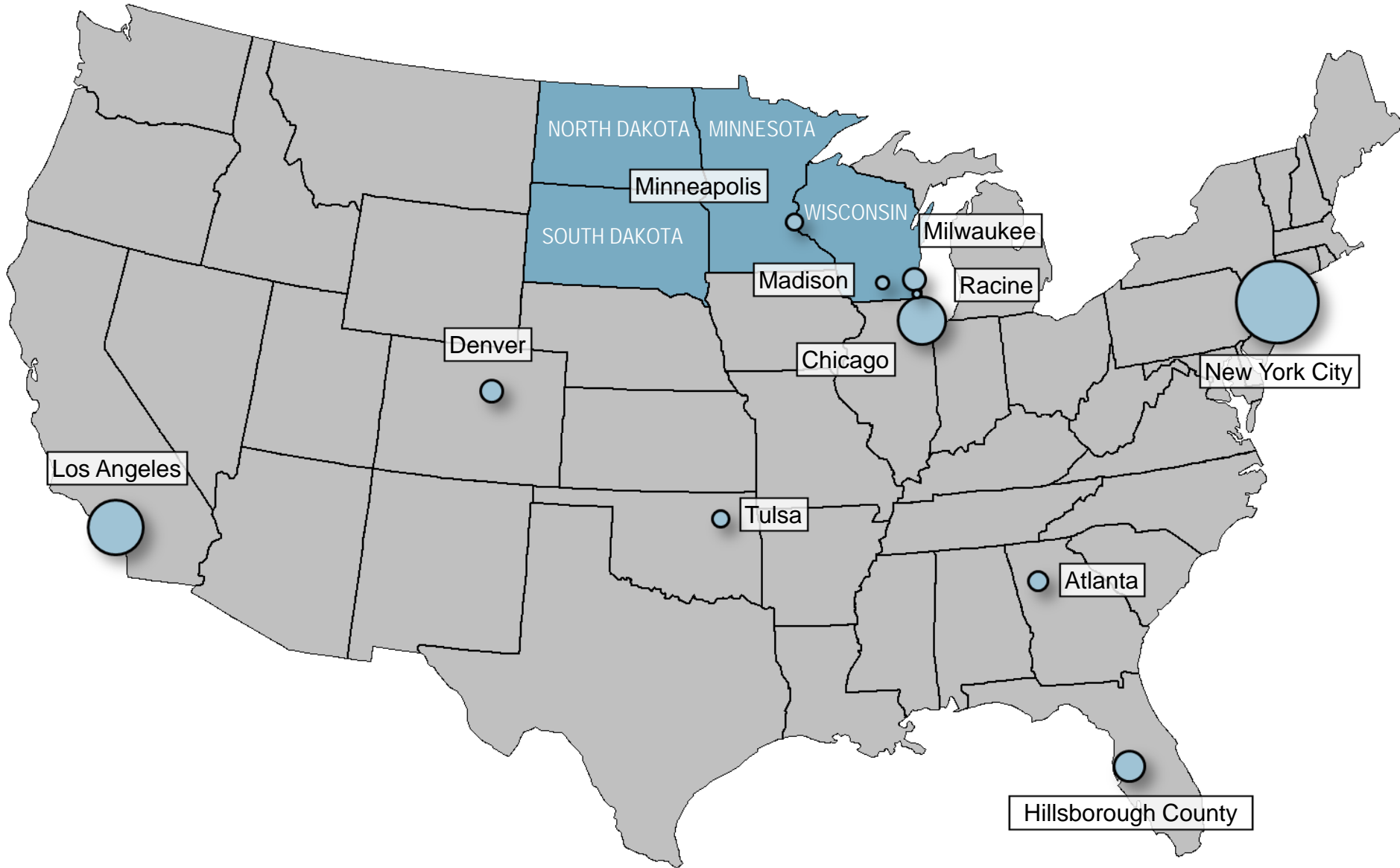


Value-Added in Wisconsin

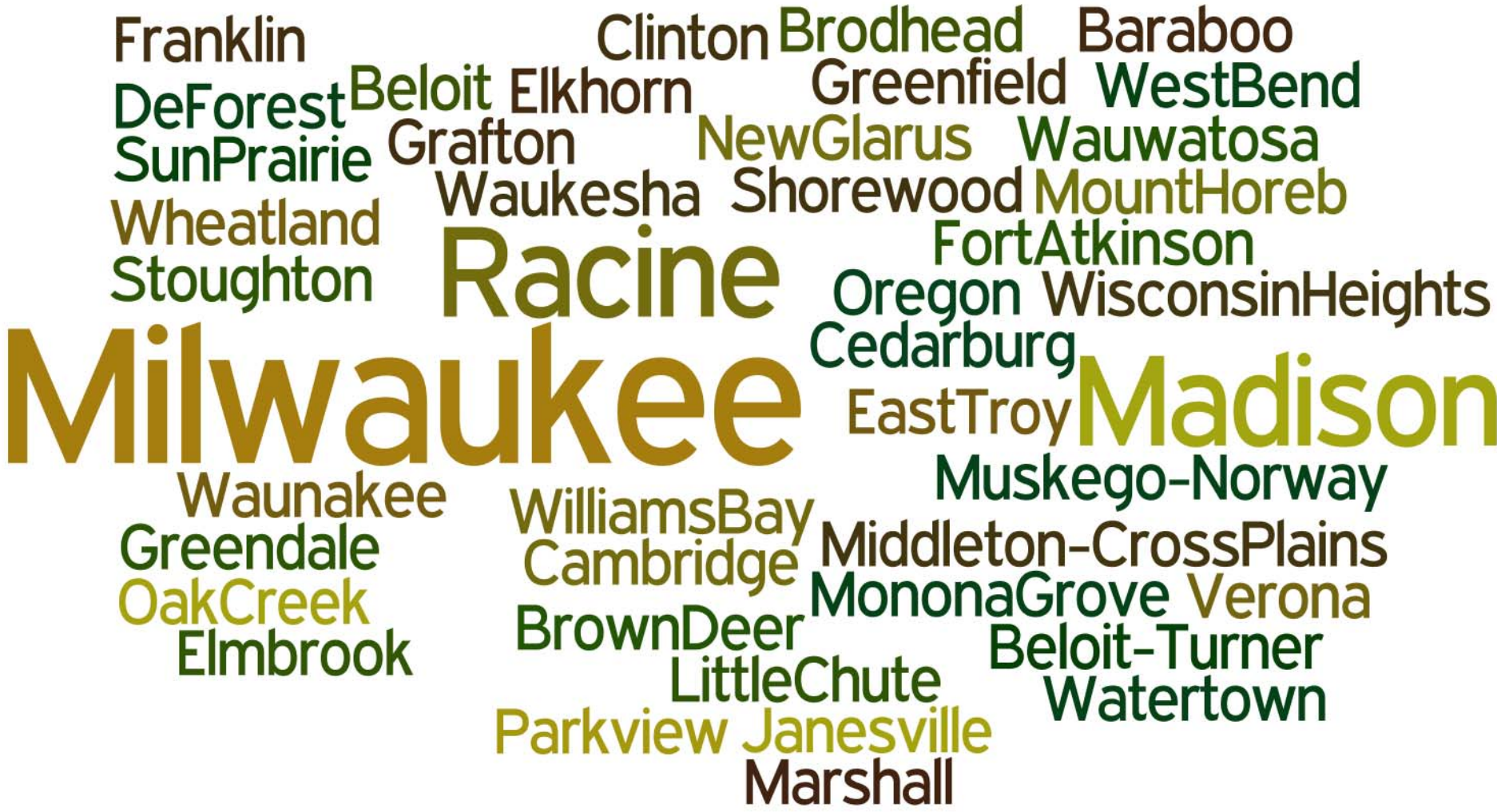
Value-Added Research Center
University of Wisconsin-Madison

October 17, 2011

Districts and States working with VARC



Wisconsin districts using Value-Added



Southeast Wisconsin Consortium



A word cloud of Wisconsin counties, with the text rotated and colored in shades of blue, orange, and white. The counties listed are: Swallow, Nicolet, Hamilton, Cudahy, Waukesha, Elmbrook, Shorewood, Stone, Bank, Lake Country, Oconomowoc, Hartland-Lakeside, Franklin, Kettle Moraine, Mequon-Thiensville, North Lake, West Allis-West Milwaukee, Brown Deer, Fox Point, Bayside, Germantown, South Milwaukee, Merton, Muskego, West Bend, Grafton, Pewaukee, and New Berlin.

WI Statewide V-A Project Page

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What is Value-Added?

- Value-Added is a statistical method used to identify the individual impact of a teacher (or team of teachers) on student learning.
- Value-Added compares the academic growth of each teacher's students to that of teachers with similar students.

Issues in Building a VA System

- Data Requirements and Data Quality
- Value-Added Model and Indicator Design: Technical and Consequential Validity
- Evaluating Instructional Practices, Programs and Policies
- Policy and Management Applications
- Alignment with School, District, and State Policies and Practices
- Reporting, Communication, and Professional Development to Support Implementation

Policy and Management Applications

- Target:
 - Educational unit: classroom, grade-level team, school
 - teacher, principal
- Stakes
 - Low: provision of information to teacher or wider support group, evaluation of instructional practices
 - High: public reporting, performance-based compensation, tenure

Technical Validity

- The quality and appropriateness of the **student outcomes**; outcomes need to be curriculum sensitive – capable of measuring the contributions of teachers, programs, and policies.
- The availability and **quality of longitudinal data** on students, teachers, and schools; accurate linkage of students, classrooms/courses, and teachers.
- The **design** of the value-added model; develop models that yield productivity estimates with low mean squared error (**MSE**) (statistical error + bias).
- The **volume** of data (number of students and magnitude of reference group).
- The degree to which the student outcomes (and other variables) are **resistant to manipulation or distorted measurement**.

Communication

I am working on the value-added story... We are trying to describe the value-added formula in a brief few words (tough, I know).

Would you say your formula is the secret sauce? I am looking for some colloquial way of ID'ing it and describing what it does for folks... The formula will look like Chinese to many, but it has a rather easy-to-understand purpose. I am trying to capture that in a quote from you.

Thanks. S.B., Wall Street Journal

Response

Maybe not a sauce, but perhaps a well-crafted recipe...made with quality ingredients...

The formulas that we use to produce value-added numbers are like recipe's in that they represent instructions for combining the ingredients required to produce valid and reliable measures of classroom productivity and teacher effectiveness.

A More Transparent (and Useful) Definition of VA

- Value-added productivity is the difference between actual student achievement and predicted student achievement.
- Or, value-added productivity is the difference between actual student achievement and the average achievement of a comparable group of students (where comparability is defined by a set of characteristics such as prior achievement, poverty and ELL status).

Value-Added Model Definition

- A value-added model (VAM) is a quasi-experimental statistical model that yields estimates of the contribution of schools, classrooms, teachers, or other educational units to student achievement, controlling for non-school sources of student achievement growth, including prior student achievement and student and family characteristics.
- A VAM produces estimates of productivity under the counterfactual assumption that all schools serve the same group of students. This facilitates apples-to-apples school comparisons rather than apples-to-oranges comparisons.
- The objective is to facilitate valid and fair comparisons of productivity with respect to student outcomes, given that schools may serve very different student populations.

How Complex Should a Value-Added Model Be?

- Rule: "Simpler is better, unless it is wrong."
- #1. Clarity: What is the objective?
 - Student growth
 - Classroom productivity
 - Teacher effectiveness
- #2. Is the model designed to inform that objective? Implies need for "quality of indicator/quality of model" diagnostics.

Consequential Validity

- Do model design features and policy and management applications produce desirable behavior?
- Incentive compatibility

Student Attainment, Growth, and Classroom Productivity: Unified Framework

1. Student attainment
2. Student Growth (Context: Prior achievement)
3. Classroom productivity (Context: Growth external to classroom)
4. Teacher effectiveness (Context: Productivity factors external to teacher)

A Unified Student Growth and VA System

Effectiveness Measure and Model

(1) Student growth = g_i

$$y_{1i} = \text{PredictedAttainment}_i + g_i$$

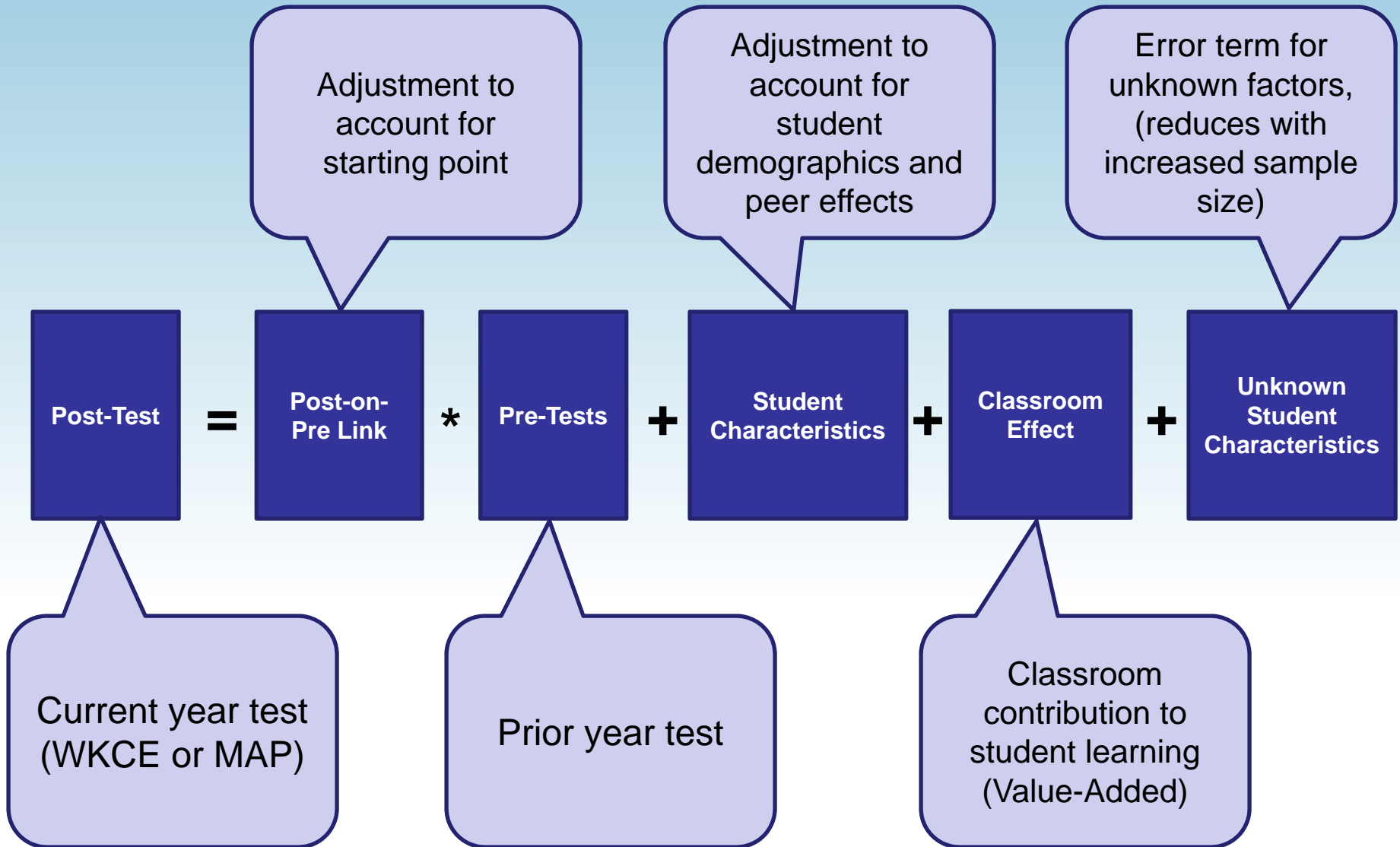
(2) Classroom productivity = $\alpha_{\text{Classroom}_j}$

$$g_i = \alpha_{\text{Classroom}_j} + \text{PredictedGrowth}_i + e_i$$

(3) Teacher effectiveness = $\alpha_{\text{Teacher}(j)}$

$$\alpha_{\text{Classroom}_j} = \text{PredictedClassroom} + \alpha_{\text{Teacher}_j}$$

The Model Definition



Test Design Features

- Curriculum sensitivity
- Coverage of content domain specified in curriculum or learning standards
- Example: Common core standards
- National test consortia
- Predictive power of prior test measures
- Evaluation with absolute standards or a tournament? Issue: horizontal equating

VA Model Design Features

- Control for student-level demographic characteristics
- Control for classroom and/or school factors
- Allow for unrestricted post-on-pre link coefficient or nonlinear function
- Control test measurement error (Fuller, 1987)
- Measure enrollment as a “dose”
- Use shrinkage to increase precision
- Use longitudinal data to control for selectivity (test for strict or sequential exogeneity)

Prior Achievement Function

- Linear
- Polynomial
- Spline (Example: Colorado growth model)
- Nonparametric
- Linear example (single or vector pretest):

$$f(y_{0i}) = \xi + y_{0i}\lambda$$

- Control test measurement error (Fuller, 1987)

Generation II Value-Added

- Conventional VAM imposes the restriction that a high-performing teacher is identically high performing for all types of students, including, for example, students with low and high prior achievement
- **Differential Effects VA:** effectiveness could vary as a function of student characteristics
- Univariate vs. multivariate DE

Transparency in Reporting

- Simpler is better unless it's wrong
- How do we deal with model complexity in professional development?
 - In-person presentations
 - Online course
 - Reporting innovations

Value-Added Online Course

- Self-directed pace
- Divided into four chapters
 - The Oak Tree Analogy
 - The Power of Two (Value-Added and Achievement)
 - Interpreting Results
 - Factors Influencing Growth
- Animated and narrated content
- Forums to ask questions and collaborate
- Quizzes to check for understanding

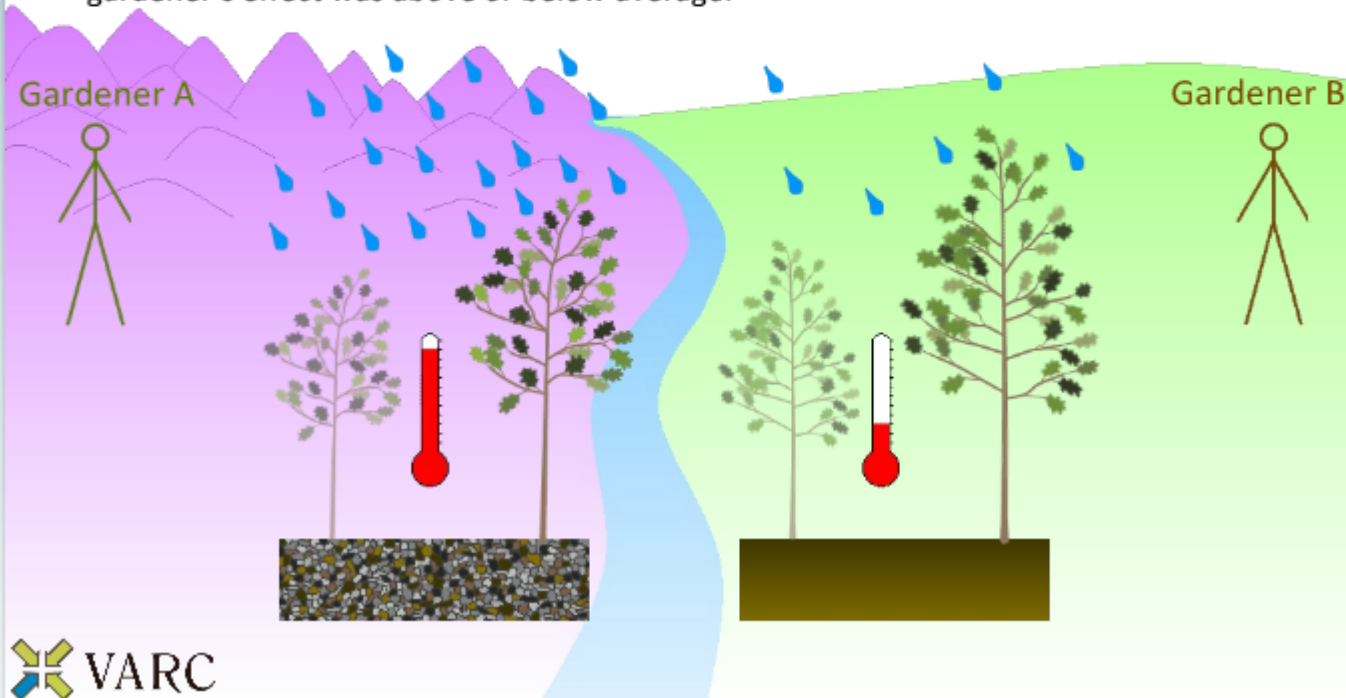
Preview and sample materials
available on our website

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Chapter One – The Oak Tree Analogy

We can use this information to calculate a predicted height for each tree today if it was being cared for by an average gardener in the area...

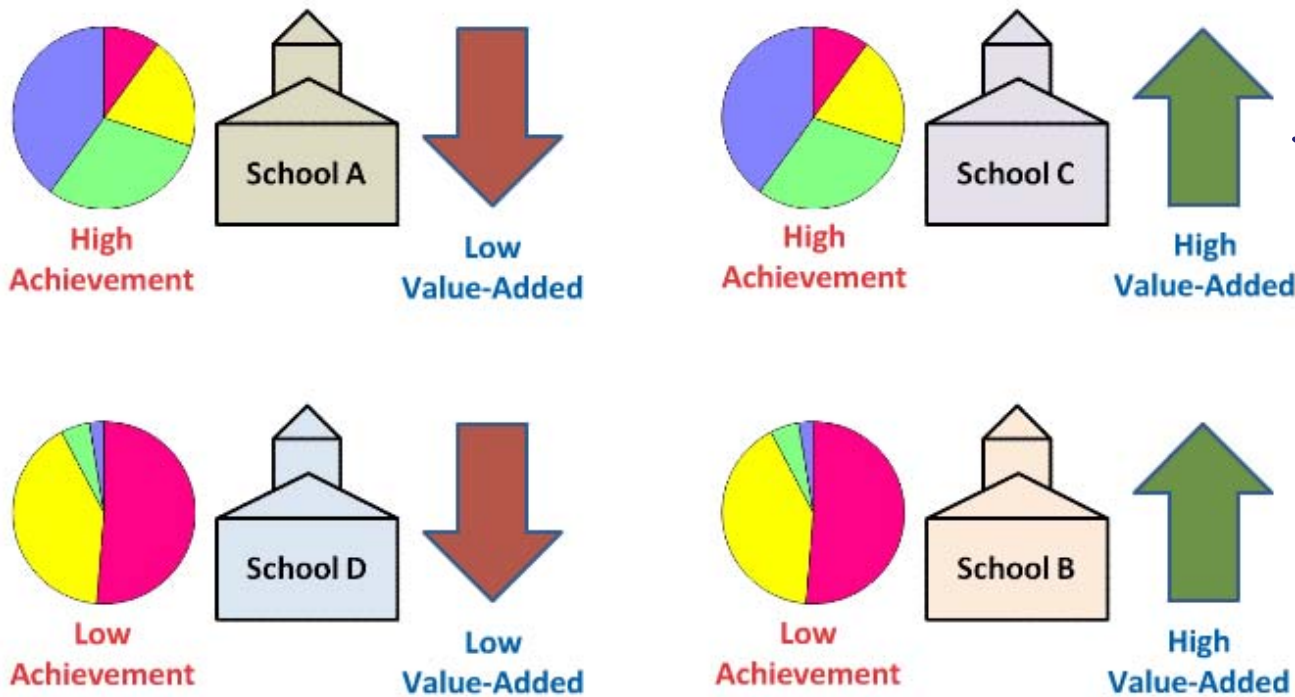
- We examine all oaks in the region to find an average height improvement for trees.
- We adjust this prediction for the effect of each tree's environmental conditions.
- We compare the actual height of the trees to their predicted heights to determine if the gardener's effect was above or below average.



Value-Added is explained conceptually out of the education context.

Chapter Two – The Power of Two

Combining Value-Added and Achievement



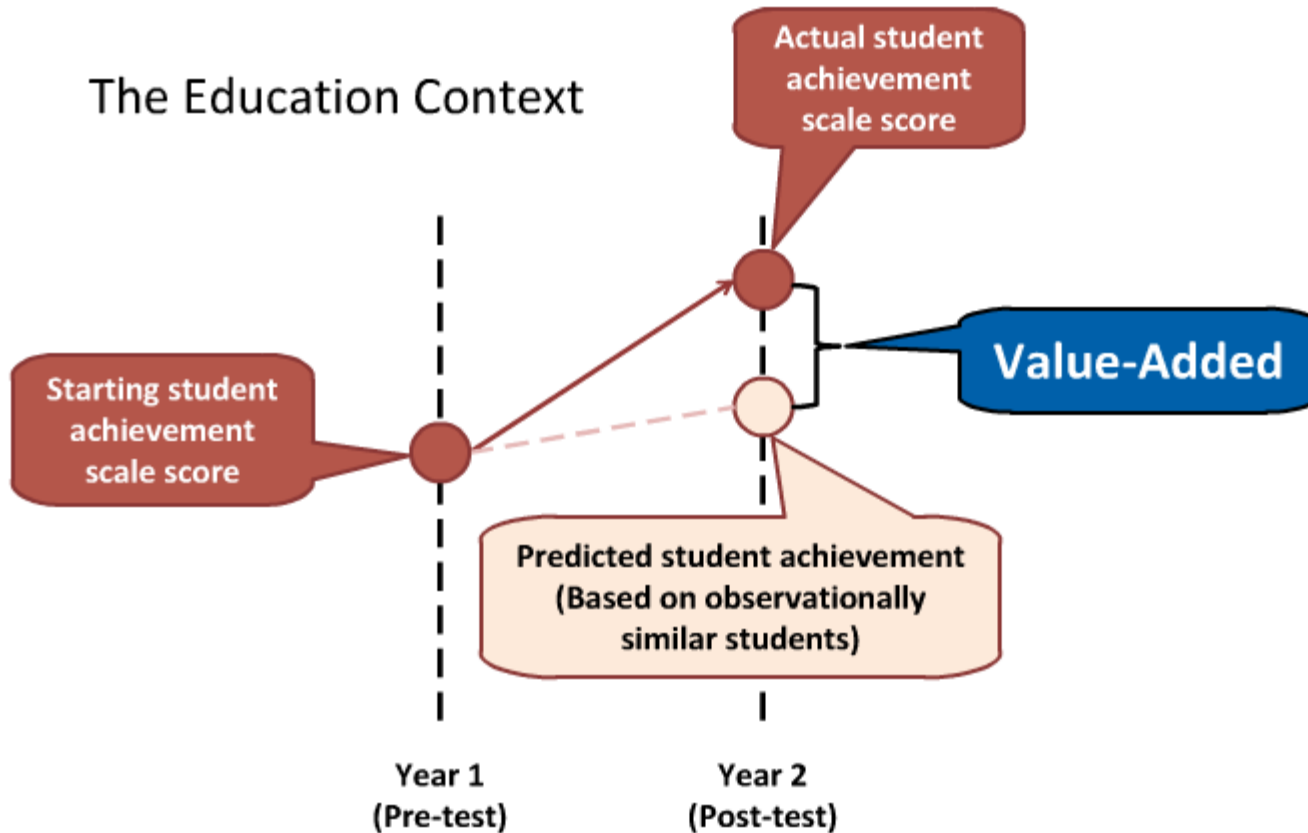
When we look at both Value-Added and Achievement measures independently, what does it tell us about the situation of a school?



Chapter Three – Interpreting Results

Interpreting Value-Added Results

The Education Context

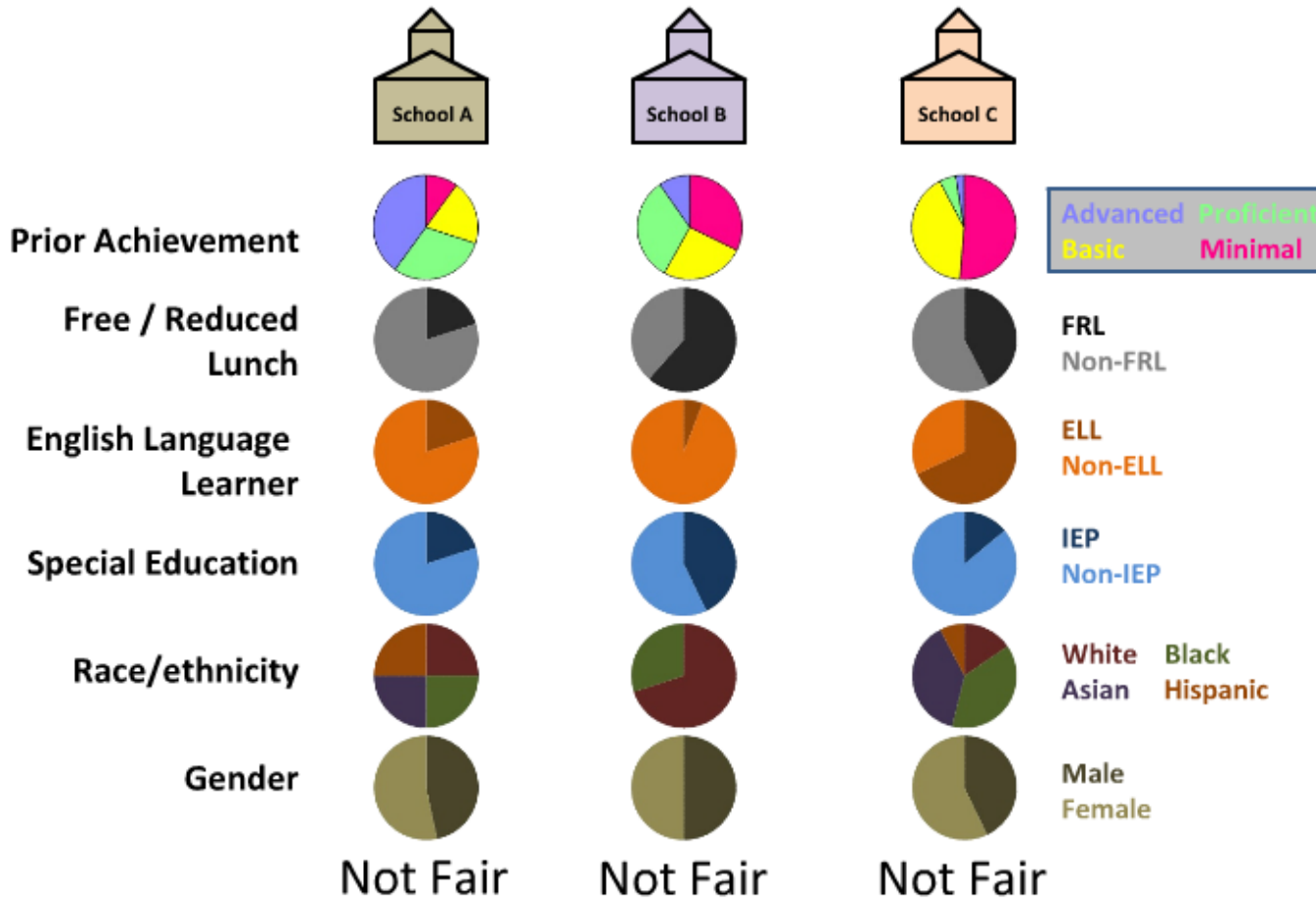


How are standardized test scores used to produce a Value-Added estimate?



Chapter Four – Factors Influencing Growth

Before controlling for all demographic characteristics



Schools serve different student populations.

How does Value-Added allow for fair comparisons of growth across schools?



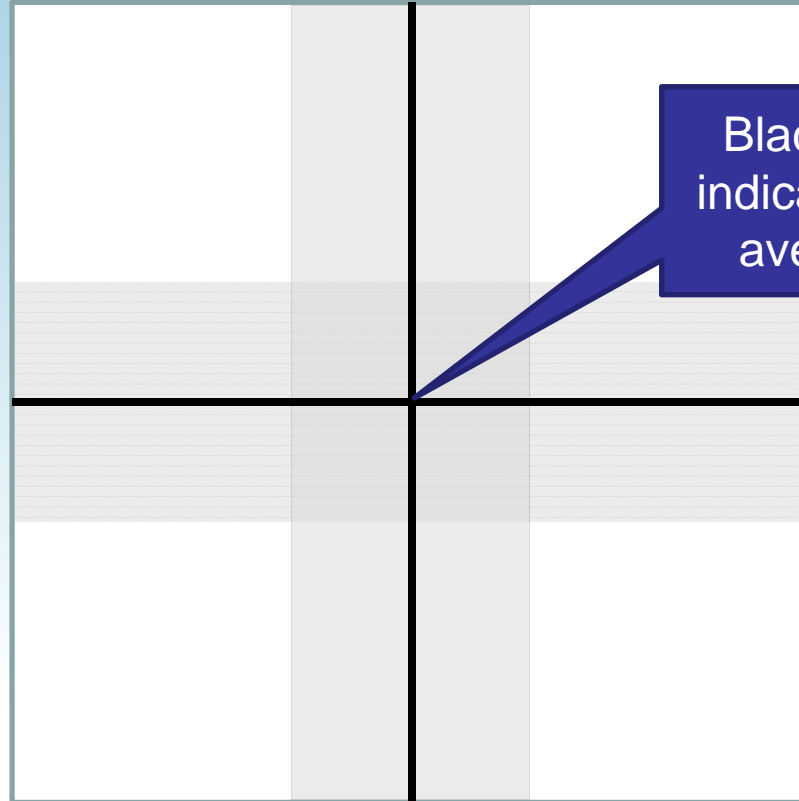
Value-Added and multiple measures

- Value-Added is one indicator in a toolbox of measures
- How can we intelligently use multiple measures to gain a fuller understanding of school performance?
- Example: Value-Added and Achievement

Mapping Value-Added and Attainment

How much do students know?

Achievement



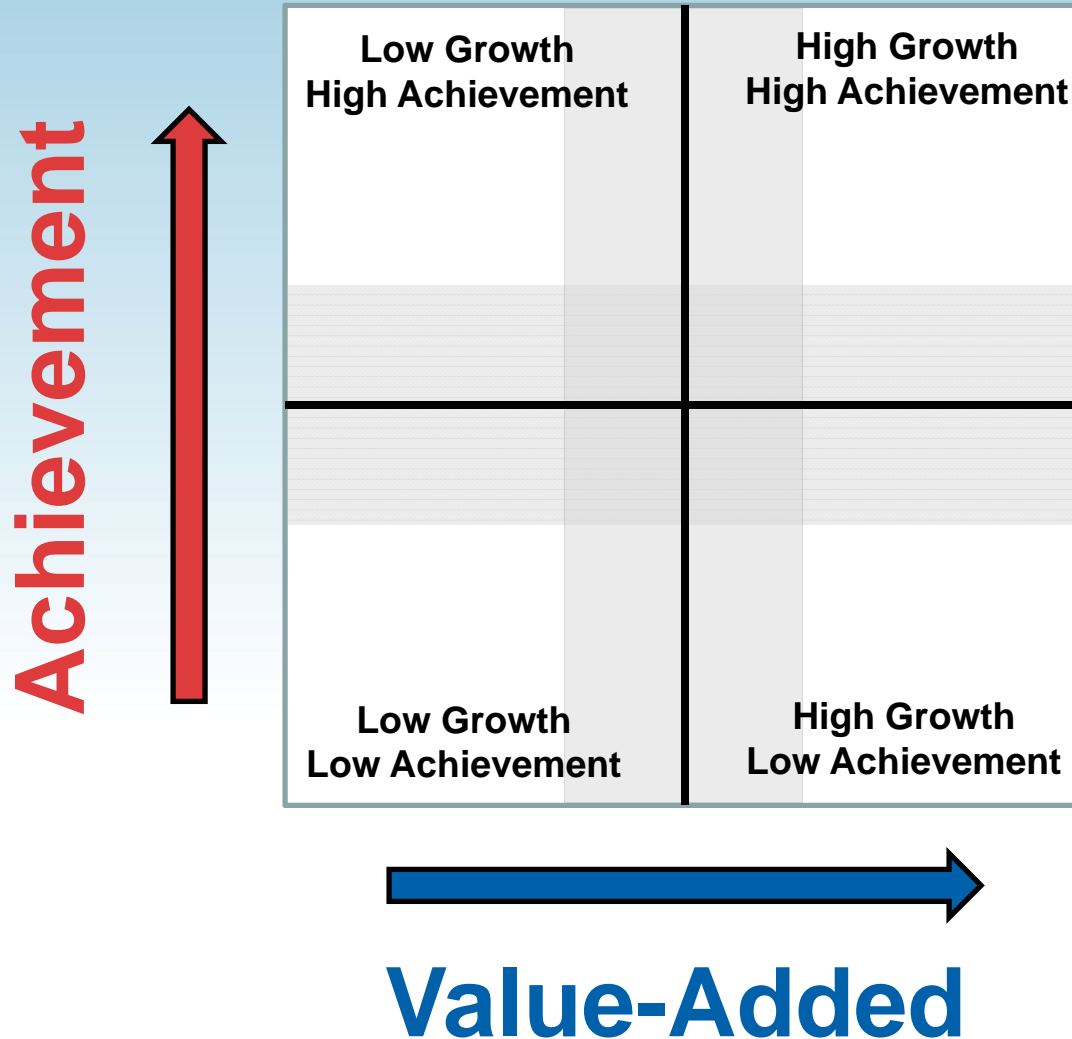
Black lines indicate state averages



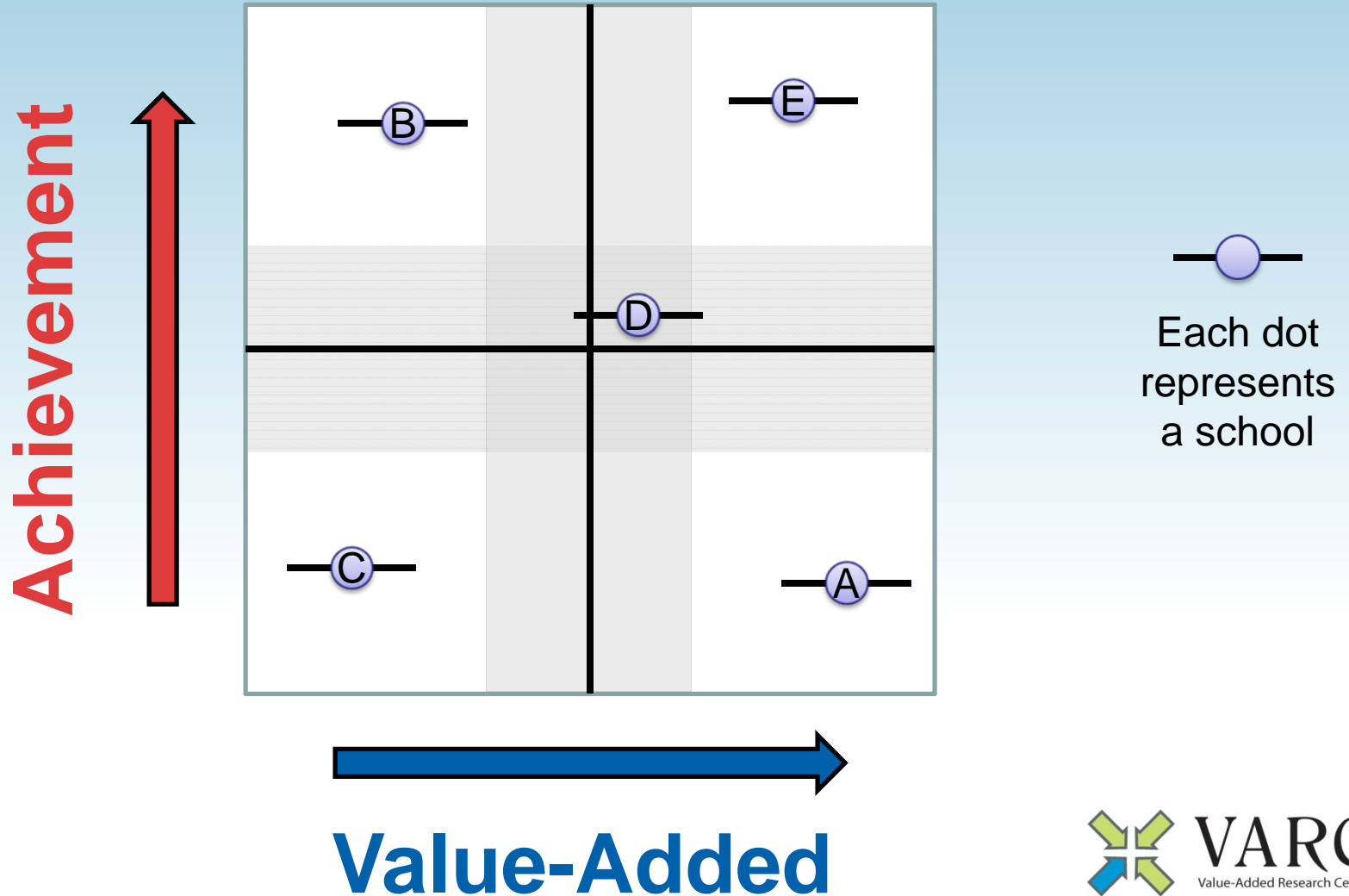
Value-Added

How fast are students growing?

Mapping Value-Added and Attainment



Mapping Value-Added and Attainment



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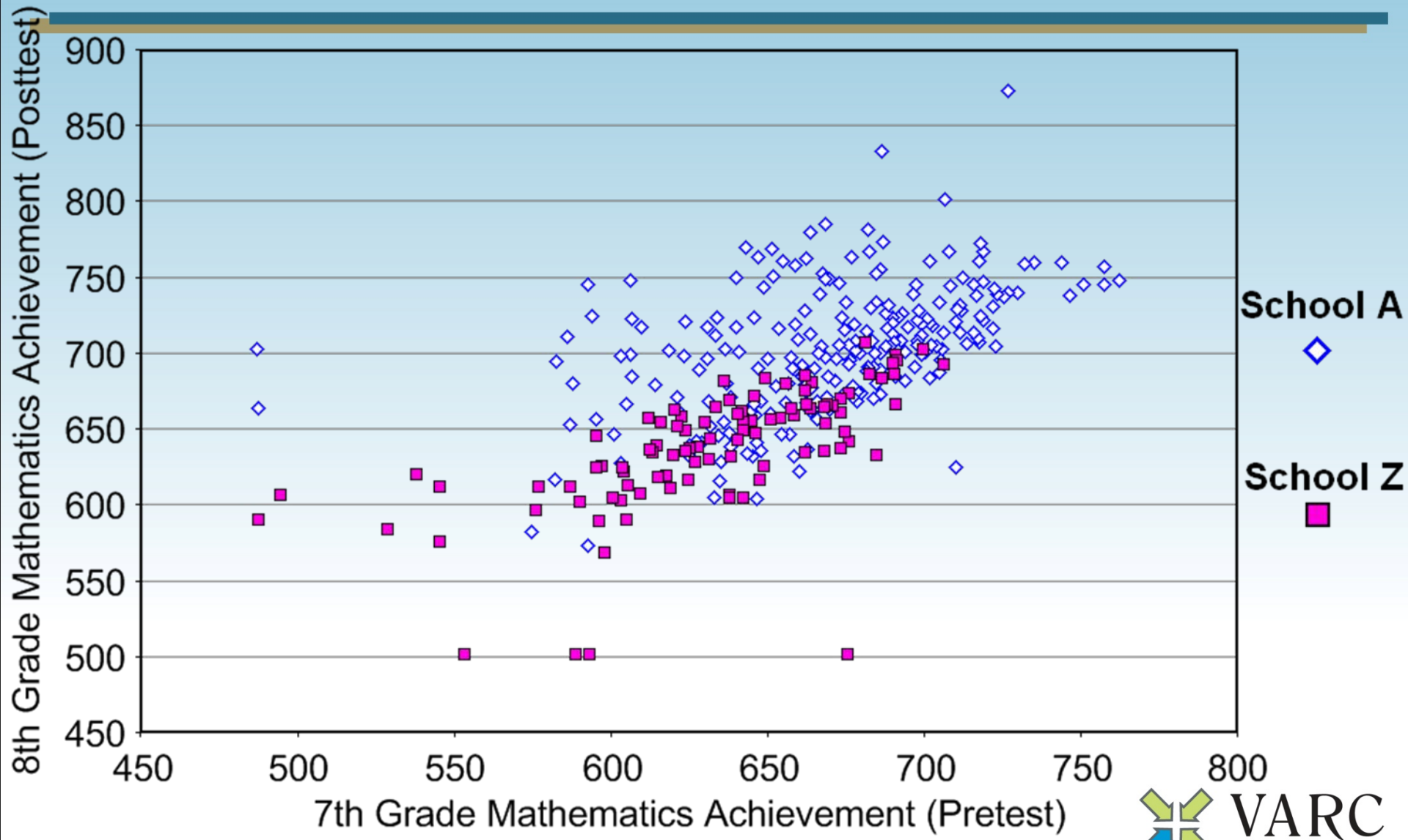
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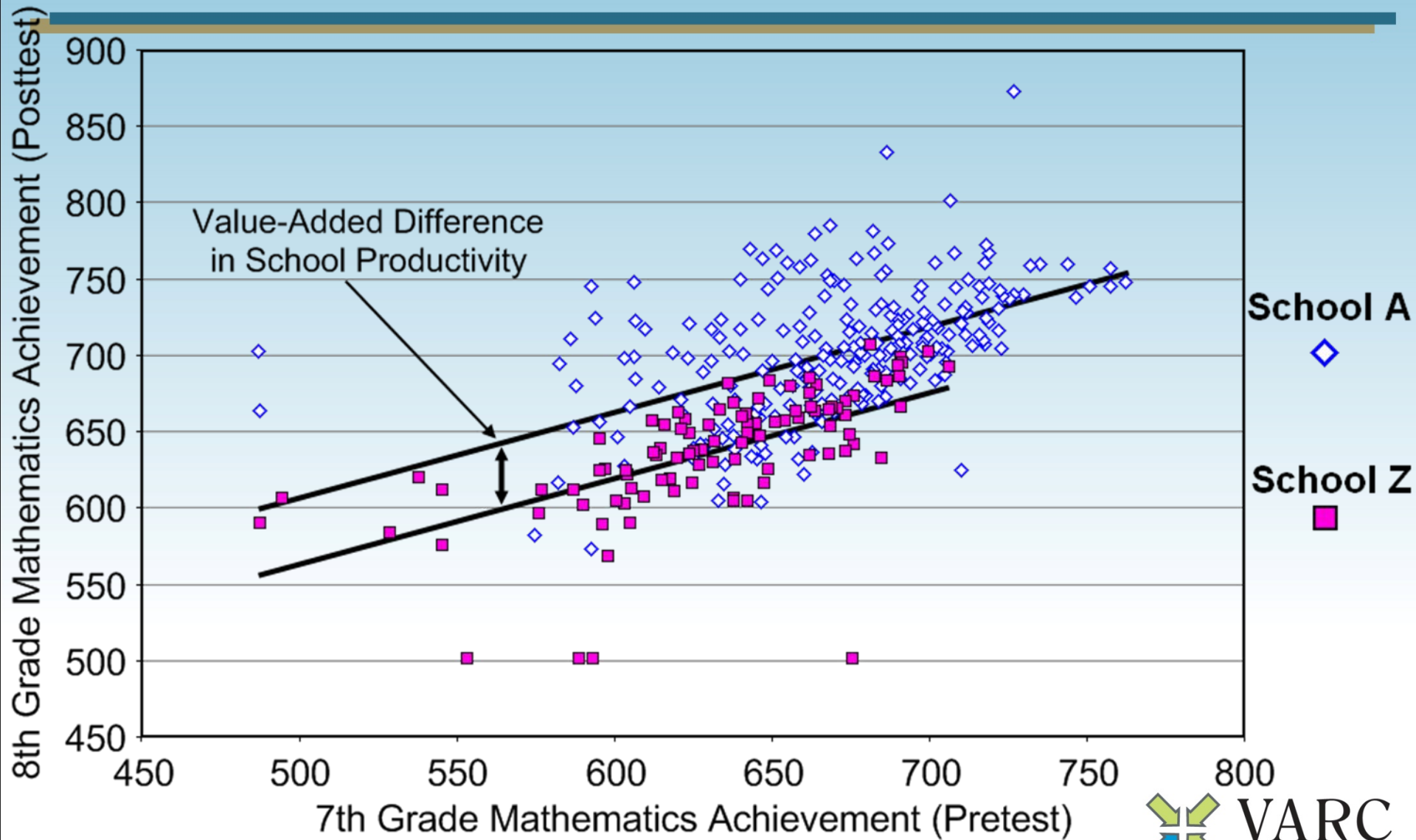
Additional Resources

- http://varc.wceruw.org/Projects/wisconsin_statewide.php
- About Value-Added in Wisconsin
- Online Course Material Introducing Value-Added Measures
- Wisconsin Online Reporting Tool
- Value-Added Resources Produced for Other Projects

A Graph of Student Achievement Data for Two Schools



A Graph of Student Achievement Data for Two Schools



Include Student-Level Demographic Characteristics in Model?

- Measure district or statewide differences in achievement growth by student subgroups (e.g., low vs. high poverty): **value-added growth gaps** (analogous to attainment gaps)
- **Monitor** changes in growth gaps to evaluate policies and programs designed to reduce inequality in student attainment and student growth
- **“Control”** for (within-classroom or within-school) differences in the student composition of schools so that estimates of educational performance reflect differences in school productivity, rather than differences in school composition
- Models that fail to include student-level variables will yield results that are systematically **biased** against schools and educators that disproportionately serve students who, on average, exhibit relatively low within-classroom and within-school achievement growth

Does Controlling for Student Characteristics Lead to Reduced Achievement Expectations?

- No, if model includes within-classroom or within-school (level 1) student characteristics
- Claim may arise from a failure to recognize that there are two dimensions to this issue: measuring the productivity of schools, classrooms, and teachers is different from setting student achievement expectations (or standards) and measuring whether students have met those expectations.
- Attainment information can appropriately be used to identify students who do not satisfy standards and thus are in need of additional resources.
- Value-added information can appropriately be used to measure the productivity of schools attended by both low and high-achieving students.
- Use two-dimensional reports to report on two dimensions: value-added and attainment.