

Ingredients for a Successful Algebra Program in Middle School

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Douglas Van Dine
REL Central

Mary Klute
REL Central

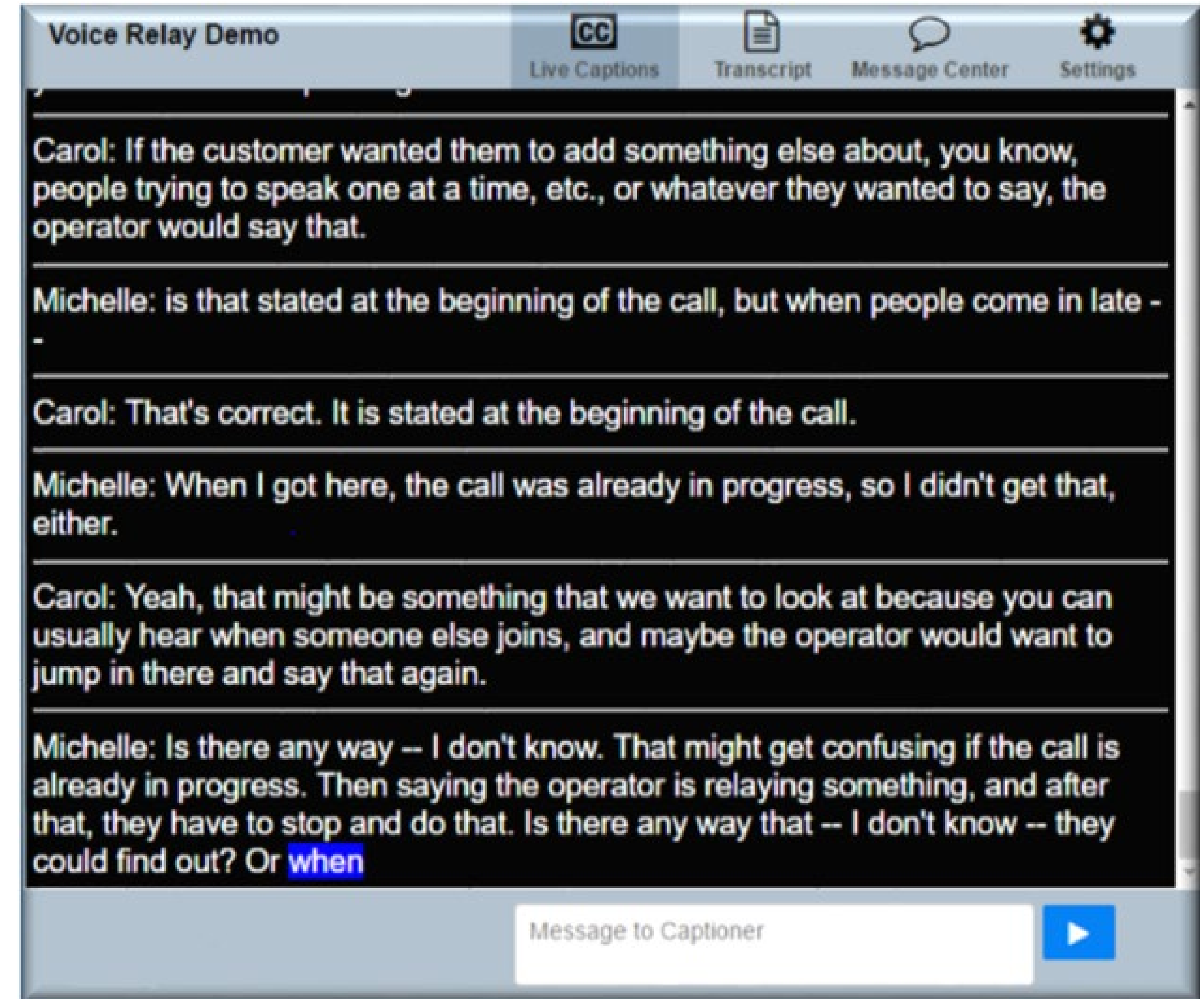
Joshua Stewart
REL Central

John Downs
Hallsville School
District

Jennifer Overley
Cherry Creek School
District

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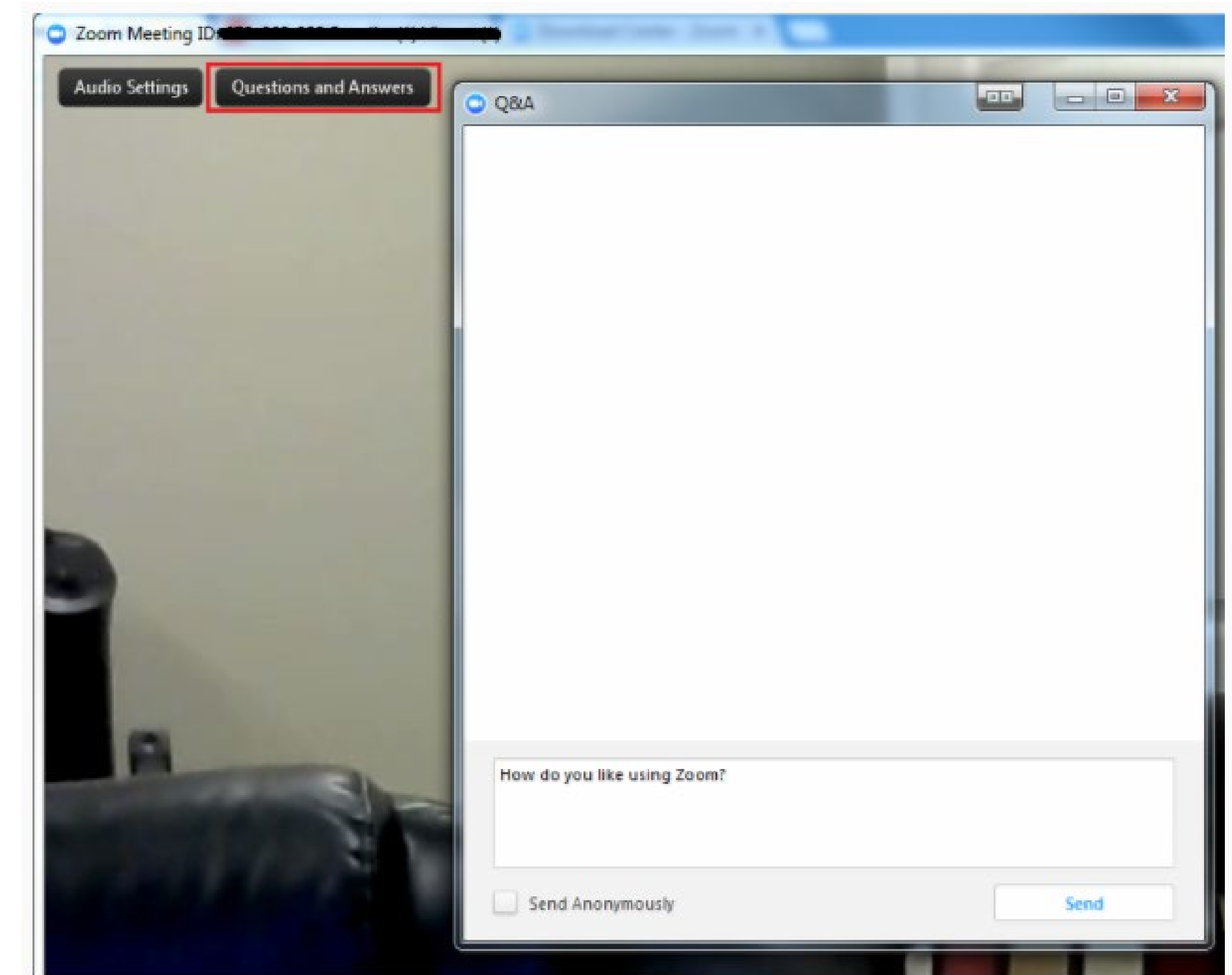


Q & A

To reduce background noise, we have muted all participants. While chat has been disabled, you are welcome to communicate by using the Q & A box.

Your Participation

- We will monitor the Q & A box throughout the presentation. Please feel free to use it at any time for any comments or questions you have.
- Simply click on the Q & A box panel at the top left corner of your screen and send us your question.



REL Central – Who We Are



The Regional Educational Laboratory (REL) Central at Marzano Research serves the applied education research needs of Colorado, Kansas, Missouri, Nebraska, North Dakota, South Dakota, and Wyoming.

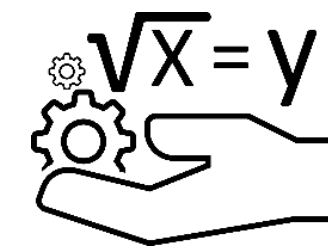
REL Central – College and Career Readiness Research Alliance

An alliance united by goals ensuring that all students graduate from high school prepared to enter the workforce or enroll in postsecondary degree or certification programs.

Areas of Focus



Postsecondary
Success Assessment



Algebra I
Readiness Support

Identifying Factors Associated With Student Success
in Algebra I



Meet Our Presenters

- Mike Siebersma, REL Central
- Douglas Van Dine, REL Central
- Mary Klute, REL Central
- John Downs, Hallsville School District, Missouri
- Jennifer Overley, Cherry Creek School District, Colorado

Goals

- To describe the extant research on factors associated with student success in Algebra I.
- To provide an overview of and review findings from the REL Central report *What Grade 7 Foundational Knowledge and Skills Are Associated With Missouri Students' Algebra I Achievement in Grade 8?* and discuss potential policy and practice implications.
- To provide perspectives from two districts on the realities of making decisions about accelerating middle school students into Algebra I and the ways in which the research findings might inform such decisions in the future.

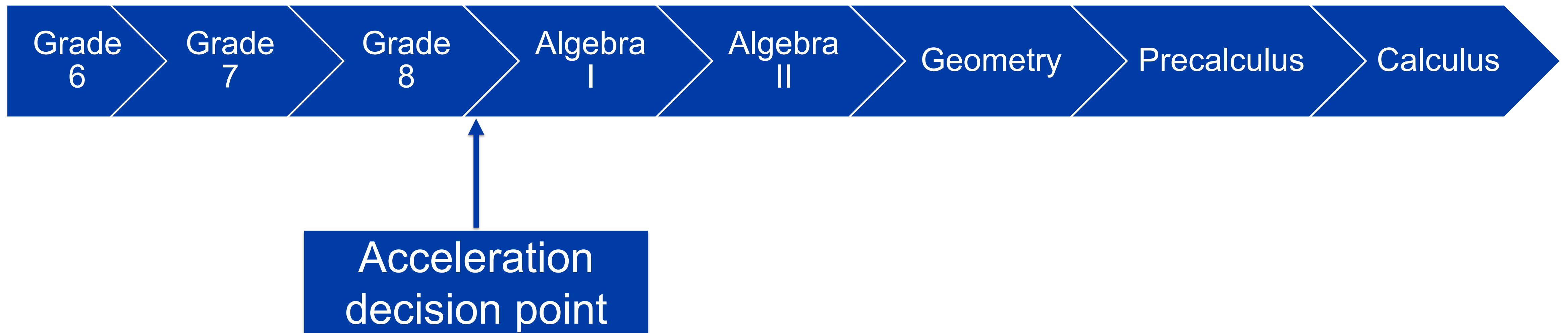
Why Offer Algebra I in Middle School?

Poll

- Does your district offer students the option of taking Algebra 1 in middle school?
 - Yes
 - No
 - Unsure

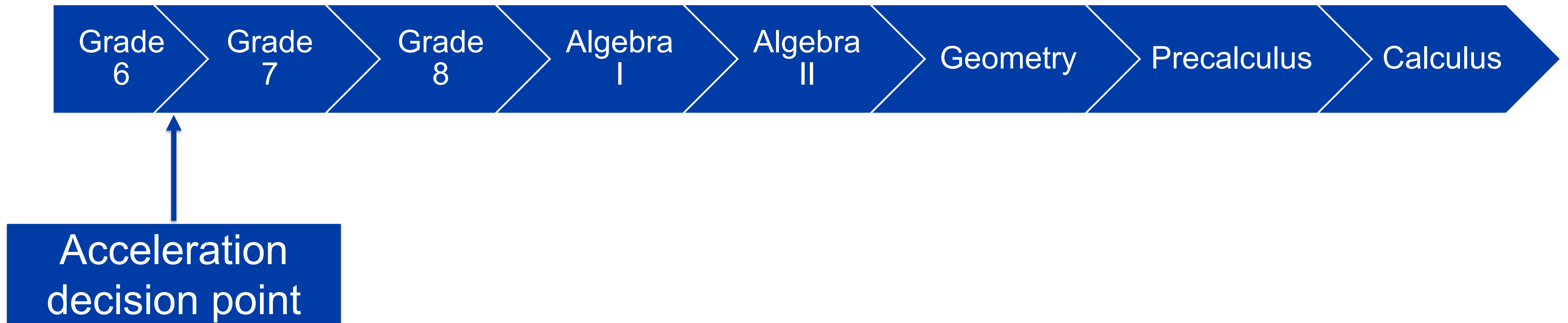
Accelerating Into Algebra Creates Pathways to Higher-Level Math

1) Enhanced Pathway in High School



Accelerating Into Algebra Creates Pathways to Higher-Level Math

2) Compacting in Middle School – Option 1



Accelerating Into Algebra Creates Pathways to Higher-Level Math

3) Compacting in Middle School – Option 2



Considerations for Standards-Aligned Implementation

- Decisions to accelerate students while in middle school should be carefully considered.
 - Solid evidence of mastery of prerequisite standards should be required; diagnostic testing can help identify strengths and challenges in particular areas of math content.

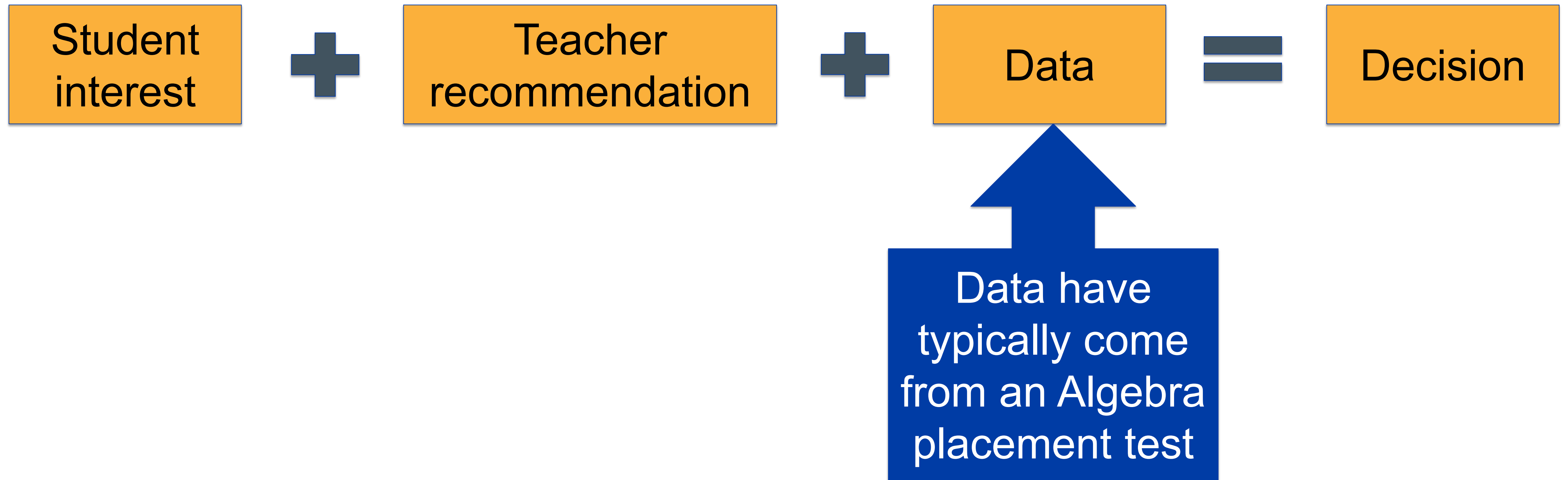
Success the First Time Taking Algebra I Is Critical

- Finding: Many students repeat Algebra, but few repeaters achieve proficiency on their second attempt.
- Success in advanced math courses gives students access to a wider variety of college and career options.
 - Students who fail Algebra I are less likely to enroll in and succeed in advanced math courses.^{1, 2, 3}

How Should We Identify Students for Acceleration Into Algebra I in Grade 8?

What Grade 7 Foundational Knowledge and Skills Are Associated With Missouri Students' Algebra I Achievement in Grade 8?⁴

Different Paths for Selecting Students



Research Questions

- The study examined associations between scores in the five math domains of the Missouri Assessment Program in grade 7 and scale scores on the Algebra I End-of-Course (EOC) Assessment in grade 8.
 1. To what extent are scores in the five math domains associated with Algebra I achievement?
 2. How do the associations vary by English learner status?
 3. How do the associations vary by special education status?

Missouri Assessment Program Grade 7 Math Domains

Ratios and proportional relationships

- Analyzing proportional relationships and using them to solve problems.

The number system

- Applying and extending understanding of operations (addition, subtraction, multiplication, and division) to rational numbers.

Expressions and equations

- Using properties of operations to generate equivalent expressions and solving problems using numerical and algebraic expressions.

Geometry

- Drawing and describing geometric figures (including two-dimensional shapes and cross sections of three-dimensional shapes) and applying and extending understanding of angle measure, area, and volume.

Statistics, and probability

- Using random sampling to draw inferences about a population; drawing informal comparative inference about two populations; and developing, using, and evaluating probability models.

Scores in All Five Math Domains in Grade 7 Were Associated With Algebra I Achievement in Grade 8

Domain	Coefficient	Algebra EOC increase associated with 10% increase on grade 7 assessment
Ratios and proportional relationships	0.10***	0.78 points
The number system	0.16***	0.86 points
Expressions and equations	0.21***	1.22 points
Geometry	0.15***	0.81 points
Statistics and probability	0.14***	0.79 points

*** Significant at $p < .001$.

The Association Between the Number Sense and Operations Domain in Grade 7 and Algebra I Achievement in Grade 8 Was Stronger for English Learner Students Than for Non–English Learner Students

Domain	Coefficient (all students)	Coefficient (English learner students)	Algebra EOC increase associated with 10% increase on grade 7 assessment (English learner students)
Number sense and operations	0.16***	0.29**	1.55 points

** Significant at $p < .01$.

*** Significant at $p < .001$.

The Associations Between the Five Grade 7 Domains and Algebra I Achievement Did Not Significantly Differ for Students Who Were Receiving Special Education Services and Those Who Were Not



The Associations Between the Five Grade 7 Domains and Algebra I Achievement Did Not Significantly Differ for Students Who Were Receiving Special Education Services and Those Who Were Not

Domain	Students who were receiving special education services (<i>n</i> = 170)	Students who were not receiving special education services (<i>n</i> = 11,128)
Ratios and proportional relationships	0.16	0.10
The number system	0.21	0.16
Expressions and equations	0.11	0.21
Geometry	0.18	0.15
Statistics and probability	0.12	0.14

Voices From the Field

Jennifer Overley, Colorado

John Downs, Missouri

Q&A

How do you make decisions about which students to enroll in Algebra I classes in middle school?



Who Should Teach Algebra I in Middle School?

Associations Between Middle School Algebra I Teacher Qualifications and Student Achievement⁵

Why Do Algebra I Teacher Qualifications Matter?

- Previous research has indicated that differences among teachers can explain a substantial amount of the variance in students' gains in math achievement.⁶
- One difference among teachers is their knowledge of the math content they teach.
 - Certifications to teach math, education background, and performance on direct assessments of teachers' math knowledge, including certification exams.⁶

Qualifications Associated With Algebra I Achievement

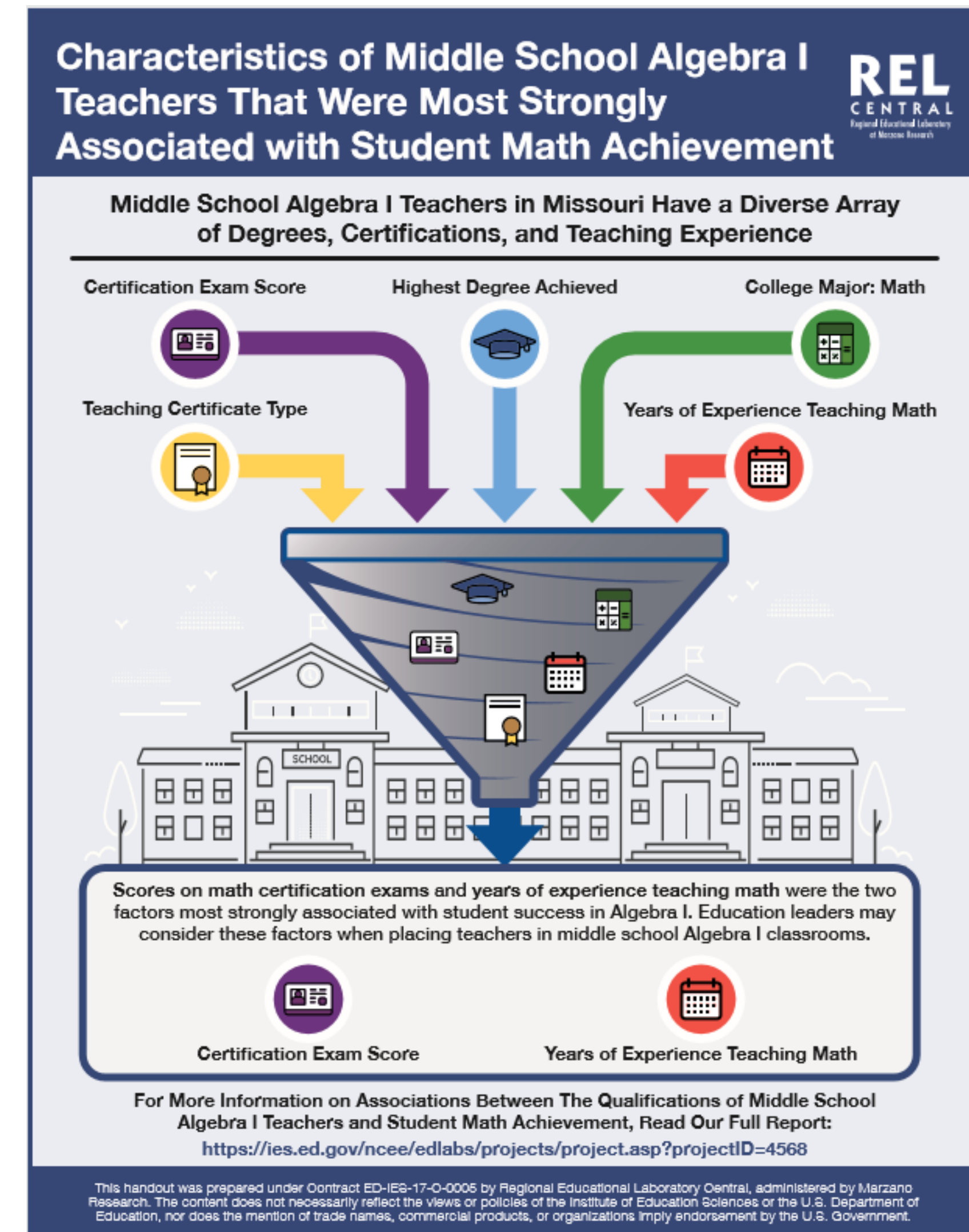
- Teacher performance on math certification exams and years of experience teaching math were the qualifications most strongly associated with middle school students' performance in Algebra I.
- Teacher performance on math certification exams and years of math teaching experience were also strongly associated with achievement in Algebra I for students in under-represented subgroups and disadvantaged subgroups.

A Number of Middle School Teacher Qualification Variables Were Strongly Associated With Student Achievement

Teacher qualification	Overall	Subgroups
Certification exams		
Praxis II Middle School Mathematics	Yes	Students receiving special education services, students eligible for the federal school lunch program
Praxis II Mathematics	Yes	
Praxis II Mathematics: Content Knowledge		Black students
Missouri Educator Gateway Assessment		Hispanic students
Middle School Education: Mathematics		
Background		
Years of experience teaching math	Yes	Hispanic students, students eligible for the federal school lunch program
Education specialist degree		Black students, Hispanic students
Certifications		
Math certification type = continuous		Students eligible for the federal school lunch program

Infographic: Teacher Qualifications⁷

https://ies.ed.gov/ncee/edlabs/infographics/pdf/REL_CE_Characteristics_of_Middle_School_Algebra_I_Teachers_That_Were_Most_Strongly_Associated_with_Student_Math_Achievement.pdf



Voices From the Field

Jennifer Overley, Colorado

John Downs, Missouri

Q&A

How do you determine which teachers will teach Algebra I in middle school?



Questions?

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