

**The Relationship between Adequate Growth Percentiles  
and Obtained Proficiency Levels**

**Accountability & Data Analysis Unit**

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**cde**

**COLORADO DEPARTMENT of EDUCATION**

## Overview

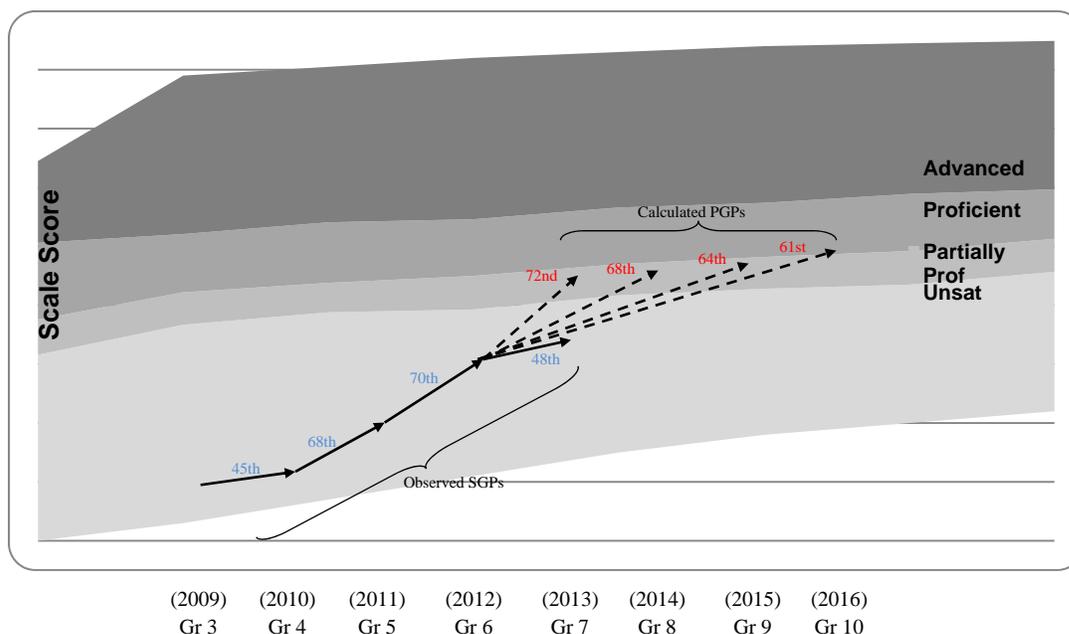
Under the Colorado Growth Model (CGM), an individual student's academic progress is expressed as a growth percentile, which describes the student's progress relative to other students at the same grade level with similar score histories. Using these observed student score trajectories, the CGM can also calculate forward-looking projections that quantify how much growth a student would need in order to reach a benchmark scale score over differing time-frames. For TCAP, CDE condenses these growth projections into a single adequate growth percentile (AGP) that indicates how much growth a student would need to reach or maintain proficiency within three years or by 10<sup>th</sup> grade, whichever comes first. By comparing a student's growth percentile for the current year to his or her AGP, it is possible to see whether a student is on track to reach this target.

## Calculating Projected Growth Percentiles

Based on the benchmark score and time-frame that have been established for TCAP, the growth model calculates a series of projected growth percentiles (PGPs or projections) for each student. This series of calculations projects a student's growth from the prior year of enrollment, through the current year, and on to each subsequent year within the specified timeframe. With the inclusion of the current year projection, the series of calculations for an individual student may include up to four projections. Once a student reaches 8<sup>th</sup> grade, and the time horizon falls below three-years, the number of projections decreases.

Figure 1 below illustrates what the series of projected growth percentiles might look like for a 7<sup>th</sup> grader who tested in 2013. The graphic traces the student's scale scores and observed growth percentiles over prior years, and shows a series of possible growth trajectories that would put the student on track to proficiency. The different trajectories are based on the distinct projection calculations, each of which represents the growth percentile that the student must achieve in order to reach proficiency by a designated point in the future. The projections and the slopes of the trajectories vary depending on the length of time the student has to reach the target. To stay on a trajectory towards proficiency, the student must reach the growth percentile indicated by the projection in the current year and maintain it across each intervening year. For the student in this example, the observed growth percentile for the current year is not sufficient to match any of the trajectories that would lead toward proficiency.

Figure 1. Calculating Target Student Growth Percentiles



### Determining a Student's Final AGP

For accountability and other reporting purposes, CDE selects a single value from the series of projections calculated for each student to serve as an overall representation of the growth necessary for that student to reach or maintain proficiency. This single value is the adequate growth target or AGP. How the AGP target is chosen differs depending on the student's performance on the test taken the year immediately prior to the current test. CDE divides students into two categories, Catch-Up and Keep-Up. The Catch-Up category includes students who scored below the proficiency benchmark in the prior year, and the Keep-Up category includes students who scored at or above the proficiency benchmark in the prior year.

For students in the Catch-Up category, CDE selects the projection with the *lowest* calculated value as the target for getting that student on track to proficiency. This is the minimum growth percentile that the student will need to achieve in order to score at the proficient level *at least once within the specified timeframe*. For students in the Keep-Up category, CDE selects the *highest* value from the series of calculated projections as the target for ensuring that the student is on track to maintain proficiency. This is the growth percentile that the student will need to achieve in order to score at the proficient level *in every year within the specified timeframe*.

Figure 2 below provides an illustration of CDE's process for selecting the final AGP for a student in the Catch-Up category. In this example, 2013 serves as the current year. The figure shows that the student scored at the unsatisfactory or partially-proficient level on the TCAP assessment in the prior year, and that the student's observed growth percentile (SGP) for 2013 was 48. The PGP for 2013, which is the growth percentile that would have been adequate for the student to have reached proficiency in the current year, was 72. This target decreases as the time-horizon is extended toward the three-year limit. The calculated PGP for 2014, which would have put the student on track to reach proficiency one year in the future, was 68. For 2015, or two years into the future, the PGP was calculated at 64, and for 2016 it was calculated to be 61. As described above, the final AGP selected for this Catch-Up student would be 61, which is the lowest value in the series of projected growth percentiles. The same process would be used to determine the final AGP for a Keep-Up student, only the highest value would be chosen.

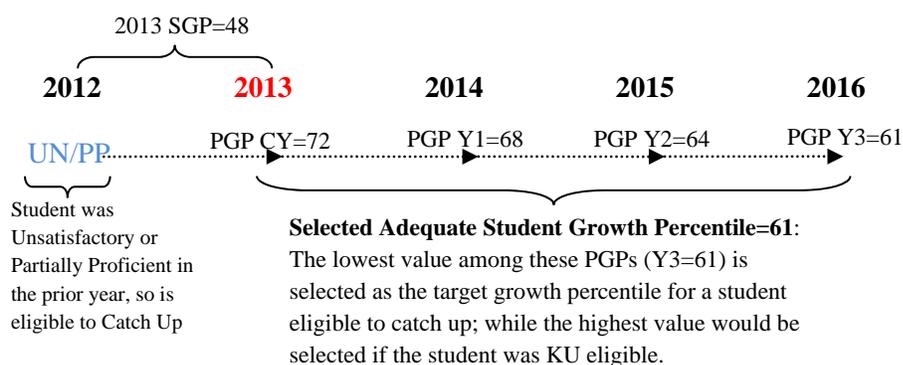


Figure 2: Selecting a Student's Adequate Growth Percentile

### Accuracy of Catch-Up and Keep-Up Metrics

CDE compares students' observed growth percentiles (SGPs) with their final AGPs to generate metrics showing the percentage of students who are on track to Catch-Up and the percentage that are on track to Keep-Up. In the Catch-Up category, students are considered to be on track to reach the proficiency benchmark if their SGPs for the current year meet or exceed their AGPs. By default, students in the Catch-Up category who score at the

proficient or advanced level in the current year are also considered to be on track to reach proficiency. Conversely, students who do not score at the proficient or advanced level in the current year and whose SGPs are lower than their AGPs are considered not to be on track to catch up. Similar logic holds for students in the Keep-Up category. Those who score at the proficient or advanced level in the current year and who have SGPs that meet or exceed their AGPs are considered to be on track to maintain proficiency. Those who score below the proficiency cut-point, or who have SGPs that fall below their final AGPs are not considered to be on track to keep up.

**Method.** To provide a sense of the accuracy of the growth model projections, CDE tracked four cohorts of students across four years of TCAP testing, comparing Catch-Up and Keep-Up projections from the first year with proficiency level outcomes over the four year period. The cohorts included students who tested at grades 4, 5, 6, and 7 during the 2010 TCAP administration who had also participated in the 2009 administration and in all subsequent administrations through 2013. Only students who followed the normal grade-level progression and who had growth data for all four years were included in the analysis. The table below shows the grade-level progressions for the cohorts included in the analysis.

2010	2011	2012	2013
4	5	6	7
5	6	7	8
6	7	8	9
7	8	9	10

Table 1. Grade by year for included student cohorts

**Results.** Following the methodology described above, we categorized the students included in the analysis as either Catch-Up or Keep-Up based on their performance on the 2009 TCAP assessment. Within these categories, we then flagged students as on track either to reach or to maintain proficiency based on AGP determinations made using the 2010 growth calculations. For students in the Catch-Up category who were flagged as being on track to reach proficiency, we then looked at TCAP results to see whether they did indeed reach proficiency at any point between 2010 and 2013. For students in the Keep-Up category, we looked to see whether they maintained proficiency across all years from 2010 to 2013.

Table 2 below summarizes the results of the analysis for each TCAP content area. These results include students across all grade levels represented in the original cohorts.

Table 2. Accuracy of Catch-up and Keep-Up Projections			# Correct	Total	% Correct	
Reading 2010- 2013	Not on track to Catch Up	(CU=0)	25,230	32,745	77%	77%
	On track to Catch Up	(CU=1)	16,729	21,657	77%	
	Not on track to Keep Up	(KU=0)	17,165	28,775	60%	83%
	On track to Keep Up	(KU=1)	96,352	108,367	89%	
Math 2010- 2013	Not on track to Catch Up	(CU=0)	43,916	48,349	91%	89%
	On track to Catch Up	(CU=1)	10,015	12,348	81%	
	Not on track to Keep Up	(KU=0)	37,619	54,453	69%	76%
	On track to Keep Up	(KU=1)	63,207	77,923	81%	
Writing 2010- 2013	Not on track to Catch Up	(CU=0)	41,432	55,896	74%	77%
	On track to Catch Up	(CU=1)	20,600	24,537	84%	
	Not on track to Keep Up	(KU=0)	21,985	33,559	66%	79%
	On track to Keep Up	(KU=1)	65,289	77,101	85%	

For the Catch-Up category in Reading, the 2010 predictions of whether or not students were on track were accurate in 77% of cases overall. The rates of accuracy were the same for students regardless of whether they were projected not to be on track or were projected to be on track to reach proficiency. In the Keep-Up category for Reading, projections of whether students were on track were accurate in 83% of cases overall. Here there were significant differences in the accuracy rates depending on whether students were projected to fall below proficiency or were projected to remain proficient. In the former case, the projections were accurate 60% of the time. In the latter case, they were accurate 89% of the time.

For Math, the 2010 predictions for Catch-Up students were accurate 89% of the time. Within the Catch-Up category, the predictions for students determined not to be on track were accurate in 91% of cases. For students projected to catch up, the accuracy rate was 81%. In the Keep-Up category for Math, the predictions were accurate in 76% of cases overall. For students determined not to be on track to keep up, predictions were accurate in 69% of cases. For students determined to be on track, predictions were accurate in 81% of cases.

For writing, the 2010 predictions for Catch-Up students were accurate in 77% of cases overall. Within the Catch-Up category, the predictions for students determined not to be on track were accurate in 74% of cases. Predictions for students projected to catch up were accurate 84% of the time. In the Keep-Up category for Writing, the predictions were accurate in 79% of cases overall. For students determined not to be on track to keep up, predictions were accurate in 66% of cases. For students determined to be on track, predictions were accurate in 85% of cases.

**Discussion.** Across all the content areas and Catch-Up/Keep-Up categories, approximately 80% of the CGM on-track predictions turned out to be accurate. Although the projections were not accurate in 100% of cases, they ultimately do provide better information than if we were to have assumed that students would remain at their original proficiency level (this was true for only 67% of the students included in the analysis). Having this information about the trajectories that students are likely to follow in the future provides stakeholders with valuable context for interpreting the growth percentiles that students obtain each year. In the immediate term, the information allows stakeholders to determine whether students are or are not on track to reach existing proficiency targets within established time-frames. In the longer term, it can play a role in reflecting on the adequacy of the targets and time-frames themselves.

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