



Answers to Administrators' Questions about Student Growth

Administrators often have questions about the kinds of information that score reports provide and about how they can use that information to help their students succeed. This is especially true about ACT Aspire®, which measures student growth over time. This report describes how student growth is reported on ACT Aspire and then answers several common questions about how to use the growth information.¹ We illustrate our answers with examples showing how the growth models work.

How ACT Measures Student Growth

Student achievement can be characterized in two main ways. Status measures tell us how students are doing now and answer questions such as “Is this student ready for college?” Growth measures, on the other hand, provide information about how much a student has learned over time and answer questions such as “How much progress has this student made during the past year toward being ready for college?”

There are a variety of statistical methods available for supporting interpretations of student growth.² Each method has unique advantages and disadvantages, which is why multiple methods support growth interpretations from students' ACT Aspire scores: gain scores, student growth percentiles, ACT Readiness Benchmarks, and predicted score paths.³

- **Gain scores** are the arithmetic differences in a student's test scores from one grade to another. Each ACT Aspire subject test except Writing is on a common scale across grade levels, allowing comparisons of scores over time. For example, if a student scores 421 on the third-grade Reading test and a 425 in fourth grade, the student's gain score is 4. Gain scores are often discussed in terms of how an individual student's gain score from one grade to the next compares to the average gain score for all students moving between the same grades.
- **Student growth percentiles (SGPs)** represent the relative standing of a student's current achievement compared to that of students with similar prior achievement (that is, score histories). SGPs can range from 1 to 100. Higher values indicate higher levels of growth than other, similar students. A student with an SGP of 30 in mathematics scored higher than 30% of students with similar score histories.
- **ACT Readiness Benchmarks** indicate whether a student taking ACT Aspire is on target to meet corresponding ACT College Readiness Benchmarks on the ACT® test. The ACT College Readiness Benchmarks represent the level of achievement required for students to have a 50% chance of obtaining a grade of B or higher, or about a 75% chance of obtaining a C or higher, in corresponding credit-bearing first-year college courses (English Composition, College Algebra, introductory social science courses, and Biology).⁴
- **Predicted score paths** provide information about where a student (or group of students) is likely to score in future years assuming average annual growth, which depends on the subject area and grade level. For example, the predicted score path can be used to determine if a student is likely or unlikely to meet the ACT Readiness Benchmarks in two years, or, for students in grades 9 and 10, to predict the range of the student's likely performance on the ACT.

For more in-depth explanations of growth models, see *A Practitioner's Guide to Growth Models* by Katherine Castellano and Andrew Ho.

Each of these features of ACT Aspire provides information that can help answer questions administrators have about student growth.

ACT Aspire

ACT Aspire is an aligned, longitudinal college and career readiness assessment system for students in grades 3–10 that provides insights into student performance in English, reading, mathematics, science, and writing in the context of college and career readiness. For more about ACT Aspire, visit www.discoveractaspire.org.

The ACT Test

The ACT is a college readiness assessment with tests in English, reading, writing, mathematics, and science. Students taking the ACT receive scores for each subject test, a Composite score, an ELA score for performance in English language arts, a STEM score for science and mathematics, and ACT College Readiness Benchmark information. For more about the ACT, visit www.act.org.

Questions Administrators Often Ask

Did the students in our school/district demonstrate sufficient growth in all content areas over the past year?

Gain scores and student growth percentiles (SGPs) can help answer this question.

Gain Scores

Gain scores can be used to determine whether a group of students has made a year's worth of expected progress—that is, whether the students have performed close to the average of other students when going from one grade to the next. Average gain scores on ACT Aspire are calculated by subtracting each student's prior-year score from their current-year score and then taking the average. Table 1 gives the average gain scores of all students from one grade to the next on ACT Aspire as well as the standard deviations (that is, a measure of variation).⁵

Table 1. ACT Aspire Average Gain Scores (and Standard Deviations)

Grade Level Pair	Subject Area			
	English	Mathematics	Reading	Science
3–4	3.7 (4.8)	3.1 (3.5)	2.8 (4.1)	3.3 (4.5)
4–5	2.9 (5.2)	2.5 (4.1)	2.5 (4.3)	2.2 (4.5)
5–6	2.0 (5.8)	3.0 (4.7)	2.6 (4.7)	1.9 (4.7)
6–7	2.3 (6.1)	0.4 (5.0)	0.7 (4.9)	1.2 (5.1)
7–8	1.6 (6.3)	2.5 (4.9)	3.0 (5.1)	2.8 (5.3)
8–9	1.0 (5.9)	1.4 (4.9)	0.0 (5.5)	1.8 (5.6)
9–10	0.9 (6.2)	1.2 (5.2)	1.0 (5.6)	1.2 (6.4)

Tip

Because individual student gain scores are whole numbers, when comparing a student's gain score to those in the table, round the table value to the nearest whole number.

Source: Based on data from spring 2013, spring 2014, and spring 2015; students took all four tests.

The standard deviations of the gain scores indicate that there is considerable variation in gain scores across students. Most students will have a gain score that is within one standard deviation of the mean. Consider fourth-grade students in mathematics: 76% of students had a gain score between 0 (approximately one standard deviation below the mean) and 7 (approximately one standard deviation above the mean). Some students will have small or even negative gain scores. Because gain scores are imprecise, negative gain scores do not imply that a student made no learning progress.

Using Table 1, the average gain score for all students in a class or school moving from one grade to the next can be compared to the average gain score for all students moving between those same grades. For example, if the average gain score for fifth-grade mathematics in a school is 2.6, we can say that the grade made roughly a year's worth of progress since 2.6 is greater than 2.5, the average gain score for all students in the period.

Average gain scores for small groups of students can be imprecise, so administrators should take class size into account when interpreting gain scores.

Student Growth Percentiles

With average gain scores, growth expectations are the same for all students, regardless of their starting point. SGPs, on the other hand, describe growth relative to other students who had the same prior test scores (sometimes called “prior-year score history”).

Administrators can calculate the mean growth percentile (MGP) for a particular class or school by taking the average of their students' SGPs.⁶ Administrators can use this information to determine whether their students' knowledge and skills are growing at least at an average pace compared to their academic peers (for example, MGP = 50). As with average gain scores, MGPs based on a small group of students are imprecise.

MGPs are often grouped into three or more categories. For example, “Low” (MGP < 35), “Average” (MGP between 35 and 65), and “High” (MGP > 65) categories have been used.⁷

Are students making appropriate progress toward meeting the ACT Readiness Benchmarks?

Administrators receive aggregate progress reports at the school, district, and state level that address how close students are to meeting the ACT Readiness Benchmarks. The sample chart from a score report in Figure 1 shows a high school's average ACT Aspire score for a particular grade and subject in relation to the ACT Readiness Benchmark. In this example, we can see that the high school average for the Science test is above the ACT Readiness Benchmark, at the Ready level. Further, the figure also provides the predicted school average for ACT Aspire Grade 10 Science and the predicted school average score on the ACT science test. The report indicates that, on average, the students are likely to meet the ACT Readiness Benchmark in grade 10 and the ACT College Readiness Benchmark in grade 11 (which is 23).

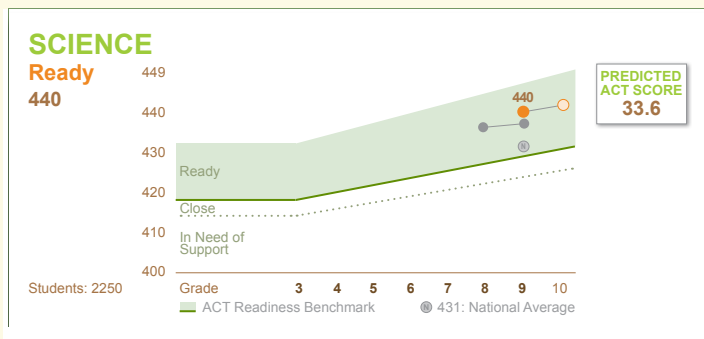


Figure 1. Sample ACT Aspire School Progress Report

Administrators wishing to evaluate school performance in other subject areas and grades would need to examine each subject area and grade level separately.

Administrators can also calculate the MGP for their school or district in each grade level and subject area. Administrators can use this information to determine if their students are growing at least at an average pace (for example, MGP = 50) compared to their academic peers in each grade level and subject area.

Does this school/program show as much growth as another?

There are multiple ways to evaluate whether one school or program shows as much growth as another. Here are two:

1. **Calculate the MGP for each school or program and compare the MGPs by subject area.** Schools or programs with a higher MGP would be demonstrating more growth for that subject area than schools or programs with a lower MGP.
2. **Compare the gain scores for each subject area and grade level.** Schools or programs with higher gain scores would be demonstrating more growth than schools or programs with lower gain scores.

Can student growth be measured for students who do not change proficiency levels?

To measure growth, administrators can use scale scores instead of the In Need of Support, Close, and Ready proficiency levels. In all subjects except writing, a positive gain score means that the student has exhibited some growth. Further, a student's growth can be calculated compared to her academic peers using SGPs. Neither method relies on the proficiency categories to calculate growth.

Can results from different grades be pooled together to draw summary conclusions?

Within a subject area, school- or district-level MGPs can be calculated for each grade level (or across grade levels) to draw summary conclusions about growth in that area.

How can student growth data help identify schools/districts showing the most growth?

Either MGPs or gain scores can be used to identify schools or districts that show the most growth. Using MGPs is straightforward.

To use gain scores, calculate average gain score for each grade level and subject area. The school or district with the highest gain scores is exhibiting the most growth.

How can student growth data help identify schools/districts that are narrowing achievement gaps?

Achievement gaps exist when there are sizable differences in average scores across student subgroups. Subgroups of interest often include students from racial/ethnic minority groups, students from families with lower income, students with disabilities, and English language learners. To identify schools or districts that are narrowing achievement gaps, growth can be compared across student subgroups.

For instance, in Figure 2 mean scores of students who tested in both grades 7 and 8 are plotted for White and Hispanic student groups. The gaps for each year are the difference between the average scale score for White students and Hispanic students. Because the eighth-grade gap in 2015 is smaller than the seventh-grade gap in 2014, the district narrowed the achievement gap

between White and Hispanic eighth-grade students. In other words, the average gain score was larger for Hispanic students relative to White students, and so the achievement gap decreased.

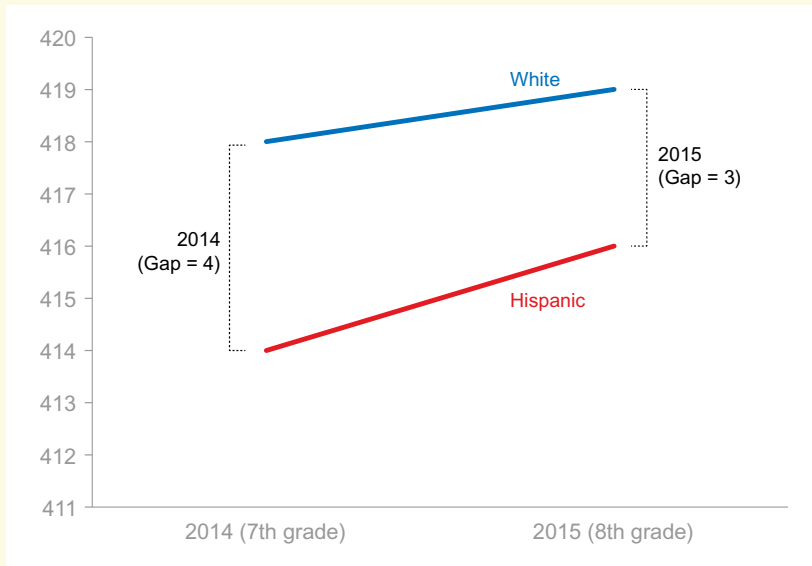


Figure 2. Calculating Achievement Gaps Using Average Scale Score

Alternatively, MGPs can be used for each student group to be compared. For instance, MGPs can be calculated for specific student groups in a given subject area. Using either gain scores (as in Figure 2) or MGPs, look for similar rates of growth for each student group (or possibly for higher rates of growth for the lower-performing group).

Should error bands be included when reporting student growth data to the public?

Because aggregated student growth data can be imprecise, error bands should be reported. For MGPs and average gain scores, error bands can be based on the standard error. One method for calculating the standard error of a growth average is to first calculate the standard deviation of the student growth measures (SGPs or gain scores) and then divide the standard deviation by the square root of N (the number of students included in the calculation of the MGP or average gain score). As the number of students increases, the width of the error band decreases.

When comparing student growth across schools, should adjustments be made for school poverty and demographics?

Neither MGPs nor average gain scores account for differences across schools in sociodemographic factors that are typically related to academic growth. MGPs and average gain scores can be compared across schools, but one must bear in mind that differences across schools could reflect differences in student poverty or other academic risk factors rather than differences in instructional effectiveness. For this reason, educational researchers often use statistical methods, such as a regression approach, to adjust school growth comparisons for sociodemographic factors.⁸

Conclusion

Administrators (as well as parents and teachers) care about more than how students perform in a single year. Knowing how much students have learned from one grade to the next and how much they can be expected to learn in the future is valuable information. The growth models used as part of ACT Aspire reporting are powerful tools administrators can use to understand and monitor their students' academic progress over time. ■

Notes

- 1 Robert L. Smith and Wendy M. Yen, "Models for Evaluating Grade-to-Grade Growth," in *Longitudinal and Value-Added Modeling of Student Performance*, ed. R. W. Lissitz (Maple Grove, MN: JAM Press, 2006), 82–94.
- 2 For a description of each type of growth model, see Katherine E. Castellano and Andrew D. Ho, *A Practitioner's Guide to Growth Models* (Washington, DC: Council of Chief State School Officers, 2013), <http://www.ccsso.org/Documents/2013GrowthModels.pdf>.
- 3 More detail about the methodology used to calculate the student growth measures can be found in ACT, *ACT Aspire Technical Bulletin #2* (Iowa City, IA: ACT, 2014), http://www.discoveractaspire.org/pdf/2014_ACT-AspireTechnicalBulletin2.pdf.
- 4 The ACT Readiness Benchmarks also help to support growth-to-standards models that determine if students are making sufficient progress toward a performance standard (such as the ACT Readiness Benchmarks that are part of ACT Aspire). In the graph below, the growth-to-standards model is applied to a fictitious fourth-grade student (John) who took ACT Aspire in grades 3 and 4.
- 5 Table 1 provides the standard deviations of gain scores for individual students, not for schools. The standard deviations of mean gain scores of schools would be smaller than those presented in Table 1.
- 6 Some districts or states opt to use median growth percentiles. Recent research suggests that the mean growth percentiles are preferable due to efficiency, alignment between the mean SGPs and their expected values, and their greater robustness to scale transformations. See Katherine E. Castellano and Andrew D. Ho, "Practical Differences Among Aggregate-Level Conditional Status Metrics: From Median Student Growth Percentiles to Value-Added Models," *Journal of Educational and Behavioral Statistics* 40, no. 1 (2015), 35–68.
- 7 Elena K. Diaz-Bilello and Derek C. Briggs, Using Student Growth Percentiles for Educator Evaluations at the Teacher Level: Key Issues and Technical Considerations for School Districts in Colorado (Boulder, CO: Center for Assessment & Center for Assessment, Design, and Evaluation, 2014), <http://www.cde.state.co.us/educatoreffectiveness/usingstudentgrowthpercentilesforee>.
- 8 Derek Briggs, Ruhan Kizil, and Nathan Dadey, "Adjusting Mean Student Growth Percentiles for Classroom Composition," in *Evaluating Technical Issues with Student Growth Percentiles as Part of Georgia's Teacher and Leader Effectiveness Systems: An Overview of Georgia Student Growth Model Research*, ed. Scott Marion (Atlanta, GA: Georgia Department of Education Center for Assessment, 2014), <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Documents/Marion%202014%20Overview.pdf>.

John's score is below the fourth-grade ACT Readiness Benchmark in mathematics, and his goal is to become on target for college readiness by seventh grade. At each future grade level, one can determine if he is growing enough to reach his goal. The ACT Readiness Benchmarks for each grade level are represented by the points on the red line, John's scores are represented by the solid black squares, and John's goals are