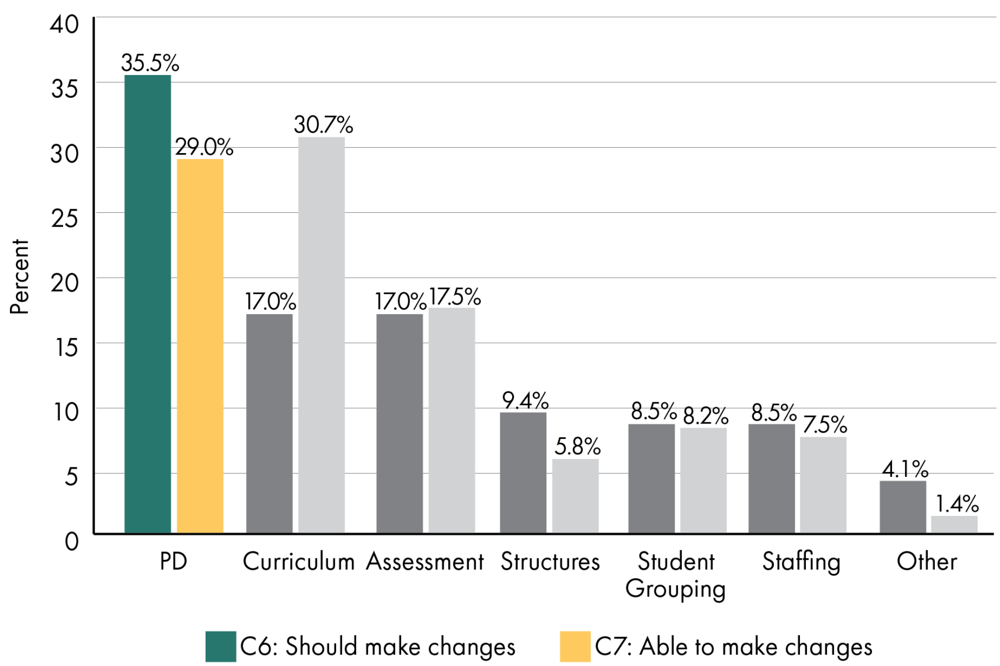
Our survey also investigated the beliefs and priorities of district mathematics leaders with respect to PD. When respondents were provided with a list of statements about early algebra completion, the statement most widely agreed with related to the importance of PD. Of district respondents, 94.3% indicated agreement with the statement: “changing teaching practices through targeted PD is critical to achieving the goal of early algebra completion” (49.1% strongly agreed, 45.2% agreed). The distribution of responses is shown in Figure 4.3. Relatively few leaders indicated disagreement with this statement, suggesting wide recognition for PD’s important place in improving early algebra completion.

FIGURE 4.3. CHANGING TEACHING PRACTICES THROUGH PD IS CRITICAL TO EARLY ALGEBRA COMPLETION



When district leaders were asked which areas related to algebra instruction they believed their district should change, 35.5% (*SE* = 1.9) identified PD as the most critical area (see Figure 4.4). Respondents were allowed to select more than one item, and the category of "other" allowed districts to write in an area different from those provided. A follow-up question assessed district leaders' opinions regarding which changes related to algebra instruction were most feasible in the district. Respondents were given the same list of items and asked which areas their districts are *most able* to change (a shift in language from which areas districts *should* change). The frequency of respondents selecting PD in this question was 29.0% (*SE* = 1.8), with curriculum selected slightly more frequently (30.7%, *SE* = 1.9) as shown in Figure 4.4.

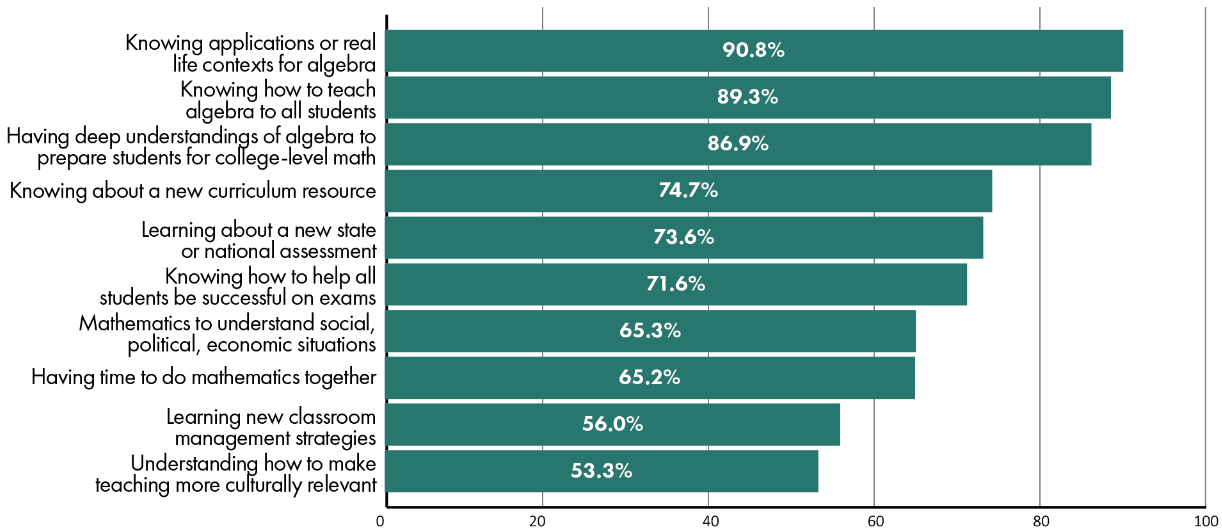
FIGURE 4.4. AREAS TO CHANGE INFLUENCING ALGEBRA INSTRUCTION



Professional Development Changes

To probe further into district leaders' perspectives on PD, we asked district leaders to identify factors that they might consider if they were to make changes to the PD offered to algebra teachers. Our aim was to gather data on district leaders' perceptions of their teachers' specific PD needs. The survey question asked district leaders to select one or more items that they would consider from a list of 10 priorities that represent different foci for PD in mathematics education. Figure 4.5 presents the priorities listed in order from most prevalent to least prevalent in district decision making. The percentages reported represent the proportion of districts that reported consideration of each criterion for decision making.

FIGURE 4.5. PRIORITIES CONSIDERED WHEN MAKING CHANGES TO PD FOR ALGEBRA TEACHERS



The response "Knowing applications or real life contexts for algebra" was a key priority that 90% of district leaders believe to be important to consider. Other responses selected by over 75% of districts include "Knowing how to teach algebra to all students" and "Having deep understandings of algebra to prepare students for college-level math." These findings illuminate district leaders' priorities for PD. Additional research might help us understand these priorities.

Key Takeaways

Professional development opportunities are modest.

–Less than half of PD hours are mathematics specific.

–Algebra-related PD accounts for an average of 7.6 hours annually.

PD is a key component in supporting teacher learning and changes in teaching practice. The resources that districts have for delivering such PD are, by the nature of school districts, constrained both by teacher time and by district budget. As a result, districts are frequently faced with important choices about the time spent on PD, the balance of subject-specific and general PD, and the selection (and payment) of PD facilitators. Our findings suggest that general PD dominates the PD landscape. PD that is mathematics or algebra related is modest, with more than half of districts offering 10 hours or fewer. Given the empirical evidence of the importance of content-focused PD experiences (e.g., Garet et al., 2001), it is surprising that some districts offer few or no hours of mathematics- and algebra-related PD experiences.

It is important to acknowledge that our inquiries into PD focus on the district level. It is likely that some individual teachers avail themselves of outside opportunities for PD, through workshops provided by local and state professional organizations, graduate coursework, and national conventions.

PD that exists involves diverse stakeholders.

–Administrators, coaches, and specialists are usually involved.

Findings indicated that district PD involves diverse stakeholders, with district administration often included as participants. It may be surprising, given the large number of responsibilities placed upon administration, that 91.4% of districts include administrative personnel in general PD activities. The fact that 45.1% of districts include administrative participants in algebra-related PD, however, suggests that supporting instruction in algebra may be a central goal of those districts.

Similar to the assessment data in Chapter 3, our findings suggest a strong inclination toward local sources for PD facilitation. Districts appear to be turning to local teachers and regional entities for mathematics-specific PD, with commercial curriculum developers figuring prominently in this equation as well. There may be many factors contributing to this decision—from minimizing the costs of PD to better understandings of the local context of the school and district. Local teachers and regional support service centers have lower direct costs to districts, and commercial curriculum developers may offer complimentary PD as a part of resource-adoption packages.

This local approach to PD does, however, serve to isolate districts—few opportunities for sharing PD knowledge across regions and states appear to exist. Similarly, national experts in mathematics pedagogy and research may not be well represented in the landscape of district PD. A risk associated with local PD approaches is that they reduce opportunities for bringing new knowledge into the district. Teacher-facilitated PD and teacher–peer collaborations are limited by the knowledge that teachers already have or can generate through their collaborative synergy.

Research has shown that positioning teachers to learn from colleagues who have more developed instructional practices is important (Sun, Garrison, Larson, & Frank, 2014), but that the quality of collaboration varies by school context and individual culture (Cochran-Smith & Lytle, 1999). A PD ecosystem that relies largely on locally sourced facilitation risks the repeated reinvention of the wheel from one district to the next, as compared with the opportunity to transform district approaches through the consideration of alternative research-based strategies or curriculum resources. As districts seek to strengthen their approach to the teaching and learning of algebra, offering PD that broadens existing conceptions seems increasingly important.

PD is viewed as a significant lever for change.

–A plurality of districts indicated changes to PD are necessary to support algebra instruction.

–Teacher knowledge of algebra and support for students are seen as important facets of PD.

While districts offer a limited amount of algebra PD, district leaders recognize the importance of PD as a tool to improve algebra completion rates, and some district leaders believe that changes to their PD related to algebra are either needed and/or can be implemented. The fact that some district leaders believe that their district is able to make changes in PD suggests that districts may need support in selecting the appropriate (and affordable) PD that will improve algebra instruction and early algebra completion.

The priorities district leaders use to make changes to PD highlight some important considerations in mathematics education but neglect others. Balancing these tensions is likely to be a continuing struggle for districts as they seek to better support student learning in algebra. These findings are important, as they provide mathematics education researchers and teacher educators with current information about the decision-making process of district leaders in the context of algebra PD. The extent to which factors such as access and equity are prioritized in districts is discussed further in the next chapter.

Chapter 5
District Leader Perspectives on Algebra I Policy: Resource Allocation, Access, and Readiness

Policies, course offerings, and visible teacher supports are key structures that frame the complex set of issues around Algebra I teaching and learning. The beliefs, attitudes, and perspectives of district leaders inform how these structures are designed and implemented. Indeed, our analysis in Chapter 3 related to what happens when students fail to meet an Algebra I policy deadline suggested that policies alone paint only part of the picture of students' opportunities to learn Algebra I. As such, we created a set of questions to find out district leaders' perspectives on a number of issues related to Algebra I policy, including student readiness to take Algebra I, curricular articulation, and the influence of an early Algebra I experience on students' futures.

The chapter's main findings are summarized below.

Perceptions about student-readiness shift at 9th grade.

–District leaders perceive most students as able to succeed in algebra at 9th grade.
–Few leaders perceive students as being able to succeed prior to 8th grade.
–Data for 8th grade is split.

Diverse factors contribute to a perception of readiness.

–Many respondents viewed readiness for algebra as influenced by developmental processes.
–Few leaders see students as having necessary algebra skills before high school.
–Changes to elementary curriculum and PD are seen as helping the situation.

Algebra I is seen as heralding STEM interest, future achievement.

–Introducing algebra before high school is seen as a critical step for STEM-intending college students.

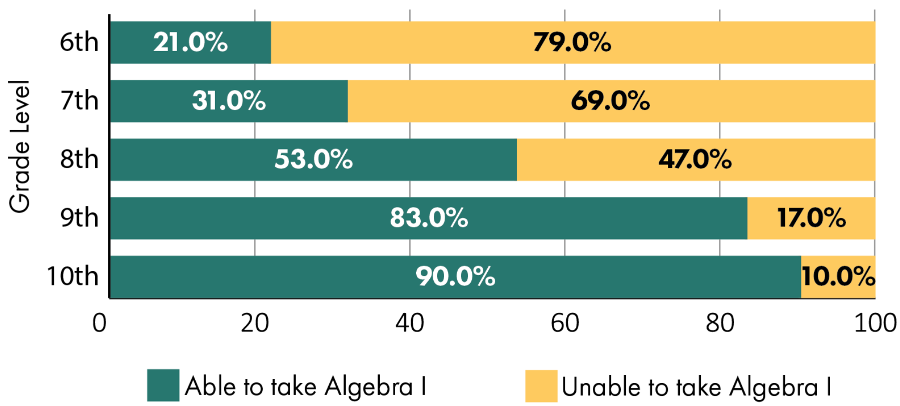
There are few identifiable pressures on districts related to Algebra I.

–The Common Core and state policies are seen as the most significant influences.

Algebra Readiness, Development, and Curriculum and Professional Development

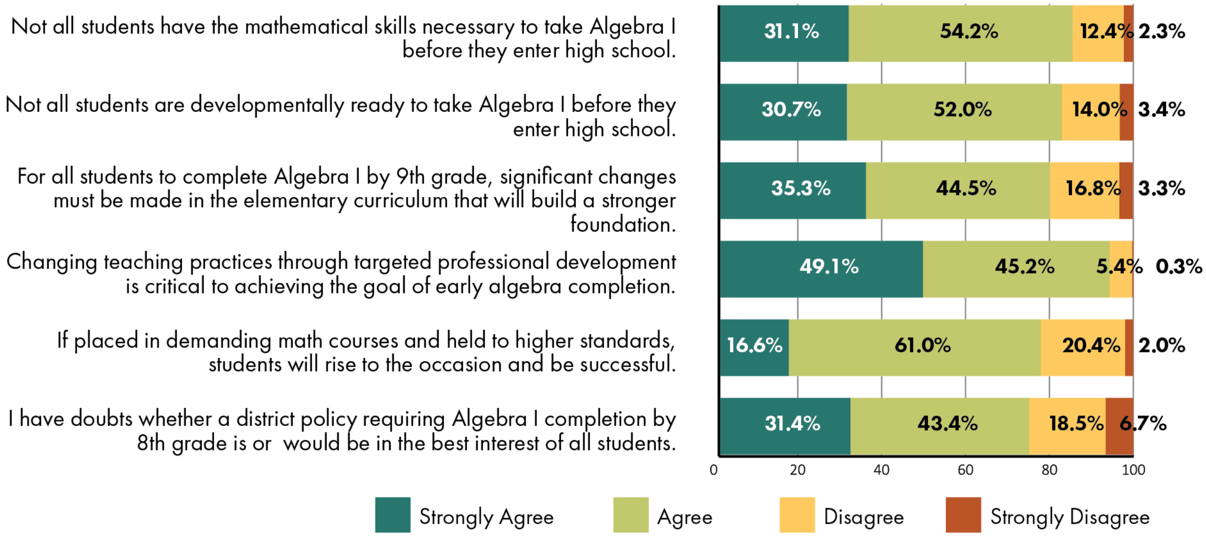
District leaders were asked to report the percentage of students in their district they thought would be unable to successfully take Algebra I in Grades 6 through 10; estimated means of the responses for each grade level are shown in Figure 5.1. On average, leaders thought almost half of 8th-grade students would be unable to successfully take Algebra I.

FIGURE 5.1. PERCEPTIONS OF STUDENTS' ABILITIES TO SUCCEED IN ALGEBRA I BY GRADE LEVEL



District leaders were asked to report their perspectives on students' readiness to take Algebra I and factors that might support student success; Figure 5.2 shows selected results. When asked their level of personal agreement with various statements about early algebra completion (or "the expectation that all students will complete Algebra I or its equivalent at or before 9th grade), 85.3% of district leaders "strongly agreed" or "agreed" that not all students had the skills necessary to take Algebra I before they entered high school, and 82.7% strongly agreed/agreed that not all students were developmentally ready to take Algebra I before entering high school. Two aspects district leaders agreed would help with successful completion were significant changes to the elementary curriculum to make a stronger foundation for Algebra I (35.4% strongly agreed; 44.5% agreed) and changing teaching through targeted PD (49.1% strongly agreed; 45.2% agreed). About three fourths (76.6%) of district leaders strongly agreed/agreed that if students were placed in demanding mathematics courses and held to higher standards they would rise to the occasion and be successful. Evidence in the literature indicates that having high expectations for students and supporting them to do well results in better learning more generally (e.g., Boaler & Staples, 2008; Gutierrez, 2011). About the same percentage of district leaders indicated that they doubted having a district policy that required Algebra I be completed by 8th grade would be in the best interest of all students.

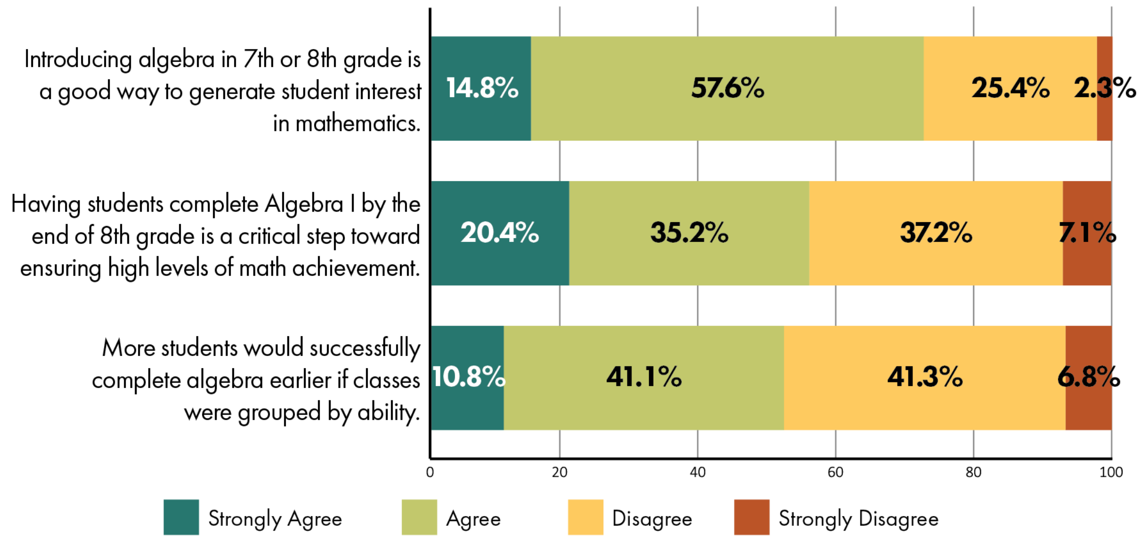
FIGURE 5.2. DISTRICT LEADER PERSPECTIVES RELATED TO ALGEBRA I READINESS



Student Success: Grouping, Fostering STEM Interest, and Future Success

When reporting on the extent to which they personally agreed with whether introducing algebra in 7th or 8th grade was a good way to generate interest in mathematics, most of the district leaders agreed (57.6%; 72.4% when including strongly agree). A quarter (27.7%) of district leaders, however, personally disagreed or disagreed strongly with this statement. Although most (55.6% strongly agreed/agreed) thought that having students complete Algebra I by the end of 8th grade was a critical step toward ensuring high levels of mathematics achievement, there was not consensus on what the role of grouping by ability might be. District leaders' perspectives on ability grouping were evenly split: almost the same percentage of district leaders reported strongly agreeing/agreeing (51.9%) that more students would successfully complete algebra earlier if they were grouped by ability as those reporting to disagree/strongly disagree (48.1%). Given the overwhelming evidence in research, dating back to the 1980s, about the effects of tracking on students (e.g., Chunn, 1988; Gamoran, 1992; Harklau, 1994; Lucas, 2001; Welner & Oakes, 1996), it is surprising that so many district leaders agreed with this statement. Response patterns for these questions are shown in Figure 5.3.

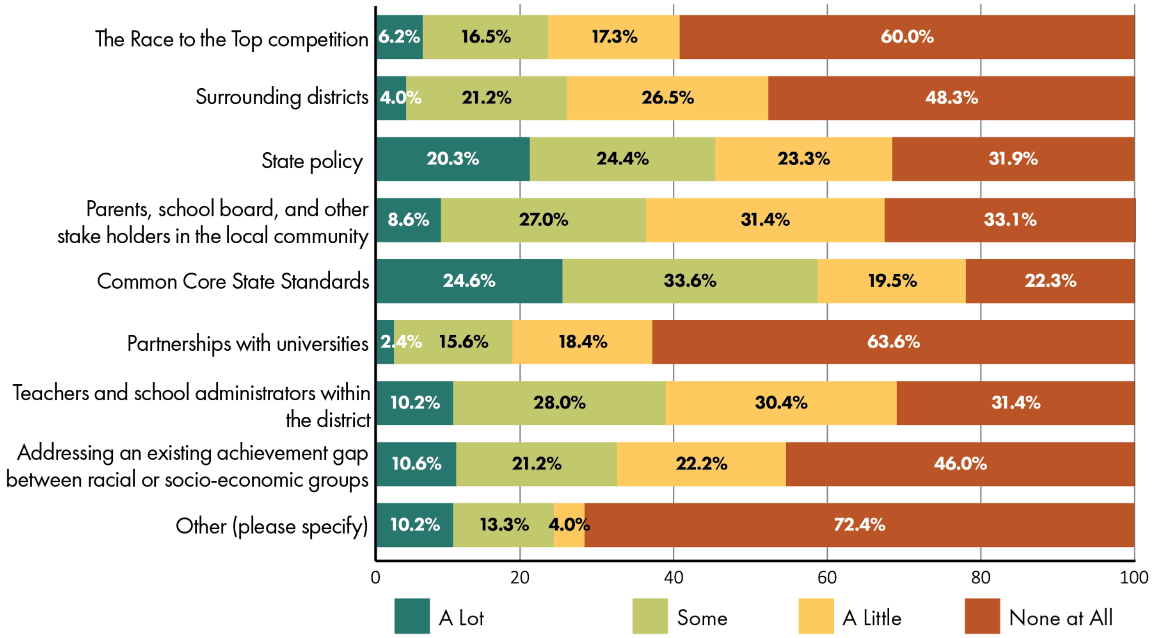
FIGURE 5.3. DISTRICT LEADER PERSPECTIVES ON STUDENT GROUPING AND FUTURE SUCCESS



Nature of Pressures in Districts

Figure 5.4 summarizes the results of questions asked to district leaders about the nature of pressures in their districts that influence Algebra I policy and practice. District leaders were asked, "How much pressure, if any, is your district receiving from each of the following, in relation to early algebra completion?" The only two responses to receive 20% or more in the category of "a lot" were state policies (20.3%) and the Common Core State Standards (24.6%). When we add in responses that districts perceive "some" pressure from, state policies and the CCSS received 44.7% and 58.2%, respectively. Pressures were perceived as being less strong in relationship to parents, school board, and other stakeholders in the local community (58.4% said some/a little; 33.1% said not at all) and teachers and school administrators (58.4% said some/a little; 31.4% said not at all). Even less pressure was felt in relationship to surrounding districts (47.7% said some/a little; 48.3% said not at all) or to addressing an existing achievement gap between racial or socioeconomic groups (43.2% said some/a little; 46% said not at all). Finally, little pressure seemed to relate to two categories: respondents reported feeling little or no pressure from Race to the Top (77.3%) and partnerships with universities (82%).

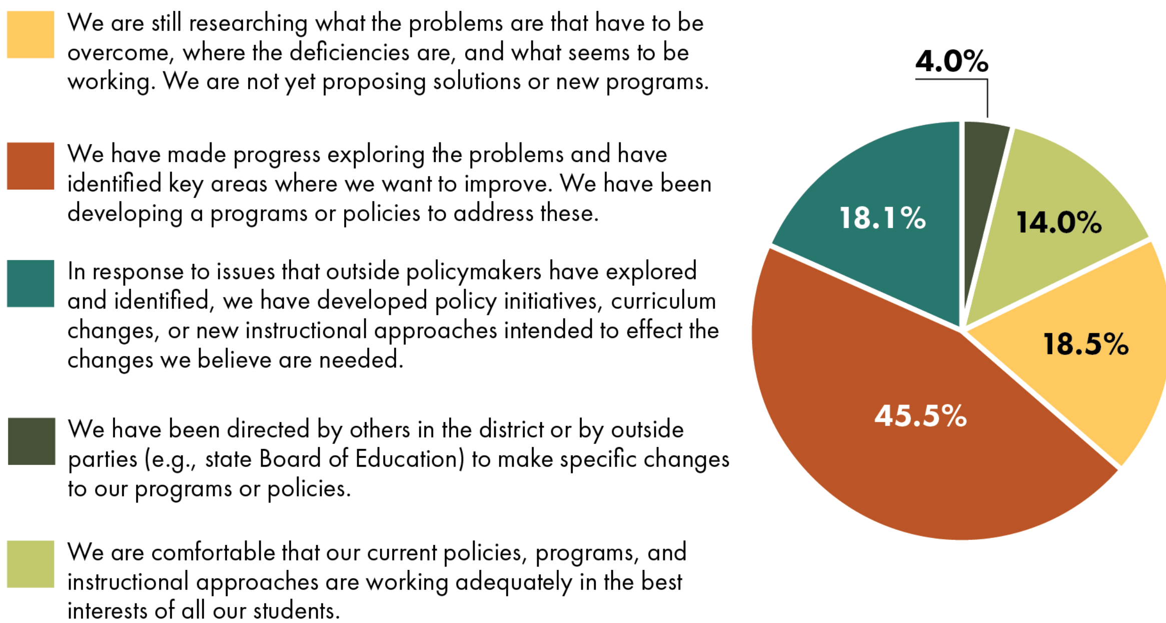
FIGURE 5.4. SOURCES OF PRESSURE ON DISTRICTS RELATED TO ALGEBRA I



District's Position in Relation to Change

We asked district leaders where they stood with respect to studying the issues in their districts and making changes. The five positions that districts could take relative to change are shown in Figure 5.5. Although most of the pressures seemed to come from state policy or the CCSS, 45.5% of the district leaders responded that they had "made progress in exploring problems and [had] identified key areas to improve," including developing programs or policies to address the issues in their mathematics programs. A little less than 20% reported that their districts were either still researching the problems and not yet ready to propose solutions or new programs, or that they were drawing on information from outside policymakers (rather than doing their own research) in order to develop their own policy initiatives, curriculum changes, or new instructional approaches to effect change. Some (14%) reported feeling comfortable that what they were doing was working adequately for students' best interests, whereas a very small percentage (4%) reported that they had been directed by others in the district or by outside parties to make specific changes to their programs or policies.

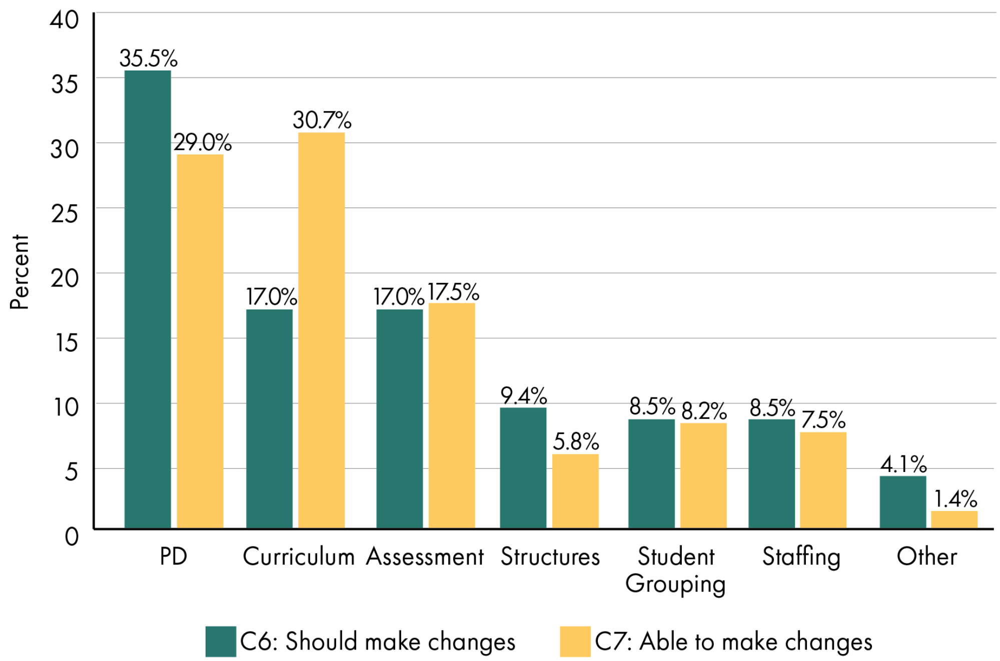
FIGURE 5.5. DISTRICT POSITIONS IN RELATION TO CHANGE



Where District Leaders Feel They *Should* and *Can* Make Change

Figure 5.6 once again shows data related to areas in which districts felt that they should or could make changes, summarizing the data across all areas of consideration. The three primary areas district decision makers felt should be changed were PD (35.5%), curriculum (17%), and assessment (formative or summative, 17%). These are the same three areas leaders reported as being most able to be changed. Less than 10% of district decision makers reported that changes should be made to student grouping practices, structures for offering classes (e.g., content vs. integrated approaches), and how mathematics courses were staffed. These areas were also the ones least identified as being possible to change.

FIGURE 5.6. AREAS TO CHANGE INFLUENCING ALGEBRA INSTRUCTION



Key Takeaways

Perceptions about student-readiness shift at 9th grade.

–District leaders perceive most students as able to succeed in algebra at 9th grade.
–Few leaders perceive students as being able to succeed prior to 8th grade.
–Data for 8th grade is split.

Diverse factors contribute to a perception of readiness.

–Many respondents viewed readiness for algebra as influenced by developmental processes.
–Few leaders see students as having necessary algebra skills before high school.
–Changes to elementary curriculum and PD are seen as helping the situation.

Our data related to district leaders' perceptions is diverse and, at times, may appear contradictory. It is, however, quite helpful as a lens through which to view policy decisions and implementation. It is interesting to note that despite a perceived push for Algebra I earlier in students' middle grades experiences, few district leaders feel that students are prepared to be successful in Algebra I prior to 8th grade. At the 8th-grade level, decisions are relatively split. The possible reasons for district personnel to hold these beliefs are interesting. In the data related to students' preparedness to engage with Algebra I, leaders held two dominant beliefs: that students may not have the mathematical skills for Algebra I prior to high school, and that students may not be developmentally ready. The former is a teaching and learning issue—supporting students in learning the skills and concepts needed to be successful in Algebra I is likely a matter of stronger and more coherent instruction in elementary and early middle grades. Indeed, district leaders overwhelmingly endorse the notion that significant changes need to be made in elementary curriculum to support stronger Algebra I outcomes in high school.

The latter notion, that there is a developmental readiness for Algebra I, may not be supported by contemporary research related to student learning. Despite widespread belief that there is a developmental component related to abstraction and logical thinking, research evidence in fact suggests the contrary (see, e.g., Carraher, Schliemann, Brizuela, & Earnest, 2006). Students as early as elementary school, for example, are able to use algebraic representations, express and articulate algebraic thinking, and make generalizations (e.g., Leinhardt & Steele, 2005). Nevertheless, if district leaders believe that some students simply have not "aged in" to algebraic thinking until the dawn of high school, it may constrain the opportunities that they provide to students to enroll in an Algebra I course.

Algebra I is seen as heralding STEM interest, future achievement.

–Introducing algebra before high school is seen as a critical step for STEM-intending college students.

While there is agreement that holding students to high standards will cause them to rise to the occasion, there is also nearly as strong an agreement that a district policy mandating Algebra I at the 8th grade is not in the best interest of students. This is particularly evident in the belief expressed by district decision makers that introducing algebra before high school is critical for the success of students intending to pursue STEM-related careers. This may be a case of a general philosophy with a specific exception. Perhaps district leaders believe that students will rise to high standards, and that this disposition is necessary but not sufficient for success in Algebra I prior to high school. The notion of developmental readiness may also play a role in the contrast between these items. With the strong agreement that middle grades algebra experiences can support interest in mathematics and future success, maybe the conceptions of developmental readiness and concerns about pre-Algebra I mathematical preparation and knowledge are more dominant factors as district leaders make decisions about access to Algebra I.

There are few identifiable pressures on districts related to Algebra I.

–The Common Core and state policies are seen as the most significant influences.

Finally, districts are reporting relatively little pressure from the outside related to Algebra I policy and practice. That the Common Core State Standards are viewed as a significant influence is not surprising; any change in academic standards is likely to cause pressure throughout a curriculum. Furthermore, at the time of the survey, Common Core was a new and very prominent initiative at the state and district levels. State policy plays a rather modest role in terms of pressure related to Algebra I. This reinforces a theme we have noted throughout this report: that the work of policy and practice around Algebra I is largely a local endeavor, considered for the most part within district boundaries rather than in the context of regional, state, or national dynamics.

Summary Remarks

Our nationally representative sample of district leaders regarding Algebra I policy and practice brings to light a wide array of factors that frame students' opportunities to learn. We set out to describe the landscape of policy and practice related to Algebra I, with a particular focus on the question of universal algebra enrollment policies. The Landscape Survey for Algebra Policy in Middle and High Schools can be found in Appendix D.

The headline finding from this study is that, in contrast to previous policy analyses and rhetoric, we find no evidence of an emphatic national push to enroll more students in Algebra I in 8th grade through the use of policy levers. While there is evidence in district leaders' responses that Algebra I enrollment in 8th grade is increasing, it still accounts for only 25% of the student population. Algebra I at the 9th grade remains the normative practice for most students in most US districts.

Another key theme that emerges in the data is that districts tend to retain local control and decision making—from a high-level course-taking policy perspective to determining successful completion of Algebra I. This is particularly evident in relation to systemic opportunity to learn related to organization and sequencing of courses, assessment, and supports for students. While districts are beholden to state policies, our data suggest flexible and adaptive approaches to policy implementation. Districts appear to take state policy as a baseline, and use local and selective factors to tailor those policies to their needs. Evidence for this claim comes from a multitude of sources—enrollment data by grade in Algebra I suggest what while 8th and 9th grade are the epicenter of Algebra I course taking, there are students on either side of that center engaged in Algebra I work. Overwhelming numbers of districts provide credit-recovery efforts aimed at preventing students from having to repeat Algebra I, and an overall mean pass rate of 85% suggests that these efforts are by and large successful. Even in cases where a student is not successful at the policy deadline, a common approach appears to be to allow students to retake the course past the deadline. Selective Algebra I policies and assessments of successful completion rely on local measures much more than more distal measures from a district, state, or commercial entity.

With regard to the systemic opportunities to learn related to curriculum and human resources, teacher PD emerges as a significant factor as districts consider successful Algebra I teaching and learning. Curriculum analyses, however, suggest that at the time of the survey, relatively traditional teaching resources still dominated the landscape. To enact meaningful change in the nature of Algebra I teaching and learning, districts must make significant investments in curricula that reflect a more contemporary set of mathematics learning standards as embodied by the Common Core State Standards. For the implementation of such a curriculum to be successful, districts must make an accompanying investment in teacher PD that supports teachers in engaging in research-based best practices (NCTM, 2014). The limited time reported for PD, combined with the curriculum landscape with respect to Algebra I, might suggest that resource limitations are a significant impediment to meaningful mathematics reform related to algebra teaching and learning.

Finally, while early exposure to algebra ideas is seen as a lynchpin to mathematics interest and achievement, district leaders overwhelmingly hold outdated conceptions about students' developmental readiness. For meaningful change to happen that opens up access and opportunity to more students to engage in algebra experiences, significant resource allocation changes would have to be made to support districts. Such a resource deployment, however, would be doomed to fail unless it is accompanied by systemic discussions about beliefs about student learning, particularly as it relates to mathematics in general and Algebra I in particular. The conflicting and sometimes contradictory beliefs about student ability and developmental readiness are likely to pose challenges to student success, even in the most well-resourced district.

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Appendix A
Definition of Terms

Algebra I

A first secondary course containing significant content related to algebra and functions; typically includes topics related to symbolic manipulation and graphing of linear and quadratic functions. May be named Algebra I or an equivalent featuring a more integrated approach to mathematics (e.g., Mathematics I).

College- and Career-Ready Curriculum (CCRC)

An initiative from Achieve (2009) that puts forth criteria for high school course taking intended to prepare graduates for a wide array of collegiate options and majors, as well as immediate post–high school career preparedness.

Common Core State Standards

A set of standards for mathematics and English language arts drafted to respond to Achieve Inc.'s College- and Career-Readiness criteria. Initially adopted by 46 US States and territories in 2010. Commissioned by the National Governors Association.

Free and Reduced Lunch (FRL)

A measure of poverty in school districts. Data provided by the Common Core of Data (2011).

Race to the Top

A 2009 federal competition for education funding that mandated the adoption of college- and career-readiness standards. Most states adopted the Common Core State Standards.

Selective Algebra Policies

Policies for placing students into Algebra I making use of one or more performance measures. Selective policies may include data from written assessments, prior academic achievement, teacher recommendation or parent request, or locally produced aggregate rating systems.

Universal Algebra (UA) Policies

Policies that dictate all students at a particular grade level (usually 8^{th} or 9^{th}) will take Algebra I, regardless of prior academic achievement.

Appendix B
Sampling and Sample Demographics

Sampling Decision

We sampled disproportionately by state from the four algebra policy groupings. As this is a main focus of the study, we wanted to have enough respondents in each grouping to make arguments about the effect of state algebra policy on district algebra policies. We sampled evenly by district from the four groupings so that the final sample would comprise 25% of districts from each grouping.

We discussed the importance of both small and large school districts, as well as urban versus suburban and town versus rural school districts. We decided to sample disproportionately based on district size (with the cutoff for a large district being a minimum of 4,000 students). The natural occurrence of large to small is 19% to 81%. We decided to sample a larger proportion of large districts because we felt that this distinction is quite important. We shifted the proportion in our sample to 40% large districts and 60% small districts.

We had a different discussion about oversampling urban districts since they are only about 6% of the total population, and we felt that this would be a grouping of significance. However, our disproportionate sampling based on district size actually helped achieve this goal of oversampling urban districts. To ensure that we got enough responses from urban districts, however, we stratified based on population density using three categories: urban, suburban/town, and rural. We sampled proportionately from these three categories. To actually create the sample, the districts were sorted by policy grouping, then by number of students, then by population density grouping.

We therefore have three sampling strata: **state algebra policy grouping, district size,** and **population density grouping**, sampling disproportionately from the first two strata and sampling proportionately from the last stratum. The natural occurrence of districts in each of these strata is displayed in Table B.1.

Based on our original power analysis, our ideal sample was identified as 1,000 districts. With this goal, we looked to have 250 school districts come from each of the algebra policy grouping categories. Four hundred districts should have been large and 600 should have been small; 105 should have been urban districts, 462 should have been suburban/town, and 433 should have been rural. This means that 25% came from each of our policy groupings; 40% of our sample were large districts and 60% were small districts; and 11% were urban, 46% were suburban/town, and 43% were rural.

TABLE B.1 POPULATION DISTRIBUTION BY ANALYTICAL LENSES

Policy Grouping	Size	Urbanicity	*N*, %
All students must enroll in C/CR curriculum by 2011 (Total: 3509, 27%)	Large (Total: 588, 4%)	Urban	177, 1%
		Suburb/Town	337, 3%
		Rural	74, 0%
	Small (Total: 2921, 22%)	Urban	32, 0%
		Suburb/Town	833, 6%
		Rural	2056, 16%
All students must enroll in C/CR curriculum by 2015 (Total: 2468, 19%)	Large (Total: 667, 5%)	Urban	141, 1%
		Suburb/Town	303, 2%
		Rural	223, 2%
	Small (Total: 1801, 14%)	Urban	19, 0%
		Suburb/Town	638, 5%
		Rural	1144, 9%
Plans to increase rigor of graduation requirements (Total: 1324, 10%)	Large (Total: 287, 2%)	Urban	55, 0%
		Suburb/Town	201, 2%
		Rural	31, 0%
	Small (Total: 1037, 8%)	Urban	5, 0%
		Suburb/Town	586, 4%
		Rural	446, 3%
No plans to increase rigor of graduation requirements (Total: 5774, 44%)	Large (Total: 976, 7%)	Urban	277, 2%
		Suburb/Town	578, 4%
		Rural	121, 1%
	Small (Total: 4798, 37%)	Urban	52, 0%
		Suburb/Town	1595, 12%
		Rural	3151, 24%

We originally expected a response rate (or *cooperation rate*) of 80%, with an eligibility rate of 95% (meaning that 95% of the people we contacted would be eligible to take the survey) and a hit rate of 95% (that we can get accurate contact information for 95% of our sample in our database). Since our end goal was 1,000 districts, we divide by each of these rates to get 1,400, the number of districts that we actually need to sample.

After piloting the survey and finding lower than expected response rates, we decided to double the potential sample to 2,800. The 2,800 were split, representatively, into six equal-sized replicates. This was done so that, if needed, we could invite additional respondents without inviting the entire overflow sample of 1,400. To create the replicates, we gave each district a number from 1 to 6, starting with 1 and continuing serially to 6 and then starting over at 1 until all 2,800 districts had such a number. We then randomly selected three of those replicates to make our initial sample of 1,400. Table B.2 contains counts of our original sample.

TABLE B.2 ORIGINAL SAMPLE (*N* = 1,396)

Policy 1				Policy 3			
	Large	Urban	42		Large	Urban	26
		Sub/town	80			Sub/town	98
		Rural	17			Rural	15
	Total		139		Total		139
	Small	Urban	1		Small	Urban	1
		Sub/town	60			Sub/town	119
		Rural	149			Rural	90
	Total		210		Total		210
Total			349	Total			349
Policy 2				**Policy 4**			
	Large	Urban	28		Large	Urban	40
		Sub/town	65			Sub/town	84
		Rural	46			Rural	15
	Total		139		Total		139
	Small	Urban	1		Small	Urban	1
		Sub/town	75			Sub/town	71
		Rural	134			Rural	138
	Total		210		Total		210
Total			349	Total			349

Table B.3 represents the final drawn sample, as well as the actual number of respondents. We used five of the six replicates, for a total of 2,332 in the sample. We had 993 bona fide respondents from 993 school districts, with an ultimate cooperation rate of 43%. There were additional respondents who did not complete the entire survey who are not included in this table or the cooperation rate.

TABLE B.3 FINAL SAMPLE AND RESPONDENTS (*N* = 2,332)

Final 2332 (1400 + 2 replicates)				Sampled	Respondents	Response %
Policy 1	Large	233	Urban	70	33	47%
			Sub/town	134	73	54%
			Rural	29	13	45%
	Small	350	Urban	3	0	0%
			Sub/town	100	40	40%
			Rural	247	96	39%
Policy 2	Large	233	Urban	48	23	48%
			Sub/town	107	50	47%
			Rural	78	37	47%
	Small	350	Urban	3	1	33%
			Sub/town	124	43	35%
			Rural	223	91	41%
Policy 3	Large	233	Urban	44	20	45%
			Sub/town	164	79	48%
			Rural	25	13	52%
	Small	350	Urban	2	0	0%
			Sub/town	198	70	35%
			Rural	150	60	40%
Policy 4	Large	233	Urban	68	34	50%
			Sub/town	140	68	49%
			Rural	25	14	56%
	Small	350	Urban	3	2	67%
			Sub/town	117	49	42%
			Rural	230	84	37%
Total				**2332**	**993**	**43%**

Our data were fairly representative of the population they were designed to capture. Table B.4 aggregates the pool of respondents by our analytical lenses and details both response and nonresponse rates. While our sample did not show bias with respect to policy grouping and urbanicity, there was bias toward smaller districts.

TABLE B.4 RESPONSE AND NONRESPONSE RATES

		Sample	Actual	Non-response	Sample %	Actual %	Non-response %
Policy	1	583	255	328	25%	26%	24%
	2	561	245	316	24%	25%	24%
	3	534	222	312	23%	22%	23%
	4	583	246	337	25%	25%	25%
Size	Large	932	457	475	40%	46%	35%
	Small	1400	536	864	60%	54%	65%
Urbanicity	Urban	241	113	128	10%	11%	10%
	Sub/Town	1084	472	612	46%	48%	46%
	Rural	1007	408	599	43%	41%	45%

Appendix C
Regression Model Estimates: Relating Universal Algebra Policy and District Characteristics

TABLE C.1 ORDINAL REGRESSION PREDICTING EXTENT OF INCREASE IN DISTRICT ALGEBRA I ENROLLMENT

	8th-grade odds ratio[a]	*9th-grade odds ratio[b]*
UA policy	1.52*	1.06
Small size	0.83	1.14
Urbanicity (*ref* = suburban)		
Urban	1.11	1.04
Rural	0.76	1.03
Policy grouping (*ref* = no plan to increase graduation requirements)		
CCRC by 2012	0.68	0.71
CCRC by 2015	1.28	0.86
Plan to increase graduation requirements	1.21	0.69
Poverty level (*ref* = FRL Quartile 4)		
FRL Quartile 1	1.87**	0.50**
FRL Quartile 2	1.52*	0.78
FRL Quartile 3	1.18	1.06

Sources: Urbanicity, FRL quartile, and size from Common Core of Data (2011). CCRC requirements from Achieve (2009).

Note. *$p < .05$; **$p < .01$; ***$p < .001$; FRL = free-and-reduced lunch eligibility percentage; CCRC = College- and Career-ready Curriculum

[a]$n = 882$. [b]$n = 868$

TABLE C.2 LINEAR REGRESSION PREDICTING 8TH-GRADE ALGEBRA I ENROLLMENT PERCENTAGE[A]

	Model 1		Model 2	
	Coefficient	*SE*	*Coefficient*	*SE*
UA policy	15.67***	2.862	-6.91	5.102
Small size	2.28	2.081	2.44	2.093
Urbanicity (*ref* = suburban)				
Urban	5.12	2.818	.88	2.939
Rural	-2.94	2.499	-7.62**	2.812
Policy grouping (*ref* = no plan to increase graduation requirements)				
CCRC by 2012	-12.86***	3.014	-12.49***	2.991
CCRC by 2015	-3.41	3.145	-3.65	3.072
Plan to increase graduation requirements	-9.87**	3.052	-10.02**	3.016
Poverty level (*ref* = FRL Quartile 4)				
FRL Quartile 1	16.24***	3.582	11.03**	4.181
FRL Quartile 2	8.50**	3.222	1.80	3.789
FRL Quartile 3	0.45	3.269	-4.56	3.810
UA policy by urbanicity (*ref* = suburban × UA)				
Urban × UA			17.95*	8.441
Rural × UA			15.72**	5.440
UA policy by poverty level (*ref* = FRL Quartile 4 × UA)				
FRL Quartile 1 × UA			16.34*	8.186
FRL Quartile 2 × UA			19.65**	7.004
FRL Quartile 3 × UA			13.89*	7.024

Sources: Urbanicity, FRL quartile, and size from Common Core of Data (2011). CCRC requirements from Achieve (2009).

Note. **p* < .05; ***p* < .01; ****p* < .001; FRL = free-and-reduced lunch eligibility percentage; CCRC = College- and Career-ready Curriculum; UA = universal Algebra I required by 8th or 9th grade.

[a]*n* = 836

TABLE C.3 LINEAR REGRESSION PREDICTING 9TH-GRADE ALGEBRA I ENROLLMENT PERCENTAGE[A]

	Model 1		Model 2	
	Coefficient	*SE*	*Coefficient*	*SE*
UA policy	-3.69	2.838	16.84**	5.385
Small size	-0.87	2.028	-0.86	2.032
Urbanicity (*ref* = suburban)				
Urban	-3.51	2.437	-1.26	2.855
Rural	5.18*	2.447	9.56***	2.681
Policy grouping (*ref* = no plan to increase graduation requirements)				
CCRC by 2012	7.56**	2.756	7.44**	2.724
CCRC by 2015	-3.65	3.077	-3.45	2.994
Plan to increase graduation requirements	4.16	2.941	3.90	2.873
Poverty level (*ref* = FRL Quartile 4)				
FRL Quartile 1	-10.19**	3.185	-7.15	3.659
FRL Quartile 2	-6.65*	3.041	0.81	3.214
FRL Quartile 3	0.89	2.891	6.16	3.178
UA policy by urbanicity (*ref* = suburban × UA)				
Urban × UA			-7.42	6.033
Rural × UA			-14.72**	5.443
UA policy by poverty level (*ref* = FRL Quartile 4 × UA)				
FRL Quartile 1 × UA			-5.40	6.951
FRL Quartile 2 × UA			-22.15**	7.387
FRL Quartile 3 × UA			-15.57*	6.740

Sources: Urbanicity, FRL quartile, and size from Common Core of Data (2011). CCRC requirements from Achieve (2009).

Note. *$p < .05$; **$p < .01$; ***$p < .001$; FRL = free-and-reduced lunch eligibility percentage; CCRC = College- and Career-ready Curriculum; UEA = universal Algebra I required by 8th or 9th grade

[a]$n = 838$

TABLE C.4 LINEAR REGRESSION PREDICTING DISTRICT ALGEBRA I PASS RATE

	Coefficient	*SE*
UEA policy	0.64	1.024
Small size	5.70***	1.028
Locale (*ref* = suburban)		
Urban	-3.46	1.773
Rural	1.37	1.025
Policy grouping (*ref* = no plan to increase graduation requirements)		
CCRC by 2012	2.03	1.171
CCRC by 2015	-0.55	1.416
Plan to increase graduation requirements	-1.49	1.322
Poverty level (*ref* = FRL Quartile 4)		
FRL Quartile 1	11.95***	1.511
FRL Quartile 2	5.81***	1.378
FRL Quartile 3	4.00**	1.470

n=802

Sources: Locale, FRL quartile, and size from Common Core of Data (2011). CCRC requirements from Achieve (2009).

Note. *$p < .05$; **$p < .01$; ***$p < .001$; FRL = free-and-reduced lunch eligibility percentage; CCRC = College- and Career-ready Curriculum; UEA = universal early Algebra I

Appendix D
Survey

Algebra Policy in Middle and High Schools

Thank you for agreeing to be a part of this important and ground-breaking research focusing on universal early algebra completion -- the expectation that students will complete Algebra I (or its equivalent) by the end of 8th or 9th grade. Your district is one of 1,400 districts selected nationwide to participate.

The survey contains questions about your district's structure and organization, your current mathematics and algebra curriculum and requirements, your perceptions about early algebra completion, and your district's current and future approaches toward early algebra completion. You should expect the survey to take about 20 minutes to complete. It may take more or less time depending on your answers and the level of detail that you wish to provide.

You do not have to complete the survey in one session. You may close your browser and access the link from the same computer and your answers will be preserved. We have included a broad spectrum of school districts in our sample, including those that only serve grades K-6 or K-8. We did so as the goal of early algebra completion may have an impact in the future regarding how students are prepared in those grade bands.

Your identity is protected and your responses are confidential. You will not be linked to any answer you provide and neither your name nor the name of your district will appear in any reports or documents generated from this research.

Please indicate your voluntary consent to participate in this research study and have your answers included in the dataset by selecting "yes" below and completing and submitting this survey.

- ❍ Yes
- ❍ No

Part A: Mathematics Requirements and Course Offerings in Your District

The following set of questions focuses on your district current mathematics requirements and class offerings for your district as a whole and specifically for mathematics in grades 6 through 10.

A1. Currently, what is the minimum number of high school mathematics courses required for graduation in your district?

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ More than 4
- ❍ No math courses are required

A2. In what school year did your district implement this mathematics requirement?

- ❍ 2011 - 2012
- ❍ 2010 - 2011
- ❍ 2009 - 2010
- ❍ 2008 - 2009
- ❍ 2007 - 2008 or before

A3. Which of the following statements best reflects how mathematics graduation requirements for your district are determined?

- My district is in a state that specifies mandatory minimum mathematics requirements for high school graduation.
- My district is in a state that has non-mandatory recommendations regarding mathematics for high school graduation.
- My district is in a state that has neither requirements nor recommendations regarding mathematics for high school graduation.

A3a. Which of the following statements best reflects your district's high school graduation requirements regarding mathematics?

- The mathematics requirements for high school graduation in my district match the state minimum requirements
- The mathematics requirements for high school graduation in my district exceed the state minimum requirements

A3a. Which of the following statements best reflects your district's high school graduation requirements regarding mathematics?

- My district has no mathematics requirements for high school graduation.
- My district requires fewer mathematics courses for high school graduation than the state recommendations.
- My district has mathematics requirements for high school graduation that match the state recommendations.
- My district requires more mathematics requirements for high school graduation than the state recommendations.

A3a. Which of the following statements best reflects your district's high school graduation requirements regarding mathematics?

- My district has mathematics requirements for high school graduation.
- My district has no mathematics requirements for high school graduation

A4. At which of the following grade levels are students in your district required to take mathematics?

	Yes, Required to Take Mathematics	No, Not Required to Take Mathematics
9th grade	❍	❍
10th grade	❍	❍
11th grade	❍	❍
12th grade	❍	❍

A5. We are interested in knowing the amount of mathematics instruction students typically receive in your district in grades 6 through 10.

For grades 6 through 10, please indicate if your district's mathematics classes meet every day (daily) or on different days of the week during different weeks (non-daily schedule) for example three days one week and two days the next week. If your district uses an alternate model, please choose the option that best reflects your district's dominant practice.

	Math Class Meets:	Math Classes Meets:
	Non-Daily Schedule	Daily Schedule
6th grade	❑	❑
7th grade	❑	❑
8th grade	❑	❑
9th grade	❑	❑
10th grade	❑	❑

6th Grade - Daily

A6a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By "other class offerings"; we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

		Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day	Yes	Full Year	Semester	Trimester	Quarter
6th grade		❑	❍	❍	❍	❍

6th Grade - Non-Daily

A6a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By "other class offerings" we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

			Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day -1st-Week	Number of Minutes Class Meets Per Day -2nd-Week	Yes	Full Year	Semester	Trimester	Quarter
6th grade			❑	❍	❍	❍	❍

6th Grade - Other Class Offerings

A6c. For other class offerings at 6th Grade that meet for different amounts of time, please indicate the number of minutes the class meets per week, the number of days, the duration of the class, and then briefly describe the nature of the class -- for example, double period, tutoring, etc.

				Course Duration			
	Number of Minutes Class Meets	Number of Days	Description of Class	Full Year	Semester	Trimester	Quarter
				❍	❍	❍	❍
				❍	❍	❍	❍

7th Grade - Daily

A7a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By "other class offerings" we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

		Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day	Yes	Full Year	Semester	Trimester	Quarter
7th grade		❑	❍	❍	❍	❍

7th Grade - Non-Daily

A7a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By “other class offerings”; we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

			Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day -1st-Week	Number of Minutes Class Meets Per Day -2nd-Week	Yes	Full Year	Semester	Trimester	Quarter
7th grade			❑	❍	❍	❍	❍

7th Grade - Other Class Offerings

A7c. For other class offerings at 7th Grade that meet for different amounts of time, please indicate the number of minutes the class meets per week, the number of days, the duration of the class, and then briefly describe the nature of the class -- for example, double period, tutoring, etc.

				Course Duration			
	Number of Minutes Class Meets	Number of Days	Description of Class	Full Year	Semester	Trimester	Quarter
				❍	❍	❍	❍
				❍	❍	❍	❍

8th Grade - Daily

A8a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By “other class offerings”; we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

		Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day	Yes	Full Year	Semester	Trimester	Quarter
8th grade		❑	❍	❍	❍	❍

8th Grade - Non-Daily

A8a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By "other class offerings" we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

			Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day -1st-Week	Number of Minutes Class Meets Per Day -2nd-Week	Yes	Full Year	Semester	Trimester	Quarter
8th grade			❑	❍	❍	❍	❍

8th Grade - Other Class Offerings

A8c. For other class offerings at 8th Grade that meet for different amounts of time, please indicate the number of minutes the class meets per week, the number of days, the duration of the class, and then briefly describe the nature of the class -- for example, double period, tutoring, etc.

				Course Duration			
	Number of Minutes Class Meets	Number of Days	Description of Class	Full Year	Semester	Trimester	Quarter
				❍	❍	❍	❍
				❍	❍	❍	❍

9th and 10th Grade - Daily

A9a. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By "other class offerings"; we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

		Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day	Yes	Full Year	Semester	Trimester	Quarter
9th grade		❑	❍	❍	❍	❍
10th grade		❑	❍	❍	❍	❍

9th and 10th Grade - Non-Daily

A9b. Please enter the number of minutes mathematics class typically meets per week, the duration of the class, and if your district has other class offerings. By "other class offerings" we are referring to classes that meet for different amounts of time per week, such as, a double period for some groups of students.

			Other Class Offerings	Class Duration			
	Number of Minutes Class Meets Per Day -1st- Week	Number of Minutes Class Meets Per Day -2nd- Week	Yes	Full Year	Semester	Trimester	Quarter
9th grade			❑	❍	❍	❍	❍
10th grade			❑	❍	❍	❍	❍

9th and 10th Grade - Other Class Offerings

A9c. For other class offerings at 9th and 10th Grade that meet for different amounts of time, please indicate the number of minutes the class meets per week, the number of days, the duration of the class, and then briefly describe the nature of the class -- for example, double period, tutoring, etc

				Class Duration			
	Number of Minutes Class Meets	Number of Days	Description of Class	Full Year	Semester	Trimester	Quarter
				❍	❍	❍	❍
				❍	❍	❍	❍

A10. At each grade level, please select the structure that most closely matches how your district's mathematics classes are structured.

Classes that are structured by content are separated by topic, such as Algebra, Geometry, Algebra II, etc. Classes that are integrated feature aspects of different content areas in a single class, and are sometimes named Integrated I, II, III or Math I, II, and III. Select both if your district offers students the option of either a content-structured or integrated track.

	Content	Integrated	Both
6th grade	❍	❍	❍
7th grade	❍	❍	❍
8th grade	❍	❍	❍
9th grade	❍	❍	❍
10th grade	❍	❍	❍

A11. At each grade level, select the way in which students are grouped within classes that best matches your district's practice.

	Heterogeneous (Mixed Ability)	Homogeneous (Similar Ability)
6th grade	❍	❍
7th grade	❍	❍
8th grade	❍	❍
9th grade	❍	❍
10th grade	❍	❍

Part B: Algebra Requirements and Course Structure

This next section focuses specifically on your district's algebra requirements and class structure. Throughout this section the term “Algebra I” is used to refer to your district’s Algebra I class or the class that is your district’s equivalent for the purposes of high school credit.

B1. Does your district require the completion of Algebra I or its equivalent for graduation?

- ❍ Yes - please indicate the name of the course if it is not titled Algebra I ____________________
- ❍ No

B2. Which one of the following statements best describes what determines the Algebra I requirements for your district?

- ❍ My district is in a state that specifies mandatory algebra requirements for high school graduation.
- ❍ My district is in a state that has non-mandatory recommendations regarding algebra for high school graduation.
- ❍ My district is in a state that has neither requirements nor recommendations regarding algebra for high school graduation.

B2a. Which of the following statements best reflects your district's high school graduation requirements regarding algebra?

- ❍ The algebra requirements for high school graduation in my district match the state minimum requirements.
- ❍ The algebra requirements for high school graduation in my district exceed the state minimum requirements.

B2a. Which of the following statements best reflects your district's high school graduation requirements regarding algebra?

- ❍ My district has no algebra requirements for high school graduation.
- ❍ My district requires fewer algebra classes for high school graduation than the state recommendations.
- ❍ My district has algebra requirements for high school graduation that match the state recommendations.
- ❍ My district requires more algebra classes for high school graduation than the state recommendations.

B2a. Which of the following statements best reflects your district's high school graduation requirements regarding algebra?

- ❍ My district has algebra requirements for high school graduation.
- ❍ My district has no algebra requirements for high school graduation.

B3. In what school year was your most recent Algebra I requirement implemented?

- ❍ 2011 - 2012
- ❍ 2010 - 2011
- ❍ 2009 - 2010
- ❍ 2008 - 2007
- ❍ 2007 - 2008 or before

B4. Does your district currently have a policy that requires students to complete Algebra I by the end of a specific grade, and if so, by the end of what grade?

- ❍ The end of 8th grade
- ❍ The end of 9th grade
- ❍ The end of 10th grade
- ❍ The end of 11th grade
- ❍ The end of 12th grade
- ❍ My district does not have a requirement for when students complete Algebra I

B5. Does your district have any plans to implement a policy that all students complete Algebra I by the end of 8th grade?

- ❍ Yes
- ❍ No

B6. By what school year do you think this policy will be in place?

- ❍ 2012 - 2013
- ❍ 2013 - 2014
- ❍ 2014 - 2015
- ❍ 2015 - 2016
- ❍ 2016 - 2017 or later

B7. Does your district have any plans to implement an Algebra I requirement in the next 5 years?

- ❍ Yes
- ❍ No
- ❍ I am unsure at this time

B8. In what school year would these changes mostly likely be implemented?

- ❍ 2012 - 2013
- ❍ 2013 - 2014
- ❍ 2014 - 2015
- ❍ 2015 - 2016
- ❍ 2016 - 2017

B9. Would this policy also include a provision that students complete Algebra I by the end of a specific grade, and if so, which grade?

- ❍ The end of 8th grade
- ❍ The end of 9th grade
- ❍ The end of 10th grade
- ❍ The end of 11th grade
- ❍ The end of 12th grade
- ❍ No, a policy would not include such a provision

B10. Which of the following describes the criteria your district uses to determine successful completion of Algebra I? (Please select all that apply)

- ❑ Enrollment and attendance in the class
- ❑ Performance on tasks and assessments (quizzes, tests) in the course
- ❑ Overall grade in the class
- ❑ Passing a teacher administered final test or exam
- ❑ Passing a district administered test
- ❑ Passing a state administered test

B11. Please indicate the percentage of students that are currently enrolled in Algebra I or its equivalent at each of the described grade levels in your district. If you are unsure, please provide your best estimate.

	Percentage of Students				
	6th Grade	7th Grade	8th Grade	9th Grade	10th Grade
Algebra I (or equivalent course)					

B12. Please indicate the specific resources that your district has purchased or adopted to support the teaching of algebra (at the middle or high school levels). For each resource, please fill in as much information as you can, such as the name of the resource, publisher, and year of publication or purchase.

	Resource Use			Name of Resource(s)		
	Core Instruction	Remediation/Credit Recovery	Other	(1)	(2)	(3)
Textbook (middle school level)	❑	❑	❑			
Textbook (high school level)	❑	❑	❑			
Software programs	❑	❑	❑			
Website or other on-line resources	❑	❑	❑			
Other technology	❑	❑	❑			
Graphing calculators	❑	❑	❑			
Other resources (please specify)	❑	❑	❑			

B13. Which of the following assessments, if any, are currently being used by teachers in your district to monitor students progress while taking Algebra I during the school year?

	Yes	No
Quizzes	❍	❍
Chapter tests Quarter or	❍	❍
semester exams	❍	❍
Benchmark assessments	❍	❍
Other (please specify)	❍	❍

B14. In your district, who is responsible for developing the assessments currently being used?

	Yes	No
Math department faculty	❍	❍
District level personnel	❍	❍
The state	❍	❍
An external company	❍	❍
Other (please specify)	❍	❍

B15. What is your district's current overall pass rate for Algebra I (or equivalent)?

B16. If a student in your district fails to meet the requirements for completing Algebra I, which of the following are possible outcomes for the student?

	Yes	No
Specific remedial or credit recovery coursework during the regular school year	❍	❍
Specific remedial or credit recovery coursework outside the regular school year	❍	❍
Repeat the course beyond the policy deadline	❍	❍
Repeat the entire grade	❍	❍
May not graduate or receive a diploma	❍	❍
Other (please specify)	❍	❍

B17. Thinking generally over the past 5 years, to what extent has your district experienced each of the following?

	A Great Deal	Somewhat	A Little	Not at All
An increase in the proportion of students taking algebra in 8th grade.	❍	❍	❍	❍
An increase in the proportion of students taking algebra in 9th grade.	❍	❍	❍	❍
An increase in the proportion of students repeating algebra.	❍	❍	❍	❍
An increase in the proportion of students failing Algebra I in 9th grade.	❍	❍	❍	❍
An increase in monitoring student progress through 9th grade algebra and providing interventions when necessary.	❍	❍	❍	❍
A change in math curriculum to follow the Common Core State Standards.	❍	❍	❍	❍
The offering of additional support (e.g., summer programs, extra tutoring, in class support) for students to help them succeed in algebra.	❍	❍	❍	❍

B18. In what ways has implementing the Common Core State Standards affected either positively or negatively the teaching of Algebra I in your district?

Part C: Early Algebra Completion

For the purposes of our research, the term "early algebra completion" is defined as -- the expectation that all students will complete Algebra I (or its equivalent) at or before 9th grade. Please keep this in mind when answering the following set of questions.C1. What percentage of students in your district do you think would be unable to successfully take Algebra I at each of the following grade levels?

	Percentage of Students				
	6th Grade	7th Grade	8th Grade	9th Grade	10th Grade
% of Students Unable to Successfully Take Algebra					

C2. Please indicate to what extent you personally agree or disagree with each of the following statements about early algebra completion

	Strongly Agree	Agree	Disagree	Strongly Disagree
For all students to complete Algebra I by 9th grade, significant changes must be made in the elementary curriculum that will build a stronger foundation.	❍	❍	❍	❍
Changing teaching practices through targeted professional development is critical to achieving the goal of early algebra completion.	❍	❍	❍	❍
Not all students have the mathematical skills necessary to take Algebra I before they enter high school.	❍	❍	❍	❍
Having students complete Algebra I by the end of 8th grade is a critical step toward ensuring high levels of math achievement.	❍	❍	❍	❍
If placed in demanding math courses and held to higher standards, students will rise	❍	❍	❍	❍

to the occasion and be successful.				
Introducing algebra in 7th or 8th grade is a good way to generate student interest in mathematics.	❍	❍	❍	❍
I have doubts whether a district policy requiring Algebra I completion by 8th grade is or would be in the best interest of all students.	❍	❍	❍	❍
More students would successfully complete algebra earlier if classes were grouped by ability.	❍	❍	❍	❍
Not all students are developmentally ready to take Algebra I before they enter high school.	❍	❍	❍	❍

C3. How much pressure, if any, is your district receiving from each of the following in relation to early algebra completion?

	A Lot	Some	A Little	None at All
The Race to the Top competition	❍	❍	❍	❍
Surrounding districts	❍	❍	❍	❍
State policy	❍	❍	❍	❍
Parents, school board, and other stake holders in the local community	❍	❍	❍	❍
Common Core State Standards	❍	❍	❍	❍
Partnerships with universities	❍	❍	❍	❍
Teachers and school administrators within the district	❍	❍	❍	❍
Addressing an existing achievement gap between racial or socio-economic groups	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍

C4. How often are each of the following criteria used by your district to determine a student's readiness or eligibility to take Algebra I early?

	Very Prominent	Somewhat Prominent	Minor Factor	Not Used at All
Locally produced assessment	❍	❍	❍	❍
Commercially produced assessment (e.g., SAT-9, Orleans-Hanna, MAP)	❍	❍	❍	❍
State produced assessment	❍	❍	❍	❍
Grade(s) in previous math course(s)	❍	❍	❍	❍
Parental request or recommendation	❍	❍	❍	❍
Teacher request or recommendation	❍	❍	❍	❍
Identified by district gifted/talented program	❍	❍	❍	❍
Available space in the class	❍	❍	❍	❍

C5. Which of the following statements best describes your school district's current position with regard to future directions for your overall mathematics program?

- ❍ We are still researching what the problems are that have to be overcome, where the deficiencies are, and what seems to be working. We are not yet proposing solutions or new programs.
- ❍ We have made progress exploring the problems and have identified key areas where we want to improve. We have been developing a programs or policies to address these.
- ❍ In response to issues that outside policymakers have explored and identified, we have developed policy initiatives, curriculum changes, or new instructional approaches intended to effect the changes we believe are needed.
- ❍ We have been directed by others in the district or by outside parties (e.g., state Board of Education) to make specific changes to our programs or policies.
- ❍ We are comfortable that our current policies, programs, and instructional approaches are working adequately in the best interests of all our students.

C6. In your opinion, in which of the following areas SHOULD your district make the most changes related to algebra instruction?

- ❍ Curriculum
- ❍ Professional development
- ❍ Student grouping practices
- ❍ Structures for offering mathematics classes (e.g., content vs integrated)
- ❍ How we staff mathematics classes
- ❍ Assessment (formative or summative)
- ❍ Other (please specify) ____________________

C7. In your opinion, in which of the following areas is your district MOST ABLE to make changes related to algebra instruction?

- ❍ Curriculum
- ❍ Professional development
- ❍ Student grouping practices
- ❍ Structures for offering mathematics classes (e.g., content vs integrated)
- ❍ How we staff mathematics classes
- ❍ Assessment (formative or summative)
- ❍ Other (please specify) ____________________

We are interested in learning about the factors districts consider and the importance of these factors when making decisions related to early algebra instruction and completion in the areas of curriculum, professional development, class structure, and assessment. For each of the areas, please drag each factor that were or will be considered to the top box on the right and rank them in order of importance. If the factor was not considered or will not be considered, please drag it to the bottom box on the right.

C8. In making changes or updating the CURRICULUM for algebra, we considered or will consider whether the . . .

	Factor was or Will be Considered in Decisions Regarding Curriculum	Factor Was or Will Not Be Considered
______Problems in the materials are relevant to real life situations. ______Materials represent the culture of the students who are in our district ______Materials have been effective for districts nearby or that are like our district ______Materials will help students do well on the state exams or other achievement tests ______Materials will prepare students for university-level mathematics courses. ______Materials will support our lower-achieving students in being able to take more courses beyond Algebra I. ______Materials will be easy for our teachers to implement. ______Materials will be accessible for all students taking the course.		

C9. In making changes to CLASS STRUCTURE to address how and when algebra is taught, we considered or will consider . . .

_____Ways to encourage underserved populations to take algebra earlier.	Factor Was or Will Be Considered in Decisions Regarding Class Structure	Factor Was or Will Not Be Considered
_____Ways to ensure that our best teachers worked with our most struggling students. _____Feedback from colleges and universities about the rigor of our math offerings. _____Making changes to what we are teaching under the title of algebra. _____Combining students of multiple ability levels in a single class. _____Creating additional tracks for students at the top or bottom of the achievement curve. _____Parental requests for more students to take algebra earlier. _____Ways to get more students to and through calculus. _____Ways to encourage underserved populations to take algebra earlier.		

C10. In making changes to PROFESSIONAL DEVELOPMENT experiences for algebra teachers, we considered or will consider the importance of our teachers. . .

______Knowing applications or real life contexts for algebra.	Factor Was or Will be Considered in Decisions Regarding Professional Development	Factor Was or Will Not Be Considered
______Understanding how to make their teaching more culturally relevant.		
______Knowing about a new curriculum resource.		
______Learning new classroom management strategies.		
______Having time set aside by the district to do mathematics together.		
______Learning about a new state or national assessment.		
______Knowing how to teach algebra to all students.		
______Knowing how to help all students be successful on the exams they take.		
______Understanding how to help students use mathematics to understand social, political, and economic situations.		
______Having deep understandings of algebra so that they can prepare students to be successful in collegiate-level mathematics.		
______Knowing applications or real life contexts for algebra.		

C11. In making changes to ASSESSMENT STRATEGIES related to algebra, we considered or will consider . . .

_____Ways to address inequities in achievement across some of the demographic groups we serve.	Factor Was or Will Be Considered in Decisions Regarding Professional Development	Factor Was or Will Not Be Considered
_____How our assessment data can be used to evaluate teaching effectiveness.		
_____How our assessment data can be used to predict future student performance.		
_____The extent to which assessments help to identify information students don't understand so we can teach that information better.		
_____The extent to which they help us evaluate whether our curriculum program is effective.		
_____The extent to which various demographic groups are consistently learning mathematics.		
_____The extent to which the assessment helps students do well on standardized tests.		
_____Ways to address inequities in achievement across some of the demographic groups we serve.		

Part D: Professional Development

The next set of questions ask about professional development opportunities. By professional development, we include formal workshops, classroom coaching, and school-wide and departmental meetings focused on the continued education of teachers.

D1. For each group of educational professionals in your district, please indicate who participates in each type of professional development learning activities.

	General Professional Development		Mathematics Related Professional Development		Algebra Related Professional Development	
	Yes	No	Yes	No	Yes	No
Teacher aides	❍	❍	❍	❍	❍	❍
Teachers	❍	❍	❍	❍	❍	❍
Math coaches	❍	❍	❍	❍	❍	❍
District math specialists	❍	❍	❍	❍	❍	❍
Administrators	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍

D2. In your district, please indicate who generally conducts the professional development learning activities.

	General Professional Development		Mathematics Related Professional Development		Algebra Related Professional Development	
	Yes	No	Yes	No	Yes	No
Math coaches	❍	❍	❍	❍	❍	❍
Teachers from within the district	❍	❍	❍	❍	❍	❍
Teachers from outside the district	❍	❍	❍	❍	❍	❍
District administrators	❍	❍	❍	❍	❍	❍
Experts from local colleges or universities	❍	❍	❍	❍	❍	❍
Public or government regional professional development entities (e.g., IDS, Area Education Association, etc)	❍	❍	❍	❍	❍	❍
Private regional professional development entities	❍	❍	❍	❍	❍	❍
Representatives from adopted textbook or other curriculum materials companies	❍	❍	❍	❍	❍	❍
Representatives from adopted supplemental technology or software companies	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍

D3. In your district, how many hours are planned during the school year for each of the following types of professional development activities?

______General
______Mathematics related
______Algebra related

D4. Are there any topics related to early algebra completion that are important to you, as an education professional, that we have missed or not covered in depth? Please share your insights below

Part E: District Demographics

So that we can better understand our results, please answer the following questions about your district.

E1. Which of the following best describes the post elementary grade level grouping by building in your district?

- ❍ 5-8, 9-12
- ❍ 6-8, 9-12
- ❍ 7-8, 9-12
- ❍ K-8, 9-12
- ❍ 7-9, 10-12
- ❍ 7-12
- ❍ 6-12
- ❍ Other (please specify) ____________________

E2. Please indicate the number of students currently enrolled at each grade level and the number of schools in your district that serve each grade level. If you are unsure of the total number of students, please provide your best estimate.

	Total Number of Students District Wide	Total Number of Schools
6th grade		
7th grade		
8th grade		
9th grade		
10th grade		
11th grade		
12th grade		

E3. Does your district have any of the following types of schools in addition to the schools previously mentioned? If you are unsure of the total number of students, please provide your best estimate.

	Have School		Number Students		Grade Levels Served							
	Yes	No	Total Number Students	Total Number of Schools	5th	6th	7th	8th	9th	10th	11th	12th
Alternative education	❍	❍			❑	❑	❑	❑	❑	❑	❑	❑
Vocational education	❍	❍			❑	❑	❑	❑	❑	❑	❑	❑
Special education	❍	❍			❑	❑	❑	❑	❑	❑	❑	❑
Specialized academies	❍	❍			❑	❑	❑	❑	❑	❑	❑	❑
On-line/Virtual	❍	❍			❑	❑	❑	❑	❑	❑	❑	❑
Other (please specify)	❍	❍			❑	❑	❑	❑	❑	❑	❑	❑

Part F: Personal Demographics

Please answer the following questions so we know more about our research partners.

F1. What is your title?

F2. For how many years have you held this position?

- ❍ 1 Year or Less
- ❍ 2 Years
- ❍ 3 Years
- ❍ 4 Years
- ❍ 5 Years
- ❍ 6 Years
- ❍ 7 Years
- ❍ 8 Years
- ❍ 9 Years
- ❍ 10 or More Years

This survey is just one part of a multi-year research study focusing on early algebra completion. We greatly appreciate your time and expertise. If you would you be willing to participate in follow-up research please check the box below.

❑ Yes, I would like the opportunity to participate in follow-up research

If you would also like a copy of the results please indicate below. Results from this part of the study will be available in the fall of 2012.

❑ Yes, I would like the results of this study

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