

Creating **Growth Trajectories** with **SMI Quantile Measures**

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Session Abstract

- Setting **student growth goals** is an individualized task that when thoughtfully implemented can **unify a school's conversation about math achievement.**
- In this session, research about setting math growth goals with Scholastic Math Inventory (SMI) data will help educators sharpen their efforts to **predict growth** and **forecast outcomes.**

Session Goals

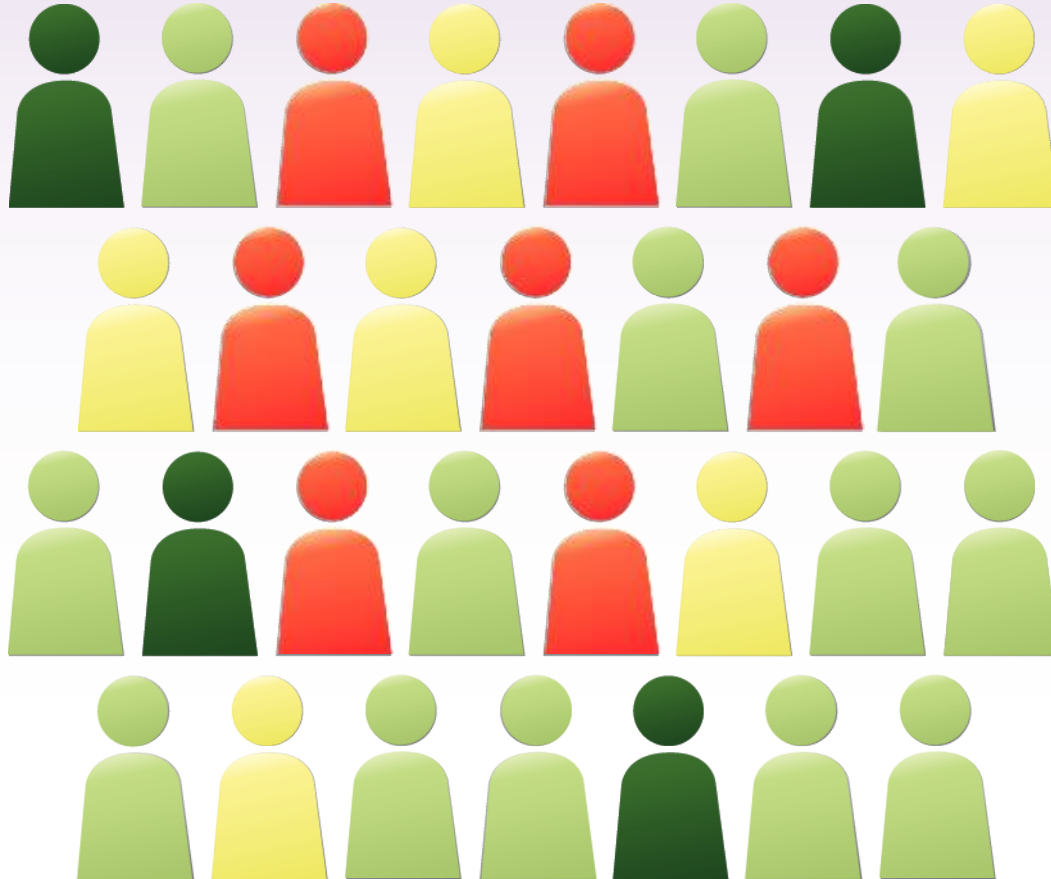
- Using SMI and the Quantile Scale to measure student math knowledge and skills.
- Creating growth curves to generate growth expectations and predict score on related assessments (local, state, or national).

Key Assumptions

- Knowledge is power
- Knowledge types: ideas, concepts, skills
- Knowledge can be measured
- Some knowledge types are more **difficult** than others (scales, tests)
- One scale used in mathematics learning and teaching is the Quantile Scale

Mixed Ability Classrooms

700Q



275Q

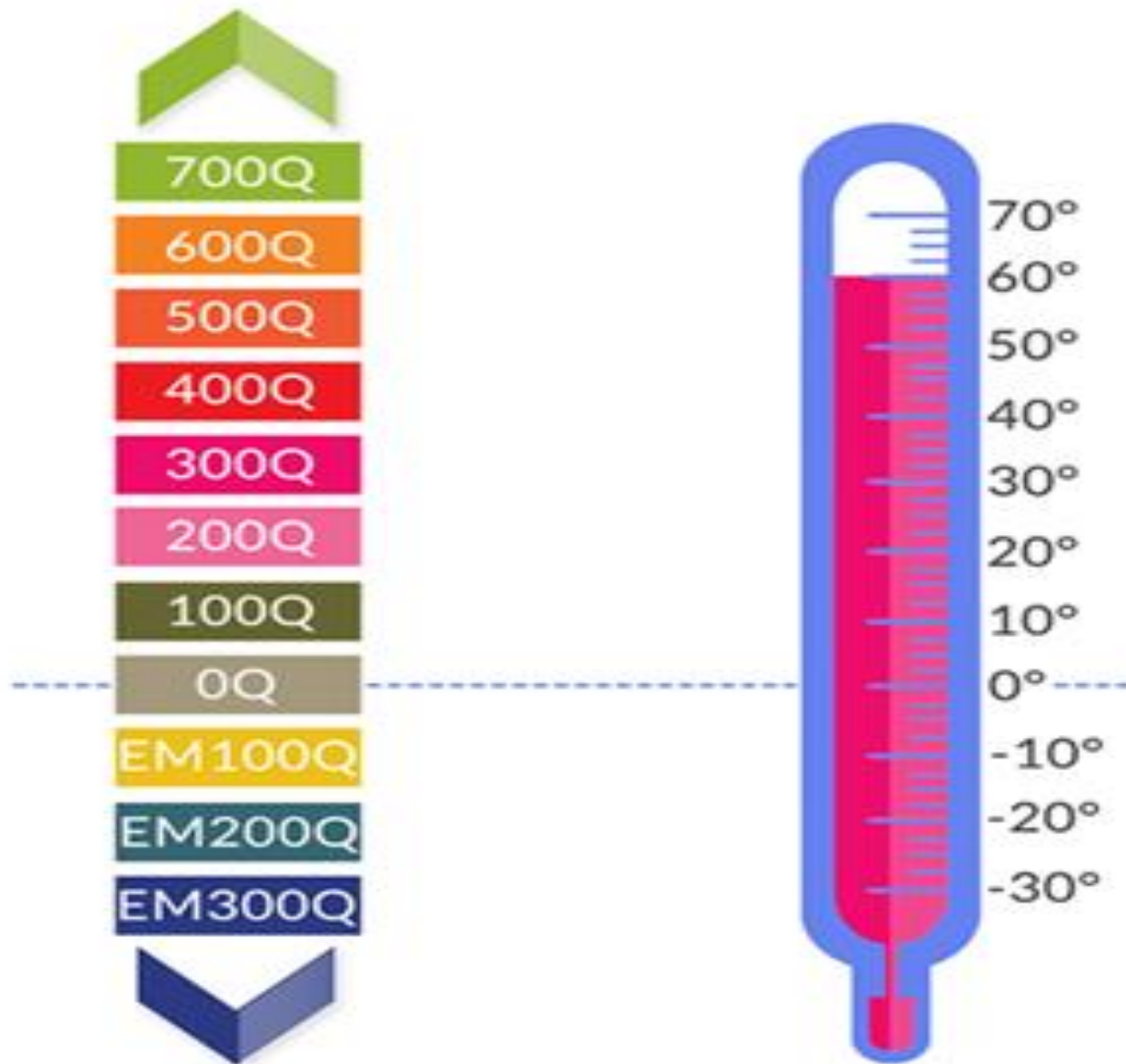
580Q

350Q

The Quantile Scale

- It measures many concepts and skills needed to learn math in school – about 500!
- Each of these concepts or skills has a measure.
- The measure is indicated by a number and the letter Q.
- Each measure shows how **difficult** one skill or concept is in relation to the others.

The Quantile Scale



The Quantile Skill and Concept (QSC)

- The description of a skill and its Quantile measure is called a *Quantile Skill and Concept (QSC)*.
- The table on the next slide shows a few of these skills and their measures.
- As **difficulty**, or demand, of the skill increases, so does the Quantile measure.

Examples of Quantile Measures and QSCs

Description	Quantile Measure
Identify and name: hexagon, trapezoid, parallelogram, and rhombus.	250Q
Solve problems involving elapsed time.	450Q
Divide two fractions or a fraction and a whole number.	870Q
Solve linear inequalities using the properties of inequality.	980Q
Use properties of circles to solve problems involving arcs formed by central angles or inscribed angles.	1140Q
Solve quadratic inequalities graphically or algebraically.	1250Q

Student Quantile Measures and the SMI



- A **student** receives a **Quantile measure** when taking the SMI, an assessment which reports results as Quantile measures.
- The student score is compared to the **Quantile measure** of the **math skills**. Using this comparison, students, parents and teachers know which mathematics students are ready to learn

Quantile Knowledge Clusters: Linking Assessment and Instruction

- Each Quantile Skill and Concept (QSC) on the Quantile Scale relates to other QSCs that are **prerequisite** concepts that students must understand in order to progress in their study of mathematics.
- This network of relationships between QSCs enables students and teachers to link **assessment results** and **instructional goals**.

Use scale factors to reduce and enlarge drawings on grids. 990Q

Use dimensional analysis to rename quantities or rates. 950Q

Impending Skills (higher Q measures)

Knowledge Cluster for *Unit Rate*

Calculate unit rates to make comparisons. 830Q

Focus Skill

Convert measures of length, area, capacity, weight, and time expressed in a given unit to other units in the same measurement system. 820Q

Describe the probability of an event using a fraction or ratio. 440Q

Determine the ratio or rate of change of a relation given a table or graph. 810Q

Supplemental Skills (similar Q measures)

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Use proportional reasoning to solve problems. 530Q

Write a ratio to compare two quantities. 210Q

Identify equivalent decimals and fractions at the symbolic level, including simplifying fractions. Explain the equivalence. 710Q

Pre-requisite Skills (lower Q measures)

Becoming Familiar with SMI and Math College and Career Standards

How are different QSCs related to other QSCs?

How are different clusters related to other clusters?

If a student does not know a QSC, what other QSCs should she review to successfully learn it?



Creating Growth Trajectories

- At each district, **SMI growth curves** can be created for a given class or grade level and the degree of variation among individual students can be assessed.
- SMI growth curves can then be used to generate **growth expectations**. If local or state assessment data were available, SMI scores could also be used to **predict** scores on these other assessments.

I am a 4th grader with a 715Q.
I am on grade level and I'm
ready to learn!



Example from School District “A” *

Demographics for SD “A” and all U.S. public schools, SY 2010-11^a %

School District	African Amer.	Hispanic	White	Asian	Other Ethnicity	F/R Lunch	ELL/LEP	ESE	Total Enroll.
SD “A”	18	5	68	3	6	27	1	13	38,224
U.S Public Schools	16	23	53	5	3	48	6	13	9,177,617

^a All values were obtained from NCES: <http://ces.ed.gov/ccd/bat/>

* For illustration purposes only – study conducted with prior version of SMI

Example from School District “A” *

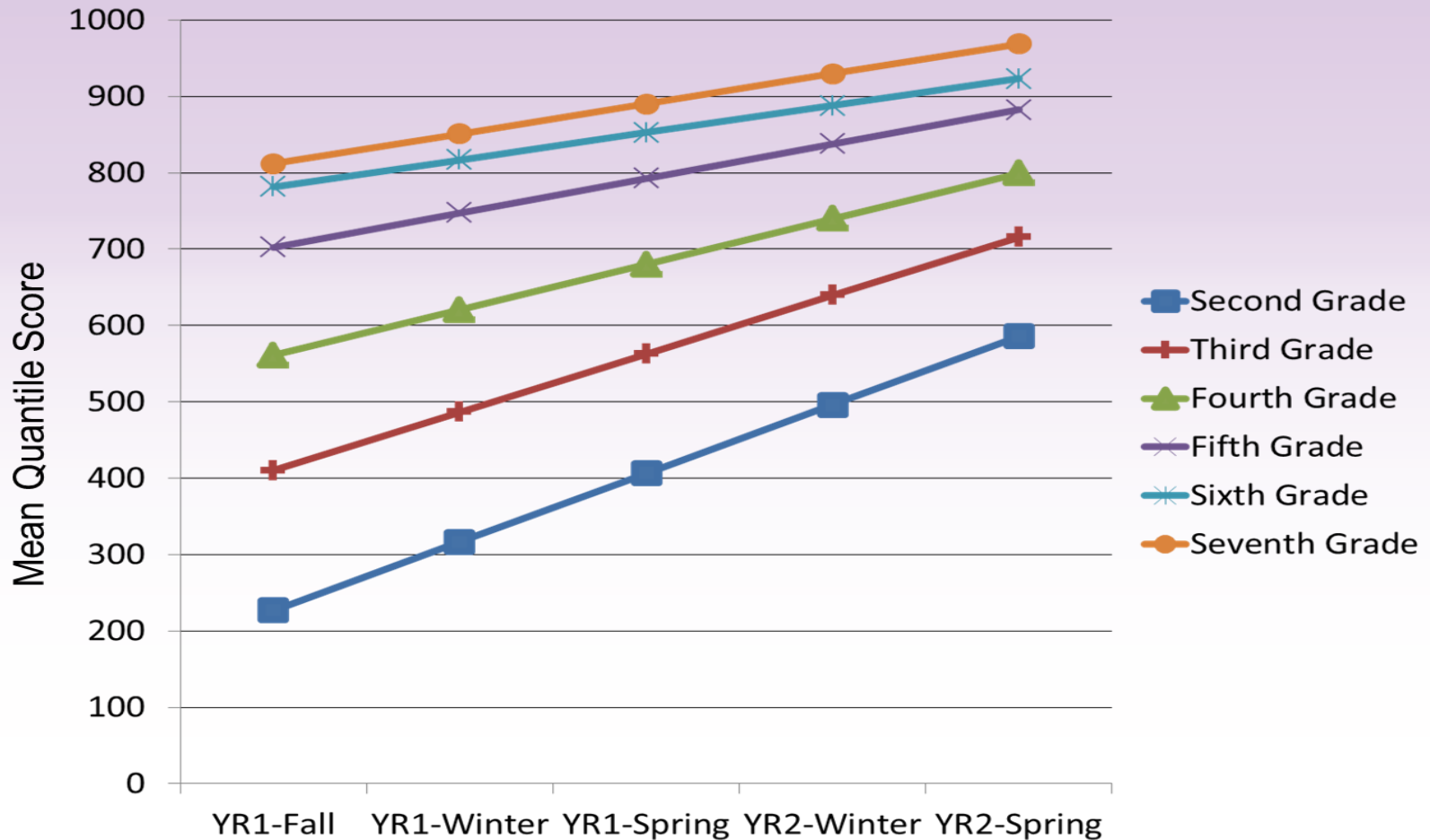
Mean SMI Scores in Quantiles, Segregated by Grade (SD in red)

Grade at Year 1	Range of n	Year 1			Year 2		
		Fall	Winter	Spring	Fall	Winter	Spring
2	2230-2306	239.7	308.6	397.6	380.0	489.7	601.0
		137.3	153.7	180.6	169.0	187.1	201.9
3	2342-2402	381.0	505.1	602.4	549.8	625.4	703.6
		148.1	186.7	208.2	184.5	172.1	169.6
7	1157-2400	805.9	854.5	887.5	883.6	941.8	925.9
		184.5	196.4	220.9	214.6	215.4	227.4

* For illustration purposes only – study conducted with prior version of SMI

Example from School District “A” *

Mean Estimated Linear Growth in Quantile Performance.



* For illustration purposes only – study conducted with prior version of SMI

References

- **Scholastic SMI**

<http://teacher.scholastic.com/math-assessment/scholastic-math-inventory/index.asp>

- **MetaMetrics**

www.quantiles.com/

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