Creating Growth Trajectories with Quantile Measures from Scholastic Math Inventory College & Career

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, new research about setting math growth goals with Scholastic Math Inventory data will help educators sharpen their efforts to predict growth and forecast outcomes.

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Presentation Format: *General Interest / All Audiences Burst*
Grade Band Audience: *General Interest/All Audiences*

The Scholastic Math Inventory (SMI and the Quantile Framework

The **Scholastic Math Inventory (SMI)** College & Career is a research-based, computer-adaptive mathematics assessment program published by Scholastic for students from Kindergarten to Algebra II. The SMI measures math achievement on The Quantile Framework for Mathematics and helps to prepare students for college and career. SMI helps educators forecast student achievement and make accurate instructional and placement decisions.

The **Quantile Framework for Mathematics** uses a common scale to measure both a student's mathematical ability and the difficulty of mathematical tasks. A student's Quantile measure (e.g., 650Q) can be matched to the Quantile measure of a mathematical skill to see if the student is **ready** to learn that skill, has already **mastered** it, or **needs to learn supporting skills first**.

SMI College & Career offers dynamic **analytics**, **actionable data**, **tools for differentiating instruction**, and embedded **professional learning** for educators.

As students advance in their math classes during the school year and from year to year, it is expected their growth in proficiency will be reflected as progressively higher scores on the Quantile Framework and hence on the SMI. The **expected growth** over time will depend on many factors, including demographics, prior knowledge, student motivation and engagement, and the quality of the instructional program.

Creating Growth Trajectories

A fall-to-spring student **growth model** that could be used to inform instructional practice over the school year can be created by schools and districts by collecting **SMI Quantile scores** and other data.

Ideally, the **student sample** should approximate as much as possible a nationally representative sample, based on demographics, socioeconomic status (SES) indicators, and school-related variables. If available, **local or state math assessment data** could also be collected.

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. These 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.

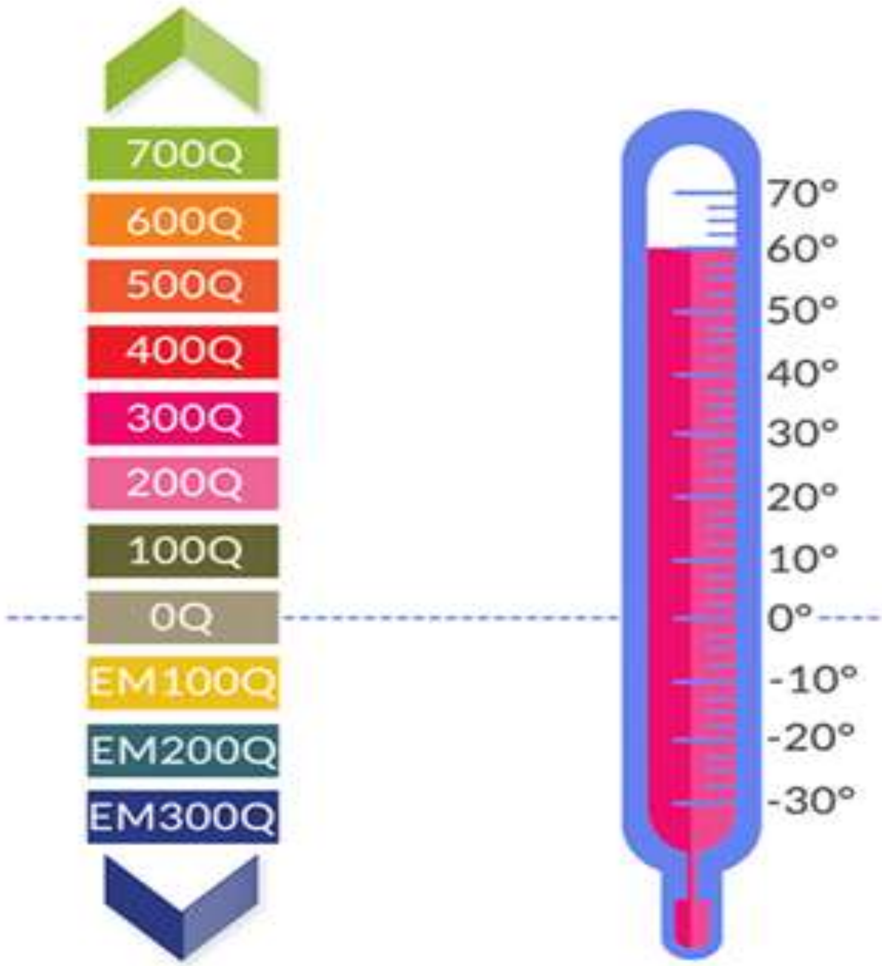
Growth curves are estimated using **hierarchical linear modeling** (HLM) procedures. With this methodology, a growth curve is fitted for **each student**. The growth curve for a group of students (**class or grade**) is the average of the growth curves of the students in the group. That average is represented by the **slope value** between two consecutive points.

As explained by Raudenbush, Bryk, & Congdon (2004), there are some **advantages** to using HLM over the more standard repeated measures analysis of variance (ANOVA). These advantages include:

1. Ability to estimate growth curves for students with **missing data** at one or more measurement points instead of dropping of cases with incomplete data;
2. Since HLM estimates growth curves separately for each student, one can determine if **different groups of individuals** (such as groups based on initial SMI percentile) are growing at different rates; and
3. The **time between each measurement** need not be exactly the same for each student, as is the case with ANOVA.

References

Raudenbush, S.W., Bryk, A.S, & Congdon, R. (2004). *HLM 6 for Windows [Computer software]*. Skokie, IL: Scientific Software International, Inc.



Example from a School District *

Demographics for SD in MD 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.
Harford	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 Fall	Winter	Spring	Year 2 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

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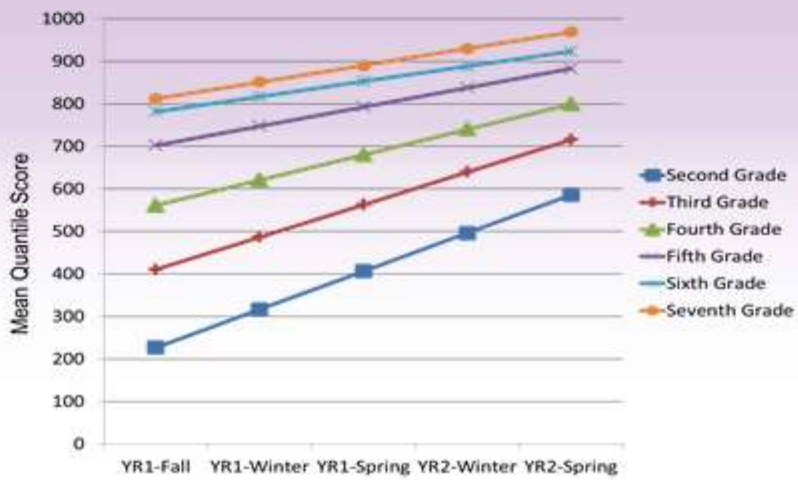
Example from School District "A" *

Mean Estimated Linear Growth in Quantile Performance.



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