education analytics

UNDERSTANDING THE WISCONSIN VALUE-ADDED GROWTH MODEL 2021-22

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OVERVIEW

Value-added modeling is the use of statistical techniques to measure the impacts of schools on student achievement. It does so by isolating the impacts of schools from the impacts of other, non-school factors such as family resources or schools attended in the past.

In practice, value-added models measure student growth on an assessment from one year to the next among students attending a given school. For example, when measuring the impact of a school in 5th-grade math, a value-added model quantifies growth between the previous year's 4th-grade Forward math assessment and the current year's 5th-grade Forward math assessment. More specifically, it compares the growth of students in that school to the growth of similar students across the state of Wisconsin. Similar students are identified by their scores on previous years' assessments and by student demographic characteristics. Schools in which students grew more than similar students statewide receive higher value-added scores.

In the sections that follow, we go into more detail about value-added modeling in general and in the Wisconsin model in particular.

VALUE-ADDED MODELS

A value-added model recognizes that a student's level of achievement at any given point in time is the result of many factors, both school and non-school related, that have accumulated over a student's lifetime up to that point in time. In contrast, a measure of average achievement, such as a proficiency rate, measures not only the impact of the school, but also the impacts of other schools those students may have attended in the past, as well as the impacts of a lifetime of non-school factors.

Purpose of value-added models

The purpose of a value-added model is to measure the impact of a school on student achievement by controlling as much as possible for factors outside the school's control. We do this by controlling for a wide range of student-level variables. We control for these variables using linear regression, a statistical method commonly used for measuring relationships in data between outcome and control variables.

Controlling for prior achievement

The most important control variables in a value-added growth model are measures of prior student achievement. The Wisconsin value-added model's control variables include assessment scores in math and reading on the previous year's Forward or Aspire assessments. It also includes Forward or Aspire assessment scores from the two years prior when available. In some cases, the model will control for past scores on a different assessment from the

assessment used to measure current achievement. For example, the model of growth for the 9th-grade Aspire assessment uses the 8th-grade Forward assessment to measure prior achievement; for more details, please see the annual Value-Added Technical Guide. Including assessment scores from prior years as control variables substantially controls for factors relevant to student achievement, both school and non-school related, experienced by the student up to the end of the prior year.

Controlling for non-school factors

The Wisconsin value-added model also controls for a set of demographic variables. For example, the model includes a set of control variables for disability status to account for different growth patterns between students with and without disabilities. The model's demographic variables are included to better control for non-school factors that may influence student growth. For a complete list of control variables, please see the annual Value-Added Technical Guide.

Averaging student growth

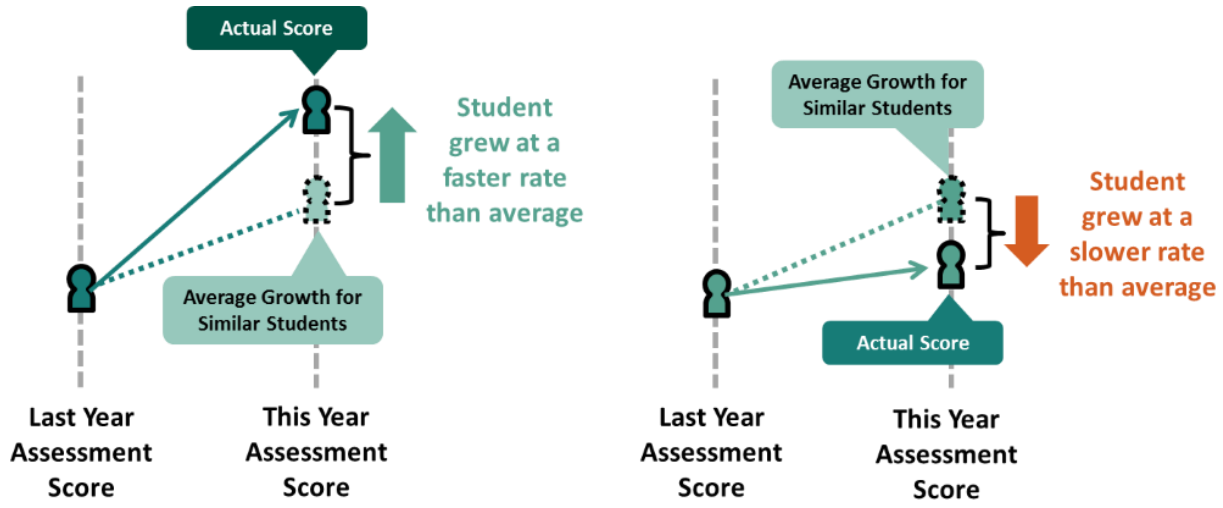
To specifically uncover the impact of the school, a value-added model averages the growth of all students who attend the school. While the growth of any individual student reflects both school and non-school factors, the average of that growth across all a school's students is more reflective of the impact of the school as a whole. The Wisconsin value-added model measures both average overall growth and average growth for students in subgroups within a school. In order to appropriately represent school and student group growth, value-added results are only reported for groups of at least 20 students.

An example of measuring value added

Value-added models start by observing each student's characteristics—including prior achievement and student demographics—and modeling the average growth among students with similar characteristics. They then measure the difference between each student's actual growth and that average. Students whose actual growth was greater than average growth had greater-than-expected growth. Conversely, students whose actual growth was less than average growth had lower-than-expected growth.

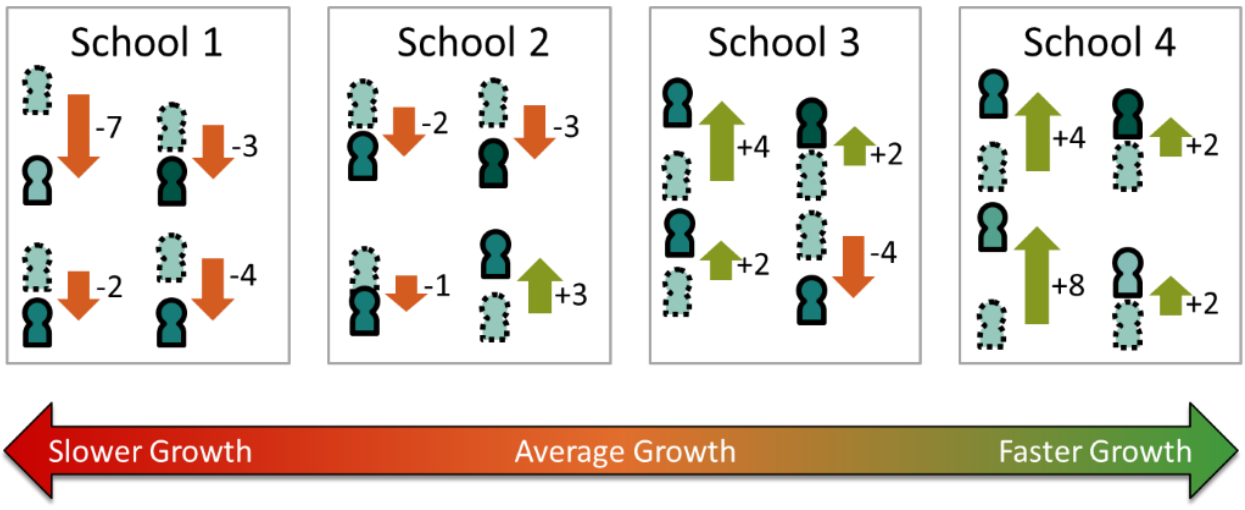
Figure 1 illustrates the comparison between actual and average growth for two similar students. Both students scored similarly on last year's assessment, and both students' scores are compared to the same average growth—indicated by the dashed green line—on this year's assessment. However, the two students scored differently on this year's assessment. The student on the left had greater growth than average between last year's and this year's assessment. In contrast, the student on the right had less growth than average.

Figure 1. Actual student growth compared to average for similar students



After computing the difference between actual and average growth for all students in the sample, we compute the average of this difference by school. Schools in which average actual growth was greater than average expected growth are schools in which, on average, students grew more than expected. These schools are identified as having above-average value-added. By comparison, schools in which average actual growth was less than average expected growth are schools in which, on average, students grew less than expected. These schools are identified as having below-average value-added. Figure 2 presents a stylized example of growth for four schools.

Figure 2. Value-added growth by school



The example illustrated in Figure 2 is substantially stylized and more technical details are presented in the annual Value-Added Technical Guide. Note that, in Wisconsin, average value-added, i.e., value-added for schools in which actual growth equals expected growth, is set at a score of 3. This is discussed further in the "Scale of the value-added measures" section below.

Students included in the model

The Wisconsin value-added growth model includes students who make typical grade progression, for whom Forward, Aspire, or ACT assessment scores are available in math and reading for the current and previous year, and for whom demographic data are available. When we measure growth for a given *school* for a given year, we only include students who were enrolled in that *school* for the full academic year (FAY) for that year. When measuring growth for a given *district* for a given year, we only include students who were enrolled in that *district* for the full academic year (FAY) of that year. District-level value-added is measured as the average of school-level value-added in the district, plus the growth of students who were FAY district but non-FAY school. Students do not have to be enrolled in or tested in the same school in the current and previous year to be included in the model. As indicated above, value-added results are only reported for groups of at least 20 students.

Value-added for student subgroups

The value-added model is used to produce measures that incorporate the growth of all students eligible for growth at the school. This "overall" growth measures the average impact of the school across students of all different kinds. The value-added model is also used to produce separate growth measures by the following subgroup categories.

Subgroup	
Disability Status	• Students *with* disabilities • Students *without* disabilities
English Language Learner Status	• Students who *are* English Language Learners • Students who *are not* English Language Learners
Economic Disadvantage	• Students who *are* economically disadvantaged • Students who *are not* economically disadvantaged
Race/Ethnicity	• American Indian/Alaskan Native • Asian • African American • Hispanic • Multiracial • Native Hawaiian/Pacific Islander • White
Membership in the target group	• Students *in* the target group • Students *not in* the target group
Proficiency on the prior year's assessment in the same subject	• Students who scored *proficient* • Students who scored *below proficient*

The last category described above refers to separate growth measures for students who scored proficient and students who scored below proficient in the previous year in the subject for which growth is measured. These growth measures are useful for indicating whether schools are having a greater or lesser impact on students who had been high-achieving or low-achieving in the past.

Scale of the value-added measures

The value-added growth measures in Wisconsin are evaluated on a scale from 0 to 6, with the vast majority of schools' scores between 1 and 5. A small number of growth measures may be less than 0 or greater than 6. This scale is not based on the scale scores of the assessment. Instead, it is measured on a scale based on differences in growth from school to school. This scale is designed to have an average of 3 and a standard deviation of 1 across schools.

It is useful to note that this scale is based on differences in *overall* value-added from school to school. We may see more very high or very low value-added measures for subgroups within schools, given that these measures can differ across both schools *and* student subgroups. Similarly, we may see fewer very high or very low value-added measures for districts given that they will often be a measure of average value-added growth across a large number of substantively different schools.

Reported value-added as a three-year average

The value-added model is estimated separately each school year. However, the value-added scores listed on each school and district report card in Wisconsin are three-year weighted averages of single-year value-added results. This weighted average puts more weight on recent years. For example, the 2021-22 weighted average included:

- value-added from 2021-22, with a base weight of 1/2 (50 percent);
- value-added from 2020-21, with a base weight of 1/3 (33.33 percent); and
- value-added from 2018-19, with a base weight of 1/6 (16.67 percent).

Base weights are adjusted for the number of students in a given year to produce an adjusted weight.

COVID-19 and value-added

Due to the COVID-19 pandemic, there was no testing in the spring of 2020. As a result, value-added for 2020-21 was measured between the 2018-19 and 2020-21 assessments using a *skip-year* model. Student growth over this period reflects schools attended in both 2019-20 and 2020-21, and school growth measures reflect a school's effect on student achievement over two years rather than one.

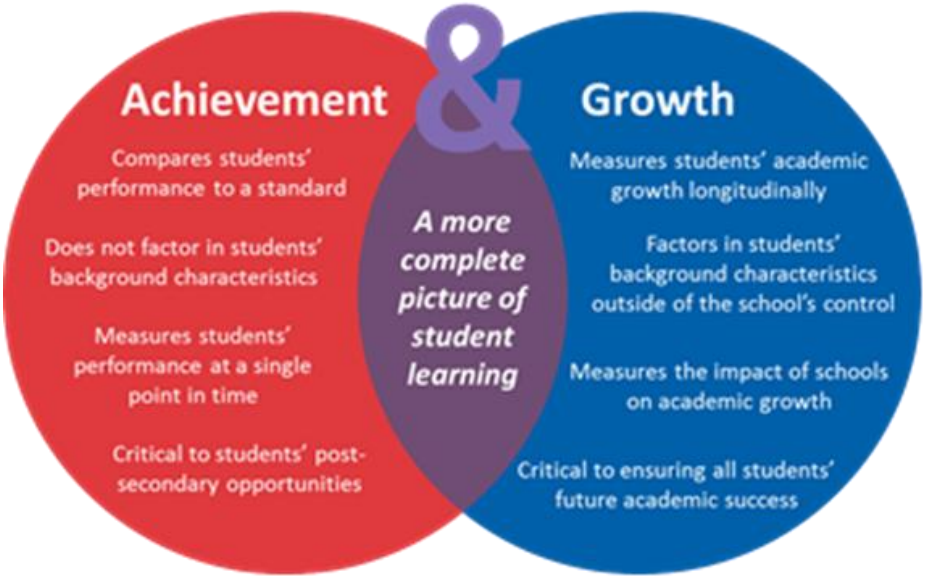
The primary challenge of measuring value-added in the skip-year context is attributing a portion of student growth to each of the schools attended in 2019-20 and 2020-21. We approached this using a weighting method. In cases where students attended the same school in both years (for example, a student who attended the same school for 4th grade in 2019-20 and 5th grade in 2020-21), the growth of that student was counted fully toward that school's value-added measure. In cases where students attended two different schools between the two years (for example, a student who attended different schools for 8th grade in 2019-20 and 9th grade in 2020-21), we attributed the student's growth with 50 percent weight to the school attended in 2019-20 and with 50 percent weight to the school attended in 2020-21.

In 2021-22, it once again became possible to measure student growth over the course of one year, using a model that measures 2021-22 student achievement and controls for 2020-21 student achievement. Consequently, the value-added growth for 2021-22 can be interpreted the same way as value-added growth in years 2018-19 and before. However, the skip-year growth measure from 2020-21 continues to be part of the reported three-year average value-added growth measure.

VALUE-ADDED IN CONTEXT

While value-added is a useful measure for growth in student achievement, it does not measure all aspects of a school. Other measures are important to evaluate alongside value-added growth. For example, both student achievement (measured with points-based proficiency rates in Wisconsin) and student growth (measured with value-added) provide a more complete picture of a school together than separately. While proficiency rates do not control for non-school factors, they nonetheless measure what students know at a single point in time relative to performance standards. Value-added, in contrast, measures the extent to which students at a school improve over two points in time and better captures the contribution of the school itself to student achievement.

Figure 3. Comparison of achievement and growth



An even more complete understanding of a school can be reached by looking beyond assessments to a wider array of data, such as chronic absenteeism, school-wide attendance, and graduation rates, all of which are included in Wisconsin's school and district report cards. Given that different measures provide information about different things, looking at a broad range of data can provide valuable information about different aspects of a school.

FOR FURTHER DETAIL

This document provides an overview of the value-added model employed in Wisconsin. For more details on the value-added growth model, the annual Value-Added Technical Guide goes into greater depth and can be found on the Report Card Resources.