

Review of  
Student Growth Models  
Used by States

Kimberly O'Malley, Ph.D.

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PEARSON

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## Review of Student Growth Models Used by States

**Summary:** After Secretary Spellings announced the United States Department of Education (USDE) growth pilot program in 2005, nine states have been approved to use student growth in their calculations of Adequate Yearly Progress (AYP):

- |             |             |                   |
|-------------|-------------|-------------------|
| 1. Alaska   | 4. Delaware | 7. North Carolina |
| 2. Arizona  | 5. Florida  | 8. Ohio           |
| 3. Arkansas | 6. Iowa     | 9. Tennessee      |

Seven of the nine states were approved to use transparent growth models, growth models similar to the Reaching the Standard (RTS) model which is being evaluated in Texas' growth pilot study. Two of the states (Ohio and Tennessee) were approved to use complex growth models.

California does not currently use student growth in their state or federal accountability systems, though California does include a measure of cohort growth as part of their Academic Performance Index (API) system. A summary of the growth models approved for use in the nine states listed above and the cohort growth model California uses are summarized below. In addition, a description of the way in which all ten of these states include growth information in their AYP calculations is provided.

<b>Alaska</b>
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**Growth Model Description:** Alaska administers annual assessments in grades 3-10 in the content areas of reading, writing (language arts), and mathematics. Alaska also administers annual assessments in grades 4, 8, and 10 in science. In Alaska, a score of 300 on the statewide assessment defines proficiency. Scores on these state assessments are not on vertical scales. For students with scores below 300, growth targets are set. The targets depend on how far a student's score is below 300, the student's grade, and the number of years a student has been in the local education agency (LEA). Alaska defines a student who is below proficient as on track if the student's score decreases the original gap by 25% each year (for grades 4-9) and 33% of the original gap each year (for grade 10) between the initial score and the proficiency score later (four years for grades 4-9 and three years for grade 10). Growth targets are reset for students who move to a new LEA. As an example, a student who starts in an LEA in grade 3 and scores below 300 will have a gap between the grade 3 score and a score of 300. For this student, the following growth targets apply:

- **Grade 4:** the student's scale score must be at least as high as his/her scale score in 3<sup>rd</sup> grade, plus one-fourth of the gap.
- **Grade 5:** the student's scale score must be at least as high as his/her scale score in 4<sup>th</sup> grade, plus one-fourth of the gap defined in grade 3.
- **Grade 6:** the student's scale score in must be at least as high as his/her scale score in 5<sup>th</sup> grade, plus one-fourth of the gap defined in grade 3.
- **Grade 7:** the student's scale score is expected to be at proficiency, or 300.

**Student Growth in AYP Calculations:** The Alaska AYP growth model first evaluates schools and subgroups according to the status model (i.e., proportion of students meeting proficiency). If the school or subgroup meets the proficiency target, then the school or subgroup meets AYP. The Alaska AYP growth model then evaluates schools and subgroups for AYP using growth. In this second evaluation, the proportion of students in schools or subgroups who are either proficient or who are on track to be proficient according to the growth model are then compared against the proficiency targets. Schools or subgroups that meet these targets taking growth into account meet the performance requirements for the AYP calculations.

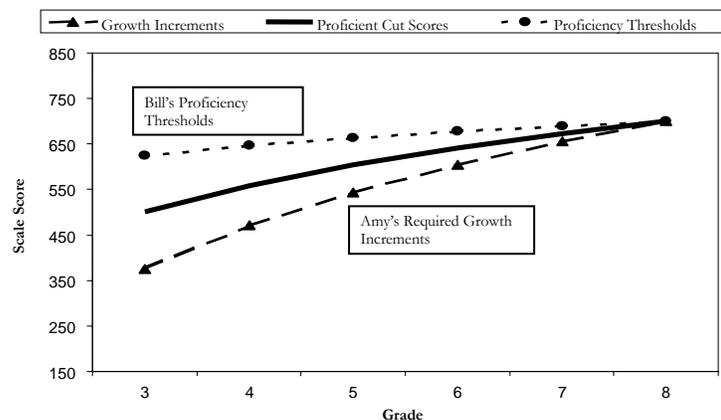
## Arizona

**Growth Model Description:** Arizona tests students annually in reading and mathematics in grades 3-8 and 10. The statewide test in Arizona has a vertical scale in grades 3-8 reading and mathematics, and these grades and subjects are used in the growth model. In Arizona, the growth model includes growth targets and predicted scores. The growth target part of the model requires that students reach proficiency within three years or by the eighth grade, whichever comes first. To calculate student growth targets, Arizona subtracts a student's current year scale score from the scale score for proficiency three grades later and divides by the number of remaining grades. As an example (example adapted from Arizona's proposal at <http://www.ed.gov/admins/lead/account/growthmodel/az/azgmp.doc>) suppose a student in 2005 scores 469 on the 6<sup>th</sup> grade reading test. The passing score on the 8<sup>th</sup> grade reading test is 499. The student's reading score must improve 15 points each year— $(499-469)/(8-6) = 30/2 = 15$ —for her/him to reach proficiency by 8<sup>th</sup> grade. A predicted score is calculated for each student as well. Regression analyses are used to create the prediction equation using current and previous year scale scores. Arizona creates a confidence interval around students' predicted scores and compares the lower bound of the interval to the growth target to determine whether students have made sufficient growth in a year.

**Student Growth in AYP Calculations:** For schools and subgroups to meet AYP proficiency targets, the number of students meeting growth targets is added to the number of students who are proficient but who did not meet growth targets. Then, this sum is divided by all students in the analysis. This proportion is compared to the proficiency target for the year. If the value meets or exceeds the target, that school or subgroup meets the AYP performance requirements.

## Arkansas

**Growth Model Description:** Arkansas administers literacy and mathematics exams in grades 3-8, and scores on these exams are on vertical scales. Arkansas also administers a literacy exam in grade 11 and an algebra I and geometry end-of-course exam. Arkansas implements nonlinear growth trajectories for students in grades 4-8 with the expectation that students will reach proficiency by eighth grade. Growth increments required to reach proficiency vary across the years as shown by the graph below (graph taken from Arkansas proposal at <http://www.ed.gov/admins/lead/account/growthmodel/ar/argmp.doc>).



**Student Growth in AYP Calculations:** In AYP calculations, Arkansas uses growth in addition to status and safe harbor provisions. A district, school, or subgroup can meet safe harbor if the proportion of students in that school or subgroup scoring below proficient decreases by at least 10% from the prior year. In AYP calculations, a school or district is expected to meet the proficiency target that year based on the status model, the safe harbor model provision, or the target for individual growth. For example, under the Arkansas status model, the proficiency target for grades K-5 mathematics is that 64.08% of the students should be proficient in 2007-2008 in each school and subgroup within a school. Under the proposed growth model, 64.08% of the students in these grades in a school and in each subgroup in the school must make assessment gains in mathematics for the school to be making AYP for 2007-08, or the percentages of such students must meet the safe harbor standard. Required growth is calculated for all students, including those currently below proficient and for those at proficient or above.

**Delaware**

**Growth Model Description:** Delaware tests students in reading and mathematics in grades 2-10, writing in grade 2, and science and social studies in four grades each (grades 4, 6, 8, and 11). Scores on these assessments are not on vertical scales. Delaware implements a value tables approach to growth-based accountability. Each student in a subgroup earns points for moving across proficiency levels. The number of points increases as students move from levels below proficiency to levels at proficiency. Delaware has five proficiency levels. In the growth model, the two lowest levels are subdivided into two groups each. For example, if a student scored at Level 1A in Year 1 and Level 1B in Year 2, that result would earn the student’s school a certain number of points (e.g., 150 according to the table below). The points in the value tables were set by committee. An example of a value table used in Delaware (taken from a slide show at link [http://www.ccsso.org/content/PDFs/DE\\_Model\\_2006\\_032706.ppt](http://www.ccsso.org/content/PDFs/DE_Model_2006_032706.ppt) #392,7,Slide 7) is shown below. As shown in the table, the maximum average score for a group of students is 300, which is equivalent to 100% proficient. An average score of 300 would indicate that all students are meeting the standards.

**Value Table for Grades 4-10**

Year 1 Level Grades 3-10	Year 2 Level Grades 4 - 10						
	Level 1A	Level 1B	Level 2A	Level 2B	Level 3	Level 4	Level 5
Level 1A	25	150	225	250	300	300	300
Level 1B	25	75	175	225	300	300	300
Level 2A	0	25	125	200	300	300	300
Level 2B	0	0	50	125	300	300	300
Level 3	0	0	25	100	300	300	300
Level 4	0	0	0	50	300	300	300
Level 5	0	0	0	0	300	300	300

**Student Growth in AYP Calculations:** In Delaware, a school or subgroup meets AYP if that school or subgroup meets three conditions:

1. proficiency targets in English language arts and mathematics or meets growth targets
2. meets participation rates
3. meets other academic indicator requirements

The growth target for a school or subgroup in any one year is calculated as the proficiency target times 300. For example in 2007 the proficiency target for English language arts was 68%. The growth target

was then calculated as 68% of 300 or 204. A school or subgroup needed to have an average growth value of at least 204 to meet growth expectations.

**Florida**

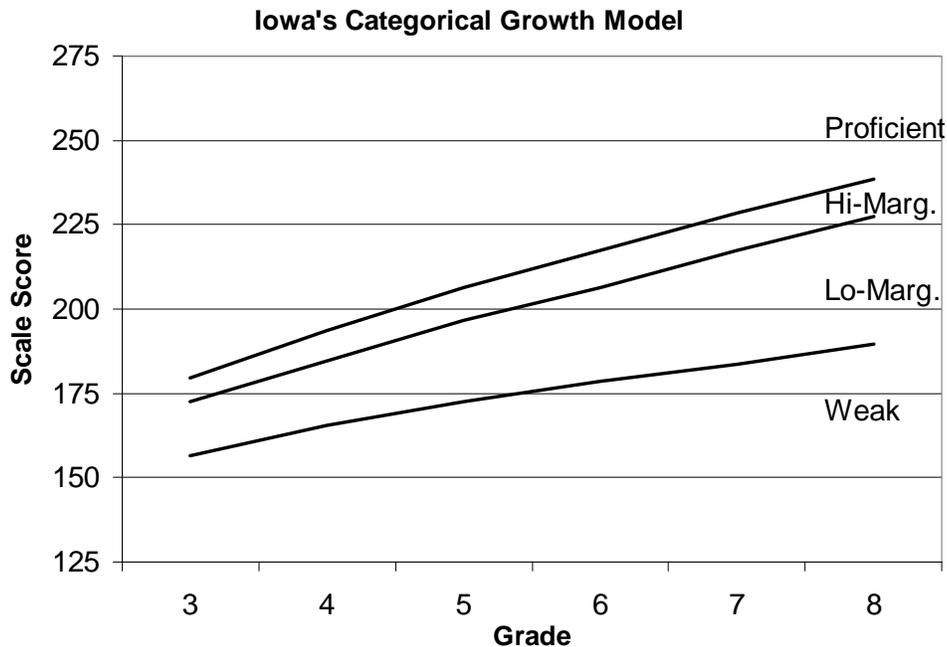
**Growth Model Description:** Florida administers its state assessment in grades 3-11. The test contains criterion-referenced tests (measuring selected benchmarks in mathematics, reading, science, and writing) and norm-referenced tests in reading and mathematics (measuring individual student performance against national norms). Florida’s state assessment is reported on a vertical scale from grades 3 to 10 with scale values ranging from 0 to 3000. Florida expects students who are not proficient to reach proficiency in three years. Growth targets are set by taking the difference between the proficiency score three years later and the student’s initial test score. Students are expected to score at least a third of that difference greater each year. For example, the amount of improvement in terms of decreasing the score difference between the initial score and the proficiency point three years in the future is shown in the table (table information taken from Florida’s proposal at link <http://www.ed.gov/admins/lead/account/growthmodel/fl/flrevisions2006.doc>) below.

Year In State-Tested Grade	Decrease From Baseline Assessment In Performance Discrepancy
1	33% of original gap
2	66% of original gap
3	Student must be proficient

**Student Growth in AYP Calculations:** Under Florida’s growth proposal, a subgroup will have AYP calculated using the status, safe harbor criteria, and a growth model calculation. Each subgroup will be evaluated for AYP using all three calculations. A school or subgroup makes AYP if it meets the proficiency target that year based on the status model, satisfies the safe harbor model provision, or meets the target for individual growth.

**Iowa**

**Growth Model Description:** Iowa districts test all grade 3-8 students using the Iowa Tests of Basic Skills (ITBS) which has a vertical scale. Districts also test all grade 11 students using the Iowa Test of Educational Development (ITEDs). To set growth targets for non-proficient students, Iowa divides the below proficient scale score range for grades 3-8 into three categories and has established category boundaries on the scale score system for non-proficient students across grades. A student’s growth trajectory must cross a category boundary in order to be considered to have met growth expectations. In their USDE growth proposal, Iowa decided to label the meeting of growth expectations as Adequate Yearly Growth. Adequate Yearly Growth is defined as the score improvement that non-proficient students are expected to make from one year to the next. The figure below (taken from Iowa’s proposal at link <http://www.ed.gov/admins/lead/account/growthmodel/ia/iagmp07.doc>) shows the category boundaries for non-proficient students across grades. A student’s growth trajectory must cross a category boundary in order to be considered for Adequate Yearly Growth.



**Student Growth in AYP Calculations:** In AYP calculations, Iowa adds the number of students who meet proficiency and those who meet growth targets and divides by all students in the analysis. The proportion is compared with the proficiency target for that year.

**North Carolina**

**Growth Model Description:** At the earlier grades, North Carolina tests students in reading and mathematics in grades 3-8, in science in grades 5 and 8, in writing in grades 4 and 7, and in computer skills in grade 8. At the upper grades, students enrolled in the following courses are required to take the North Carolina end-of-course assessments: Algebra I, Algebra II, Biology, Chemistry, English I, Geometry, Physical Science, Physics, Civics and Economics, and U.S. History. North Carolina has a vertical scale in the grades 3-8 assessments, but it does not use that vertical scale in its growth model. One of the reasons that North Carolina decided not to use the vertical scale in its growth model is that not all assessments have a vertical scale (e.g., the end-of-course assessments are not on the vertical scale). To set student growth targets, North Carolina puts students' scores on a common scale (using standard deviation units). Then, students who are not proficient are expected to lower by 25% each year the difference between the first test and the proficiency standard four years later. North Carolina also gives a third grade pretest and uses that pretest in growth calculations. For example, a student in grade 3 who scores below proficiency on the pretest is expected to score 25% closer to the proficiency score at grade 6 by the end of grade 3. The North Carolina grades and tests used to define growth and the percent of score difference expected to be closed each year is presented in the table (taken from North Carolina's proposal at link <http://www.ed.gov/admins/lead/account/growthmodel/nc/ncgmp.doc>) below.

Grade Of First Enrollment	Test Used As The Basis For Prediction	Test Used As Target For Proficiency	Years In Trajectory	Percent Of Difference Closed Per Year
3	3 <sup>rd</sup> grade pretest	6 <sup>th</sup> grade EOG	4	25%
4	3 <sup>rd</sup> grade EOG	7 <sup>th</sup> grade EOG	4	25%
5	4 <sup>th</sup> grade EOG	8 <sup>th</sup> grade EOG	4	25%
6	5 <sup>th</sup> grade EOG	Algebra I or English I EOC	4	25%
7	6 <sup>th</sup> grade EOG	Algebra I or English I EOC	4	25%
8	7 <sup>th</sup> grade EOG	Algebra I or English I EOC	3	33%

**Student Growth in AYP Calculations:** In its AYP calculations, North Carolina adds the number of students who score at or above proficiency to those students (below proficiency) meeting growth targets and divides by the number of students in the analysis. The proportion is compared with the proficiency target for that year.

#### Ohio

**Growth Model Description:** Ohio tests lower grade level students in reading and mathematics in grades 3-8, writing grades 4 and 7, science in grades 5 and 8, and social studies in grades 5 and 8. Ohio also tests grade 10 students in reading, mathematics, writing, science, and social studies. Ohio works with Dr. Bill Sanders to calculate student growth. Ohio implements a statistically complex projection model such that students are expected to have projected scores at least as high as the proficiency standard by the grade beyond the configuration of the school in which the student first was tested, or within four years, whichever comes first. For example, a third grade student in a K-8 school must be on track to meet the proficiency targets by the end of 7<sup>th</sup> grade. All scores for a student are used to project that student's score in one subject. For example, a student's projected score in mathematics will be computed from that student's prior mathematics, reading, science, and social studies scores.

**Student Growth in AYP Calculations:** Ohio evaluates projected scores separately for reading/language arts and mathematics. When determining whether a school, district, or subgroup has met the annual proficiency target in reading/language arts, Ohio adds the number of students who score at least proficient and the number who meet projection targets (but who score below proficient) and divides by the total number of students. The resulting proportion is compared with the proficiency target for that year in the AYP calculations.

#### Tennessee

**Growth Model Description:** Tennessee tests students in grades 3-8 in reading/language arts, mathematics, science, and social studies. In the upper grades, Tennessee assesses students in end-of-course assessments, including Algebra I, Mathematics Foundations II, English I, English II, and Biology I, Physics, and US History. Students must pass Algebra I, English II, and Biology I in order to earn a high school diploma. Tennessee works with Dr. Bill Sanders and implements a statistically complex projection model such that students are projected to score at least as high as the proficiency standard three years in the future. The growth model applies to students in grades 3-8. For example, a third grade student must be projected to be at or above proficiency in grade 6 to meet the growth target in

Tennessee's AYP calculations. Tennessee's criterion referenced assessments in grades 3-8 are on a vertical scale, though the vertical scale is not used in the projection calculations. One of the reasons Tennessee does not use its vertical scale in the growth model is that not all assessments have an underlying vertical scale. To compare scores for purposes of growth, Tennessee transforms all assessment scores to a normal curve equivalent scale.

**Student Growth in AYP Calculations:** Schools and subgroups in Tennessee have two options for meeting elementary and middle school AYP proficiency targets. The first way is to have the percent of students scoring at proficiency or higher at least as great as the proficiency target for Tennessee that year. The second option is to have the percent of students with scores in both reading and mathematics projected three years later as proficient or higher at least as high as the proficiency target for that year. One feature of the second option is that a student who scores at least proficient in the current year but has a projected score three years later that is below proficient will not add to the numerator of the percent of students compared with the proficiency target for that year.

<b>California</b>
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**Growth Model Description:** California tests students in the following grades and subjects:

- English language arts - grades 2-11
- Mathematics
  - grades 2-6 - standards tests
  - grade 7 - math test or Algebra I test
  - grades 8-11
    - general mathematics (grades 8-9 only)
    - Algebra I
    - Geometry
    - Algebra II
    - Integrated mathematics 1
    - Integrated mathematics 2
    - Integrated mathematics 3
    - Summative high school math (grades 9-11 only)
- Science
  - grades 5, 8 and 10 - standards tests
  - End-of-course tests
    - Biology/Life Science
    - Chemistry
    - Earth Sciences
    - Physics
    - Integrated/Coordinated science 1
    - Integrated/Coordinated science 2
    - Integrated/Coordinated science 3
    - Integrated/Coordinated science 4
- History/Social Science
  - Grades 8 and 10 - standards tests
  - End-of-course tests
    - World History, Culture and Geography

California uses the Academic Performance Index (API) in its state and federal accountability systems. The API is an index system that has values ranging from 200-1000, with statewide API performance target for all schools at 800. The API is determined from testing results from California's Standardized Testing and Reporting (STAR) Program and the California High School Exit Examination (CAHSEE). The API value indicates a school's or LEA's performance level. A school's growth is measured by how much it is moving toward or past the goal of 800. A school's base API is subtracted from the next year's

Growth API to determine how much the school grew in a year. The API system does not include a measure of student growth. Instead, the API looks at growth in scores at the school and LEA level.

**Student Growth in AYP Calculations:** Growth at the student level is not part of California's AYP calculations. California uses the percent of students at or above proficient in AYP calculations. California uses the API in AYP calculations as an additional academic indicator. Progress on the API for purposes of AYP is defined as demonstrating a gain of one or more API points or meeting the annual API status target.