

Inequality for All

*William H. Schmidt
University Distinguished Professor
Michigan State University*

Instructional Content Constructs

❖ **Curricular Coherence**

- **Curricular Structure**

❖ **Curricular Focus**

- **Exposure Time (OTL)**

❖ **Curricular Rigor**

- **Level of Cognitive Complexity**

Top Achieving Countries' Mathematics Curriculum

Topic	Grade							
	1	2	3	4	5	6	7	8
Whole Number: Meaning	■	■	■	●	●			
Whole Number: Operations	■	■	■	■	●			
Measurement Units	▲	■	■	■	■	■	●	
Common Fractions			▲	■	■	●		
Equations & Formulas			▲	●	●	●	■	■
Data Representation & Analysis			▲	▲	●	●		▲
2-D Geometry: Basics			▲	●	●	●	■	■
2-D Geometry: Polygons & Circles				▲	●	●	■	■
Measurement: Perimeter, Area & Volume				●	●	●	●	▲
Rounding & Significant Figures				●	●			
Estimating Computations				●	●	●		
Whole Numbers: Properties of Operations				●	●			
Estimating Quantity & Size				▲	▲			
Decimal Fractions				●	■	●		
Relation of Common & Decimal Fractions				▲	■	●		
Properties of Common & Decimal Fractions					●	●		
Percentages					●	●		
Proportionality Concepts					●	●	●	▲
Proportionality Problems					●	●	■	■
2-D Geometry: Coordinate Geometry					▲	▲	●	●
Geometry: Transformations						●	●	●
Negative Numbers, Integers, & Their Properties						▲	●	
Number Theory							●	▲
Exponents, Roots & Radicals							●	●
Exponents & Orders of Magnitude							▲	▲
Measurement: Estimation & Errors							▲	
Constructions Using Straightedge & Compass							■	▲
3-D Geometry							●	■
Geometry: Congruence & Similarity								■
Rational Numbers & Their Properties								▲
Patterns, Relations & Functions								▲
Proportionality: Slope & Trigonometry								▲

- ▲ Intended by 4 out of the 6 top-achieving countries
- Intended by all but *one* of the top-achieving countries (5 out of 6).
- Intended by *all* of the top-achieving countries.

State Level Agreement

Topic	Grade							
	1	2	3	4	5	6	7	8
Whole Number: Meaning								
Whole Number: Operations			●					
Measurement Units			●		●			
Common Fractions								
Equations & Formulas								
Data Representation & Analysis			●		●			
2-D Geometry: Basics								
2-D Geometry: Polygons & Circles								
Measurement: Perimeter, Area & Volume						●		
Rounding & Significant Figures								
Estimating Computations								
Whole Numbers: Properties of Operations								
Estimating Quantity & Size								
Decimal Fractions								
Relation of Common & Decimal Fractions								
Properties of Common & Decimal Fractions	○	○						
Percentages	○							
Proportionality Concepts								
Proportionality Problems								
2-D Geometry: Coordinate Geometry								
Geometry: Transformations								
Negative Numbers, Integers, & Their Properties								
Number Theory								
Exponents, Roots & Radicals	○	○						
Exponents & Orders of Magnitude	○	○						
Measurement: Estimation & Errors								
Constructions Using Straightedge & Compass	○	○	○	○				
3-D Geometry								
Geometry: Congruence & Similarity								
Rational Numbers & Their Properties	○	○	○					
Patterns, Relations & Functions								
Proportionality: Slope & Trigonometry	○	○	○	○	○			

Intended by all states ●
 Intended by none of the states ○
 Intended by more than half of the top-achieving countries

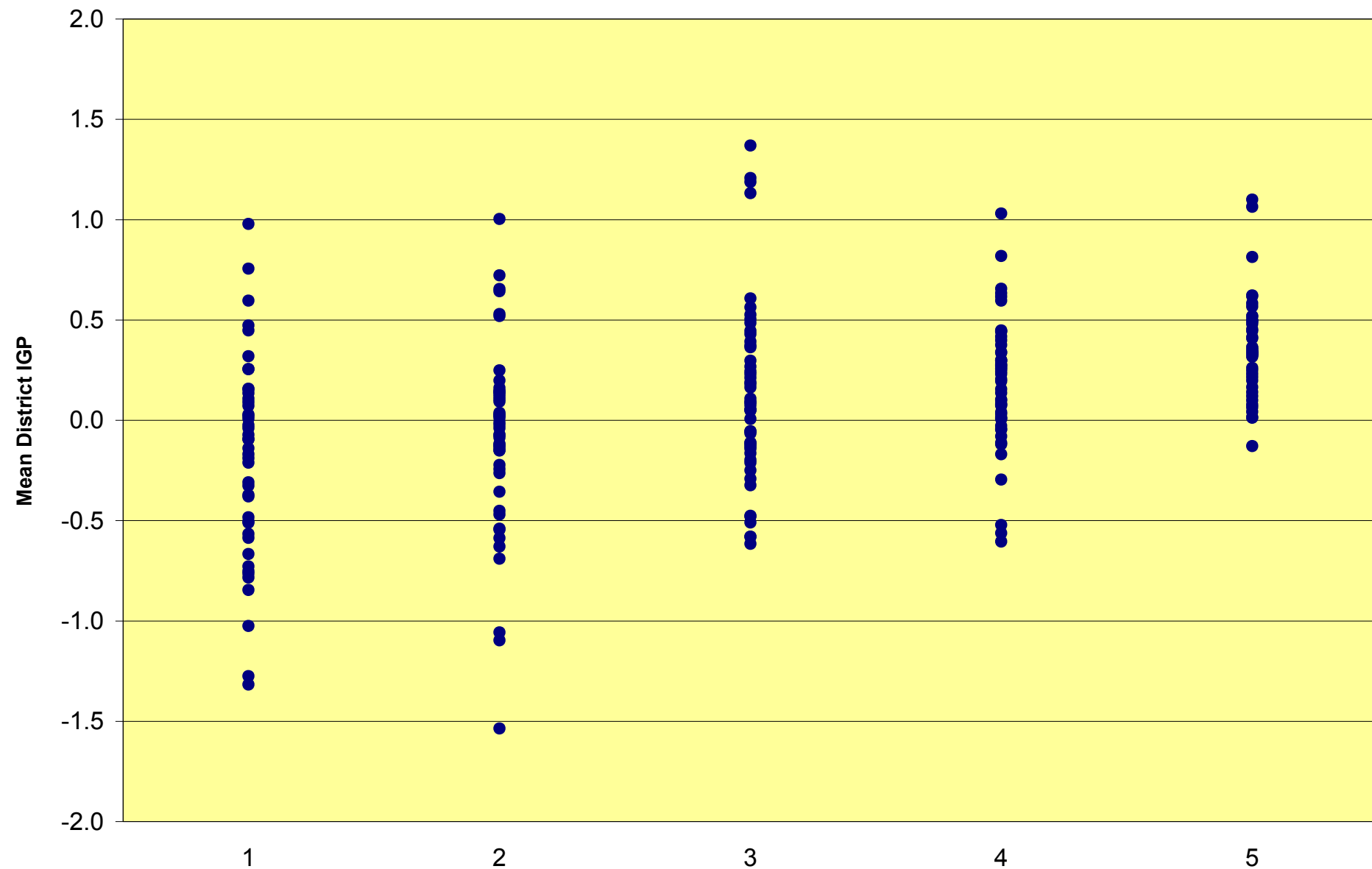
Topics for Which Virtually All States Agree (90%)

Topic	Grade							
	1	2	3	4	5	6	7	8
Whole Number: Meaning	●	●	●	●	●			
Whole Number: Operations	●	●	●	●	●			
Measurement Units	●	●	●	●	●	●		
Common Fractions			●	●	●	●		
Equations & Formulas			●	●	●	●	●	●
Data Representation & Analysis	●	●	●	●	●	●	●	●
2-D Geometry: Basics	○		●	●	●	●	●	●
2-D Geometry: Polygons & Circles	●	●	●	●	●	●	●	●
Measurement: Perimeter, Area & Volume						●		
Rounding & Significant Figures	○							
Estimating Computations								
Whole Numbers: Properties of Operations								
Estimating Quantity & Size					●			
Decimal Fractions					●			
Relation of Common & Decimal Fractions	○	○						
Properties of Common & Decimal Fractions	○	○	○	○				○
Percentages	○	○	○	○				
Proportionality Concepts	○	○	○					
Proportionality Problems	○							
2-D Geometry: Coordinate Geometry							●	●
Geometry: Transformations				●				
Negative Numbers, Integers, & Their Properties	○	○	○					
Number Theory								
Exponents, Roots & Radicals	○	○	○	○				
Exponents & Orders of Magnitude	○	○	○	○	○			
Measurement: Estimation & Errors								
Constructions Using Straightedge & Compass	○	○	○	○	○			
3-D Geometry	●							
Geometry: Congruence & Similarity								
Rational Numbers & Their Properties	○	○	○	○				
Patterns, Relations & Functions								●
Proportionality: Slope & Trigonometry	○	○	○	○	○	○		

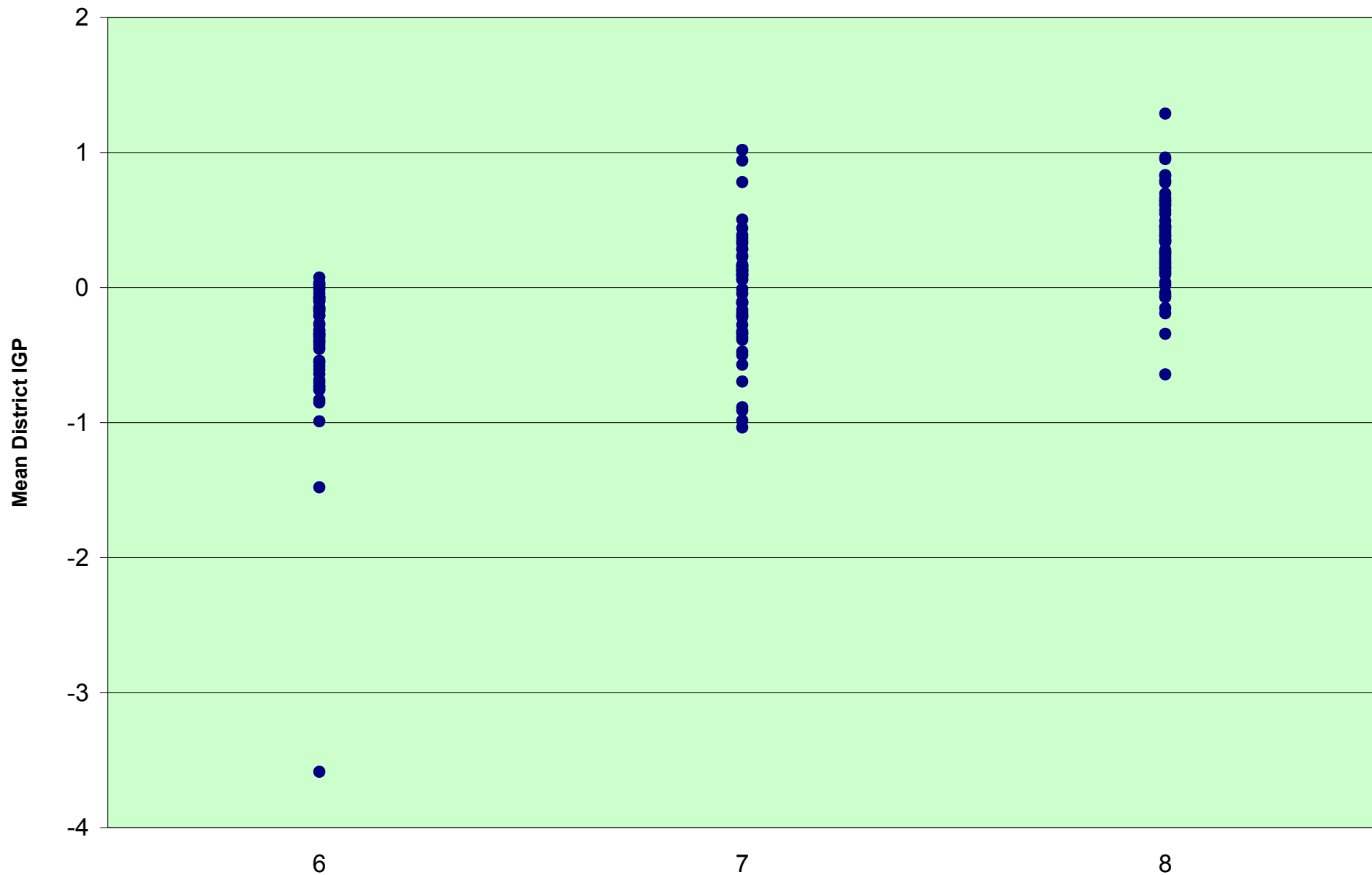
Intended by
more than 90% States ●

Intended by
less than 10%
of the States ○

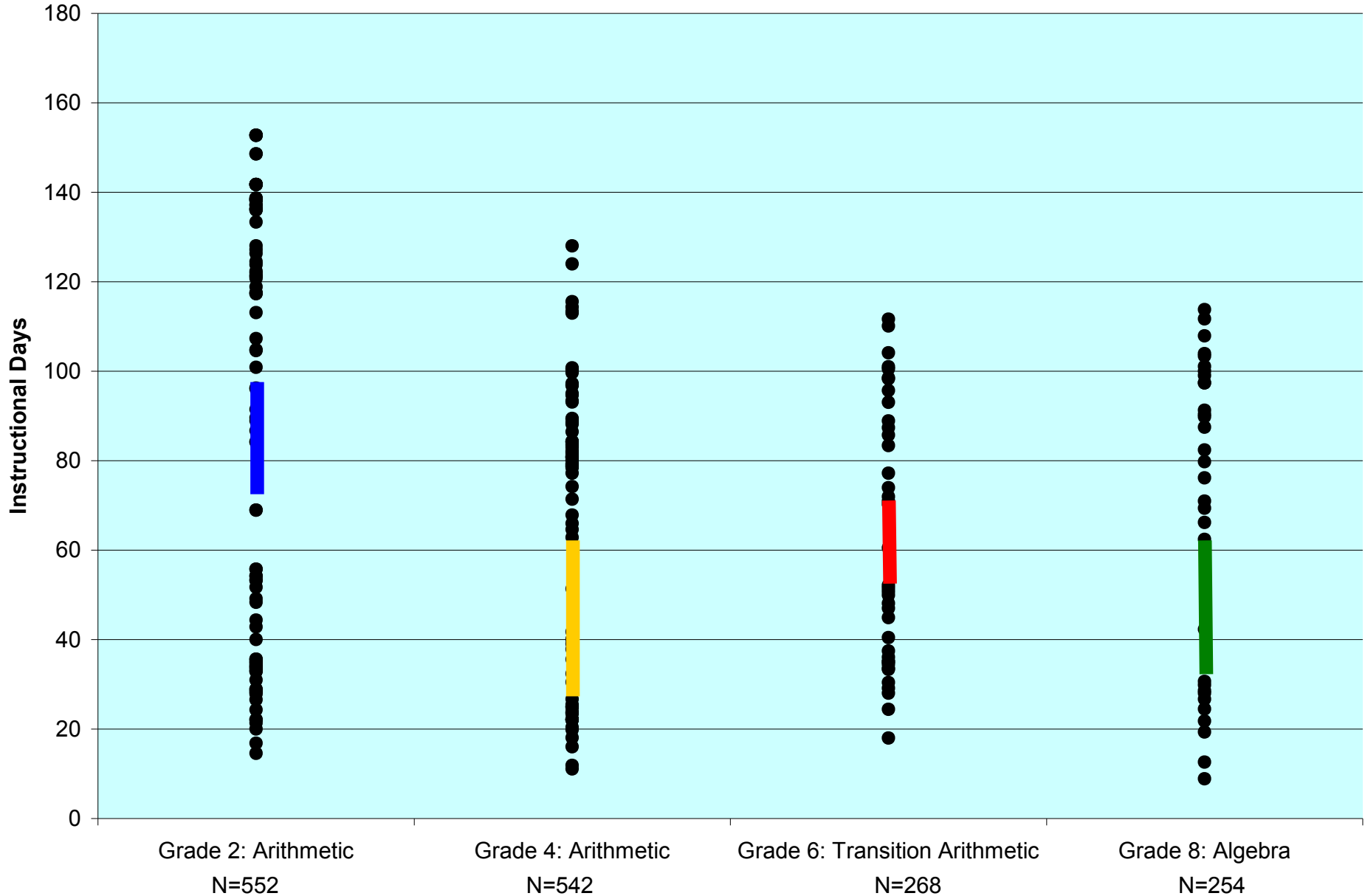
Distribution of Mean District IGP for PROM/SE Mathematics Classes by Grade



Distribution of Mean District IGP for PROM/SE Mathematics Classes by Grade



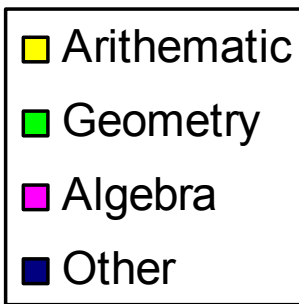
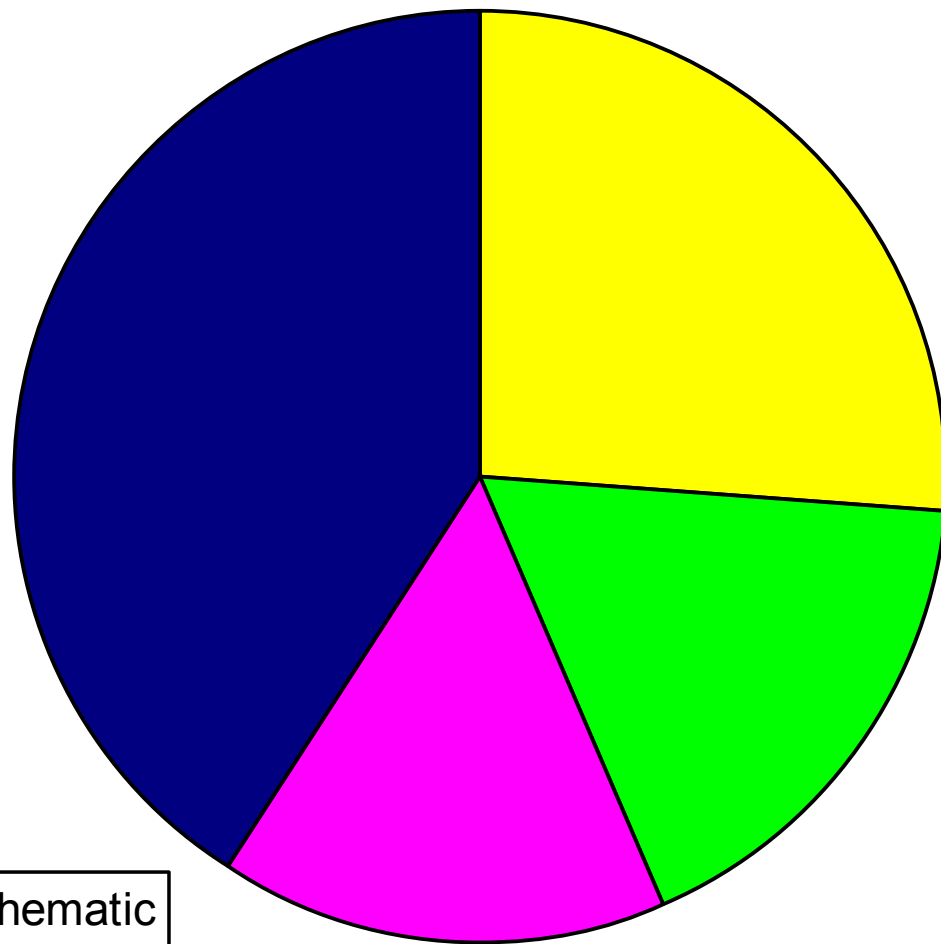
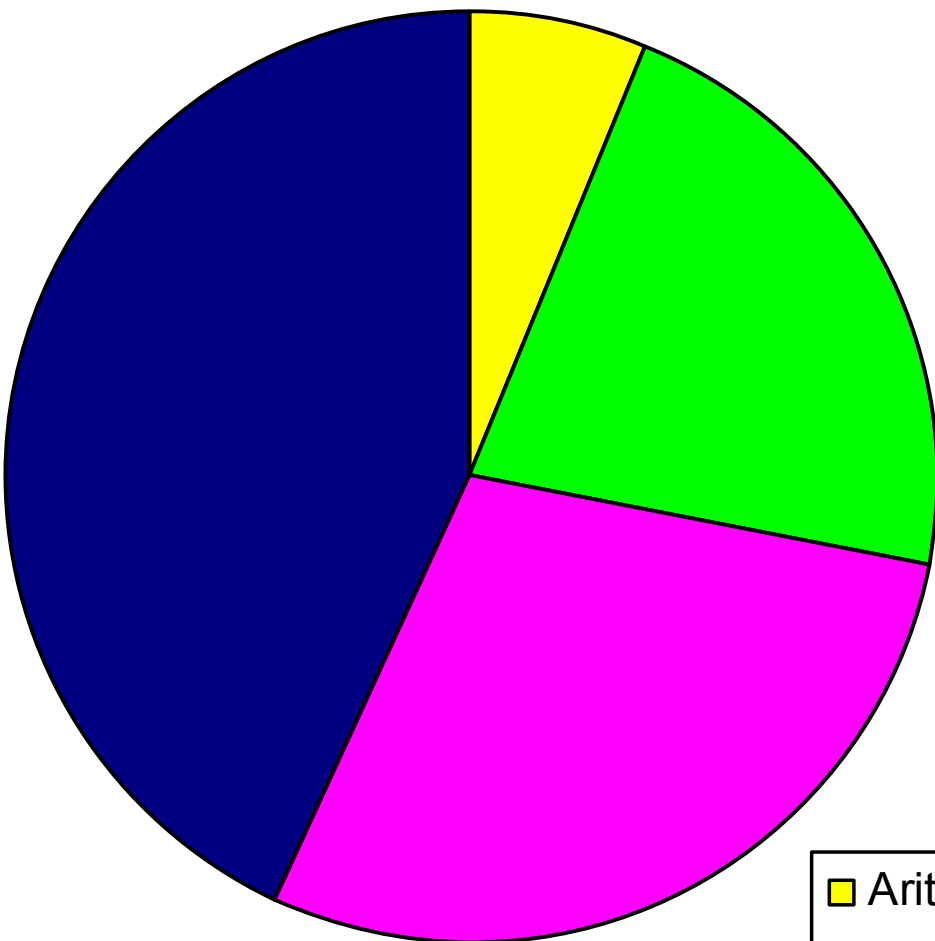
Instructional Days Spent on Selected Areas of Mathematics at Elementary and Middle Grades



Teachers Coverage of Mathematics Topics in Two Types of Schools

High SES Schools

Low SES Schools



Percent (standard error) of US eighth grade students attending schools offering each type of mathematics course

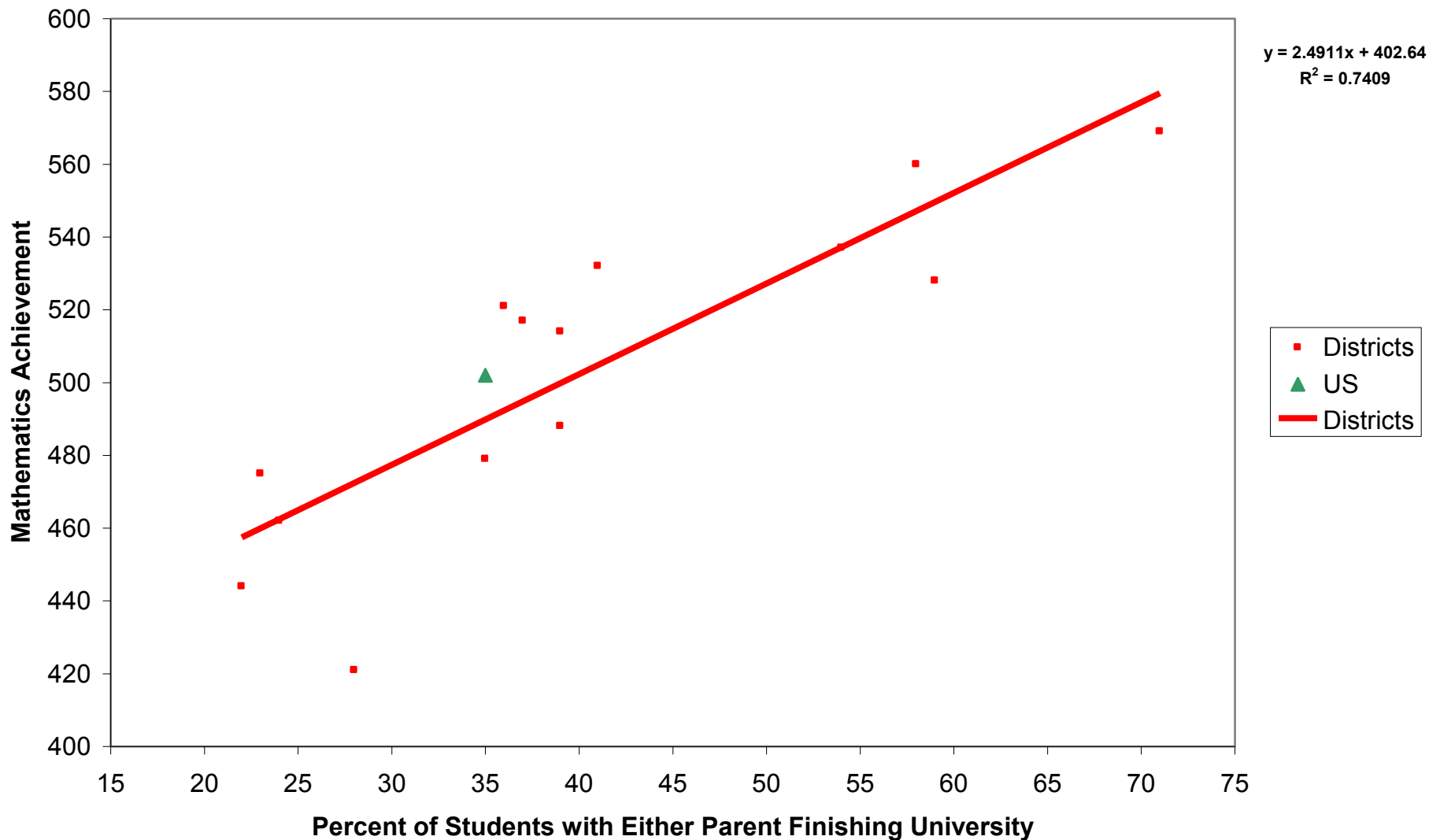
<i>Course Type</i>	<i>Schools Offering Course</i>
GEOMETRY	6 (1.9)
ALGEBRA I	66.5 (2.8)
PRE-ALGEBRA	37.1 (3.8)
ENRICHED	13.9 (2.2)
REGULAR	80.9 (3.1)
REMEDIAL	13.1 (2.3)

Percent of U.S. Students Enrolled in Each Type of Math Course Using Each Type of Textbook

Course Type	Textbook Type		
	Regular	Pre-Algebra	Algebra
Remedial	91 (8.5)	9.1 (8.5)	
Regular	74 (6.0)	21 (5.1)	4.5 (1.9)
Enriched	74 (15.8)	14 (8.7)	13 (3.8)
Pre-Algebra	30 (8.5)	59 (10.4)	11 (6.8)
Algebra I	25 (9.1)	5.7 (4.0)	70 (9.6)

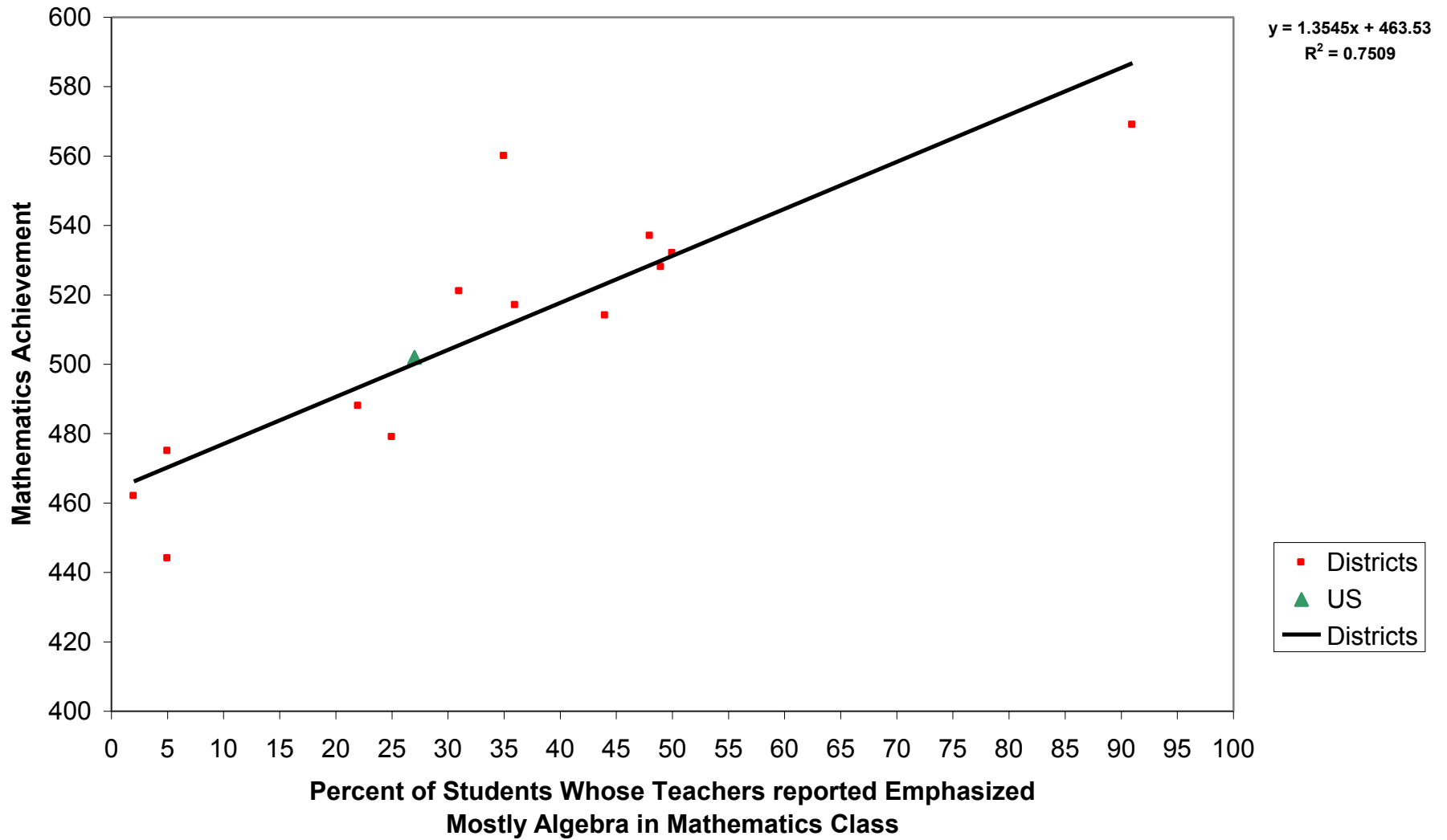
Relationship between Parents' Education and Student Achievement

1999 TIMSS-R Districts



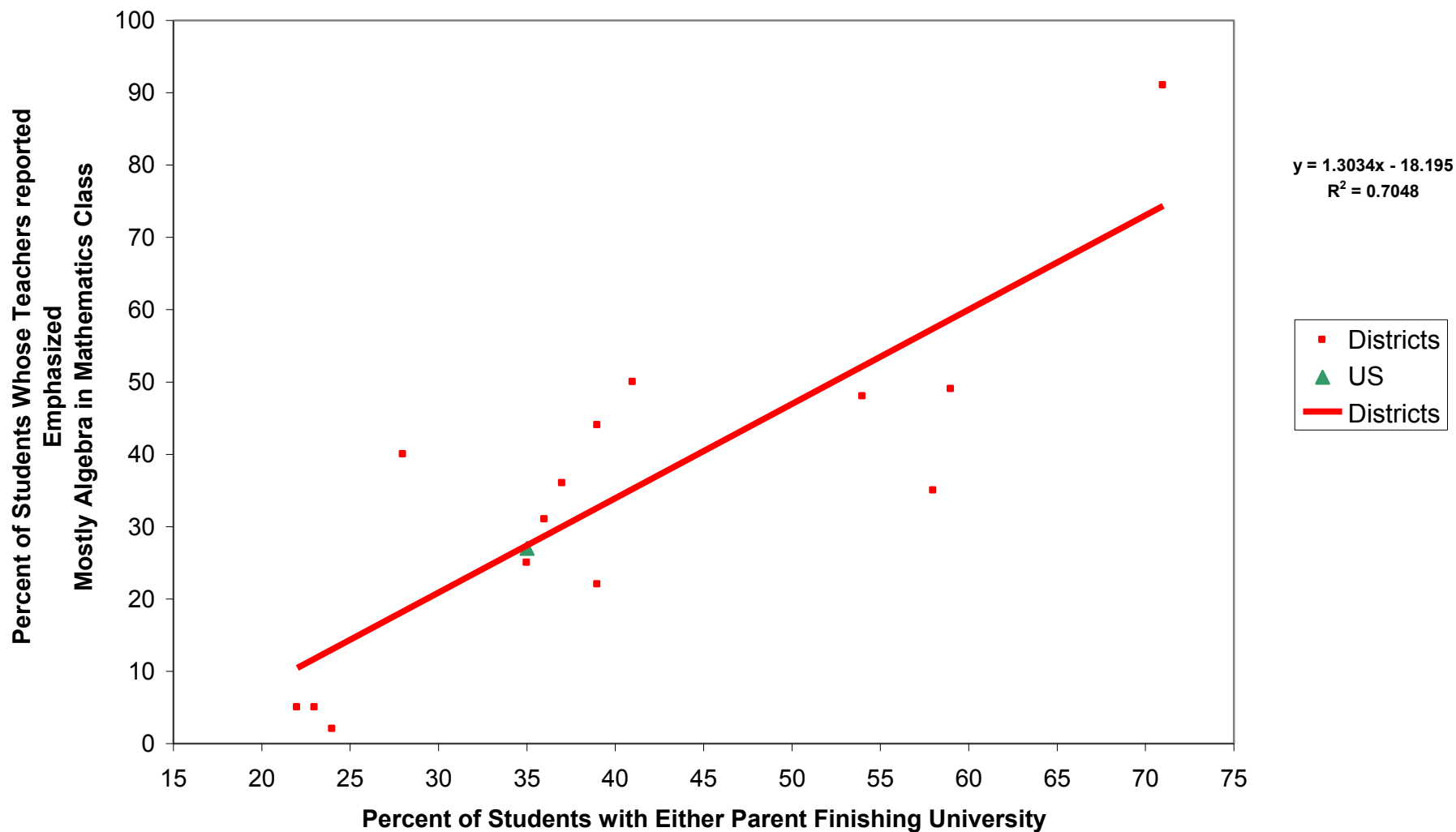
Relationship between Algebra Instruction and Student Achievement

1999 TIMSS-R Districts



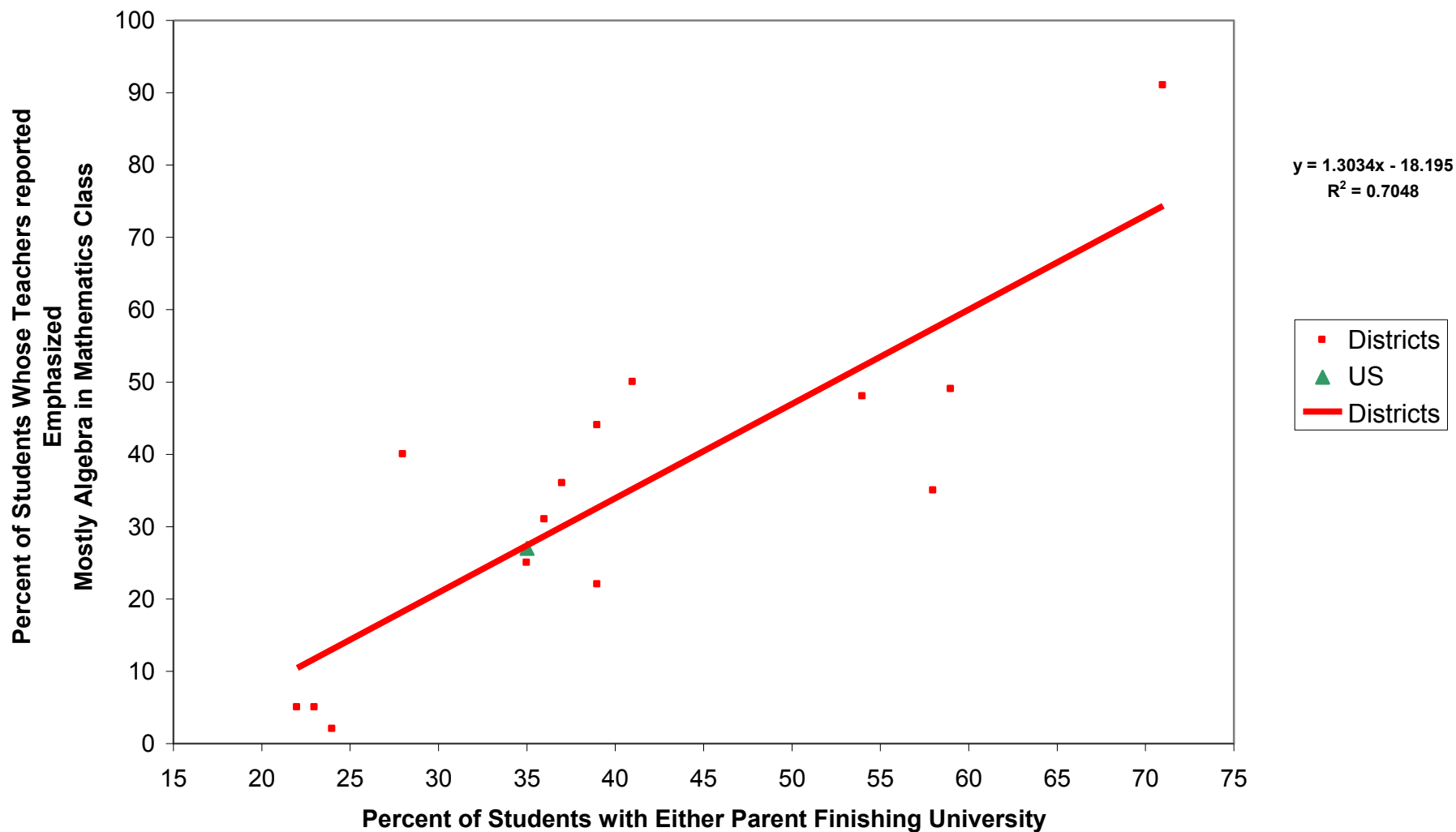
Relationship between Parents' Education and Algebra Instruction

1999 TIMSS-R Districts



Relationship between Parents' Education and Algebra Instruction

1999 TIMSS-R Districts



Relationship between Curriculum, SES and Student Learning

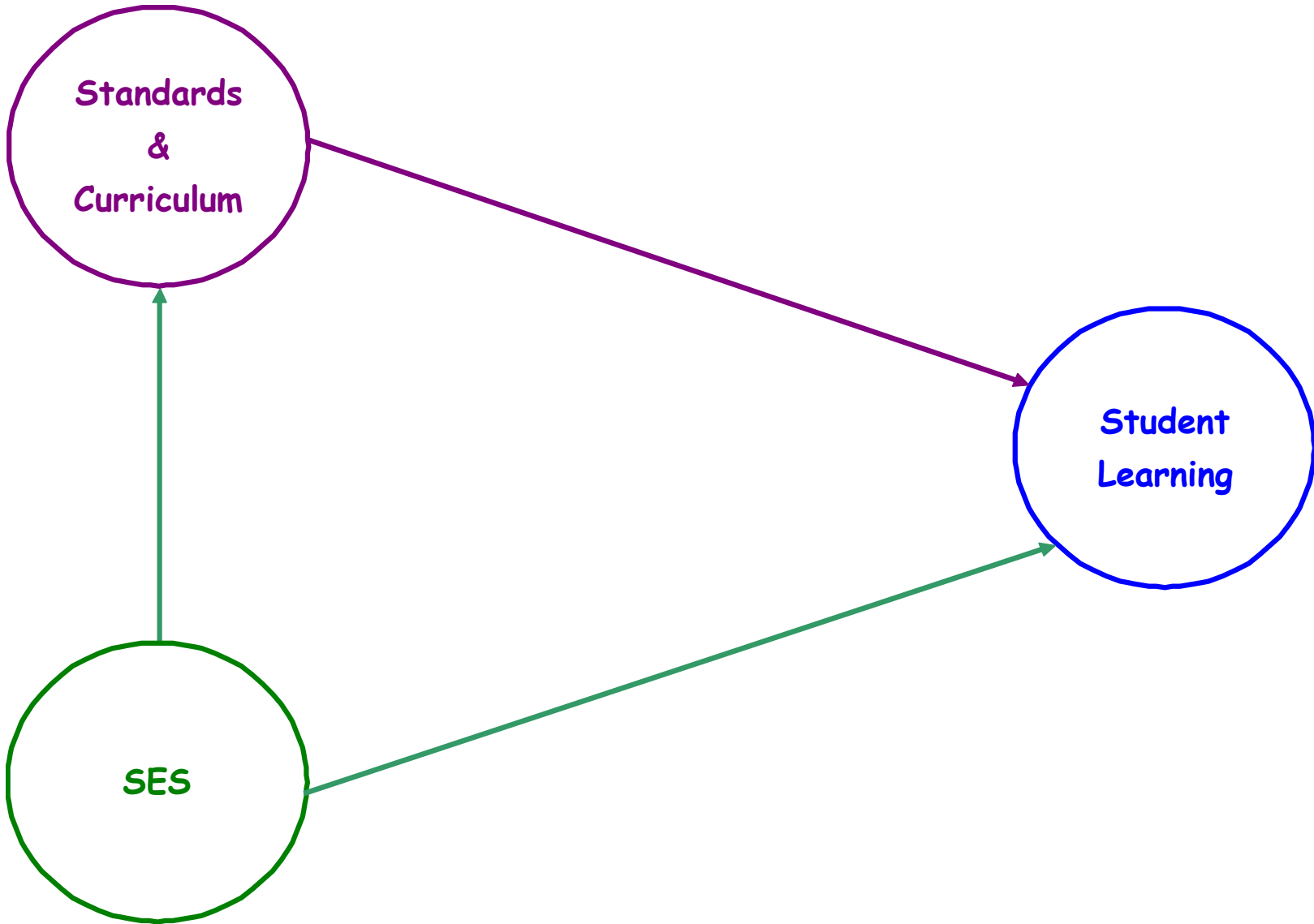
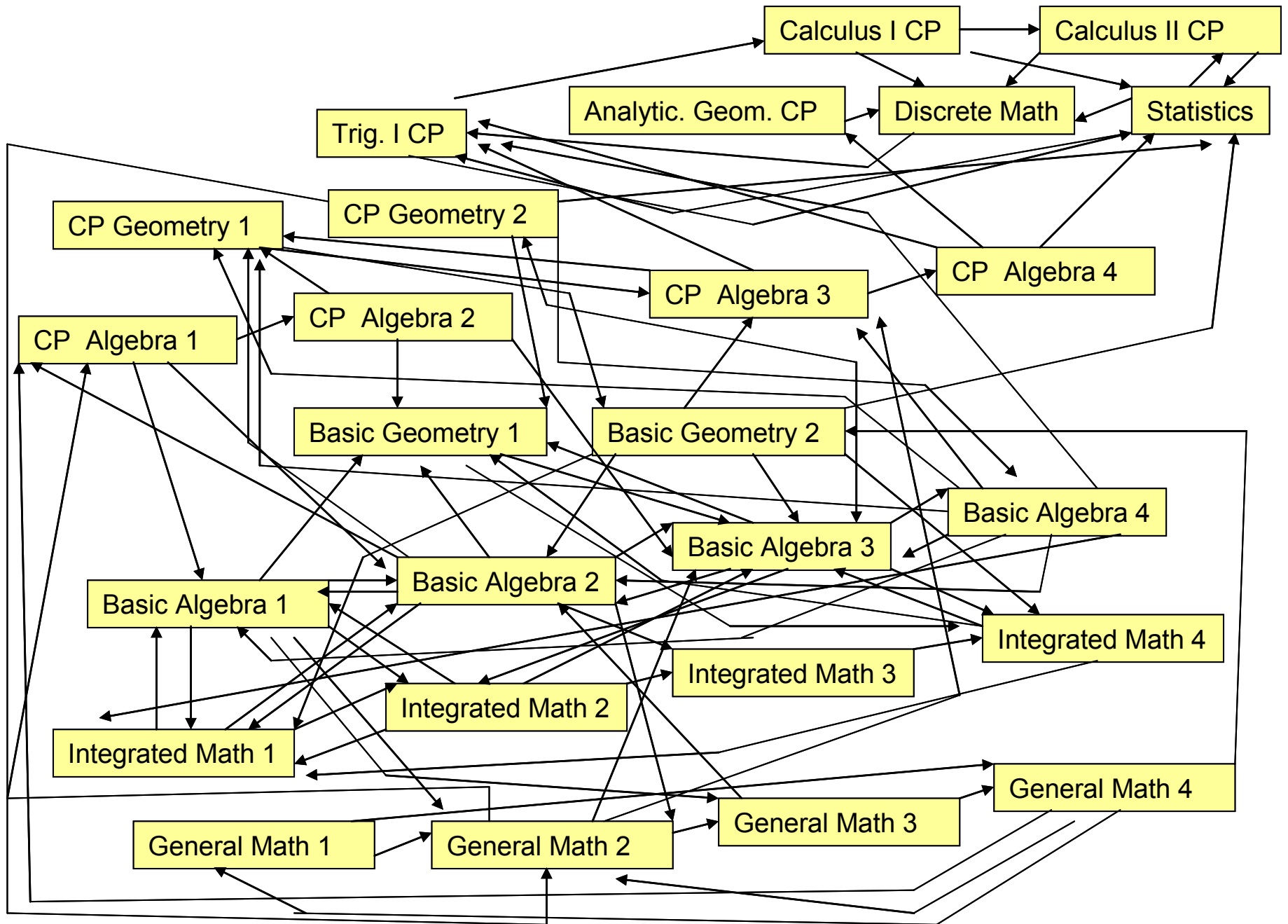


Diagram of Mathematics Course-Taking Sequences in District F



Minimal Standards?

- One course in each:
Mathematics, Biology, Chemistry, Physics
- **Algebra II/Biology/Chemistry/Physics**
 - Less than 30 % of ALL Students
 - Less than 5 % of Voc/Tech Students
 - About 15 % of General Academic Students
 - About 40 % of College Preparatory Students

Minimal Standards?

- One course in each:
Mathematics, Biology, Chemistry, Physics
- Algebra II/Biology/Chemistry/Physics
 - Less than 20 % of ALL Black Students
 - Less than 5 % of Black Voc/Tech Students
 - About 11 % of Black General Academic Students
 - About 32 % of Black College Preparatory Students

Are All Algebra Courses the Same?

- Fundamentals of Algebra
- Advanced Algebra
- Algebra I
- Algebra IA
- Algebra IB
- Algebra IC
- Algebra I Hons.
- Basic Algebra I
- Elementary Algebra
- Essentials of Algebra
- Introduction to Algebra
- Enrich. Algebra

What Mathematics is Covered in These Courses?

- Academic Math I
- Accel. Math I
- Alt. Math
- Basic Math
- Consumer Math
- Contemporary Math
- Corrective Math
- Fundamentals of Math
- General Math
- Math Skills
- Life Skills Math
- Math Proficiency
- Transitional Math
- Unified Math'
- Tech. Math
- Voc. Math
- Senior Math