Arkansas Alignment Study

Arkansas Department of Education
Division of Elementary and Secondary Education

Why did we do an alignment study?

» Requirement for federal accountability - have an assessment that aligns to the state's academic standards in literacy, math, and science

» Peer Review - process by which the federal government approves a state's assessment for grades 3-10

» Alignment Study - process used to determine whether the questions on the assessment are aligned to the state's academic standards in each grade level

Alignment has been characterized as… "the degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide the system toward students learning what they are expected to know and do" (Webb 1997; 2006). Page 4

Executive Summary

» ACS Ventures lead the independent alignment study and compiled a report.

» Study design was created with three key questions:

  ◊ What cognitive processing [Depth of Knowledge (DOK)] is expected?

  ◊ How do Performance Level Descriptors (PLDs), the full range of knowledge and skills on ACT Aspire, reflect Arkansas standards?

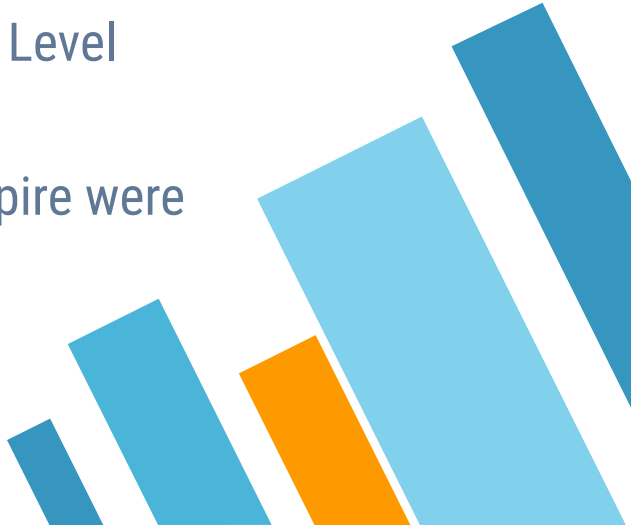 ◊ How does ACT Aspire measure knowledge and skills within Arkansas standards?

"Panels largely found alignment of the PLD elements to the Arkansas content standards, but with a few notable exceptions…" Page 3

Introduction

» 89 Arkansas educators completed the study over four days.

  ◊ 7 ELA Panels of 6 educators each - one per grade 3-EHS

  ◊ 4 Math Panels of 6 educators each - one per grade band: 3-4, 5-6, 7-8, 9-10 (EHS)

  ◊ 4 Science Panels of 6 educators each - one per grade band: 3-4, 5-6, 7-8, 9-10 (EHS)

» Panelists reviewed standards, ACT Aspire Performance Level Descriptors, and test forms.

» Panelists determined whether the questions on ACT Aspire were aligned to the Arkansas State Standards.

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Process for Each Task

1. Each task was started with panelists reviewing a few standards/PLDs/items collectively and discussing the key features that they used to complete their ratings.

2. Once this was completed, panelists rated the remaining items independently.

3. After panelists had a chance to complete their independent ratings, the panels discussed their ratings together to reach a group consensus on the alignment.

4. It was not necessary that every panelist agree 100% on the overall consensus rating; instead it was designed to reflect the majority opinion of the group.

Task 1- Standards Review

Key Question: *What level of cognitive processing is expected for students at each grade level for each standard?*

» Panelists determined the DOK level or range required by each of the Arkansas standards for their assigned grade and subject.
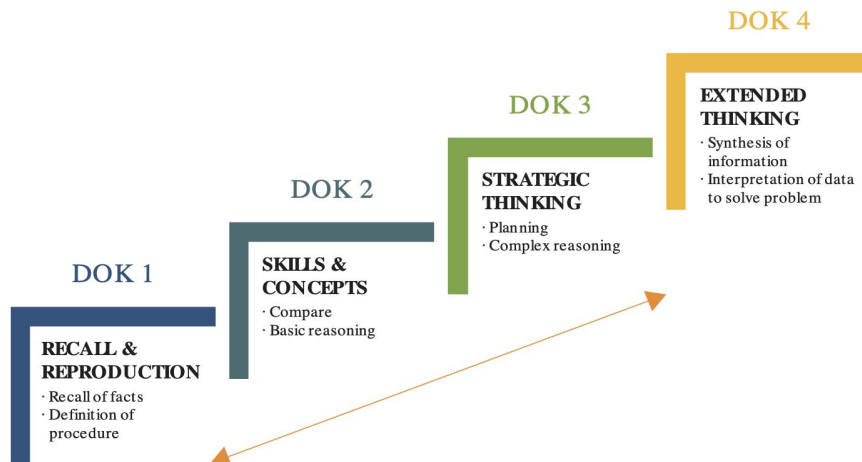
Task 2 - Performance Level Descriptors (PLDs) Alignment

Key Question: *How do the ACT Aspire PLDs reflect the knowledge and skills defined within the Arkansas standards AND demonstrate a level of cognitive complexity consistent with the level deemed appropriate/necessary for that standard(s)?*

Panelists determined:

» if the skills outlined in the READY category were found in the Arkansas State Standards for their grade and subject

AND

» the DOK level of each PLD

Pages 9-10

3rd Grade Mathematics — Performance Level Descriptors

Reporting Categories	Needs Support	Close	Ready	Exceeding
Operations and Algebraic Thinking Focus is on multiplication and division strategies and then solving problems involving the four operations.	*A student performing at the Needs Support level:* • performs multiplication within 100 using repeated addition only. • creates an expression to represent a verbal description of a mathematical situation. • recognizes that repeated addition corresponds to multiplication.	*A student performing at the Close level:* • represents word problems using expressions and equations involving single-step multiplication and division with whole numbers within 100. • performs division with no remainder within 100 using "fair-sharing" only. • translates a contextual description into an expression or equation that may be used to answer questions in the context. • recognizes that repeated subtraction corresponds to division.	*A student performing at the Ready level:* • extracts the relevant information to solve a multi-step contextual problem involving multiplication and division of numbers within 100. • fluently multiplies and divides within 100. • makes sense of a problem presented in a context and looks for entry points to a solution.	*A student performing at the Exceeding level:* • recognizes a contextual situation that matches an expression or equation. • represents contextual situation with equations or expressions involving operations with whole numbers within 100. • explains the properties of operations, including closure for subsets of the set of whole numbers. • explores and/or uses the relationship between multiplication and division to solve division problems within 100. • selects the relevant information in a given contextual situation and explains the correspondence between expressions and equations and the context.
Number and Operations in Base Ten Focus is on place-value arithmetic.	*A student performing at the Needs Support level:* • uses place value understanding to round whole numbers to the nearest 10.	*A student performing at the Close level:* • uses place value understanding to round whole numbers to the nearest 100. • uses a number line model to determine relative location of a number with respect to two benchmark numbers. Example: is 59 closer to 0 or 100?...closer to 50 or 60?	*A student performing at the Ready level:* • uses place value understanding to add and subtract multiples of 10 or 100 to whole numbers within 1,000. • solves problems that involve using place value understanding to multiply one-digit numbers by multiples of 10.	*A student performing at the Exceeding level:* • fluently adds or subtracts within 1,000.
Number and Operations— Fractions Focus is on unit fractions and understanding fractions as numbers.	*A student performing at the Needs Support level:* • recognizes a fraction model of a fraction written as a/b. • recognizes that a number of objects that are in part of a group can be represented as a fraction of the total number of objects in the whole group.	*A student performing at the Close level:* • identifies a fraction that can be used to represent a ratio described in a context. • plots a fraction a/b on a number line that has b divisions per unit. • makes sense of quantities that are represented by fractions as part of a total number of objects.	*A student performing at the Ready level:* • writes a fraction to represent a ratio from a verbal description of a real-world situation. • plots a fraction a/b on a number line that has other than b divisions per unit. • decontextualizes rational quantities from a situation and considers the meaning of the parts of a fraction.	*A student performing at the Exceeding level:* • solves multi-step problems involving parts of a whole quantity with fractions as solutions. • compares two or more fractional values, including by using a number line to identify the position of each fraction. • uses quantitative reasoning to conceptualize a fraction a/b as a parts of size 1/b, with a and b both whole numbers.
Measurement and Data Focus is on one area with the aim of connecting it to addition and multiplication, and then looking at measurements and representing measurements in charts.	*A student performing at the Needs Support level:* • recognizes that calculations of elapsed time require a different procedure than calculations with base ten numbers. • performs direct measurements of time and length accurately, using standard units (seconds, minutes, hours, inches, feet, yards, centimeters, meters), within appropriate tolerances.	*A student performing at the Close level:* • uses appropriate types of units of measure for a given situation (e.g., yards and not kilograms for distance). • finds the area or perimeter of a square or rectangle. • measures times, lengths, or liquid volumes (milliliters, liters) and draws a picture or bar graph to organize the findings.	*A student performing at the Ready level:* • solves problems involving metric linear measures of polygons, including perimeters. • recognizes area as a measurable attribute of rectangles and squares that is measured in square units. • solves problems involving time. • determines appropriate units and tools needed to perform several direct measurements of lengths, areas, or liquid volumes, and organizes the findings in a data table or plots with an appropriate degree of precision.	*A student performing at the Exceeding level:* • solves word problems involving calculations of time and can identify and explain an error in an elapsed time calculation, including using an analog clock. • is thoughtful about the units of measure they choose, clearly communicates their mathematical thinking, and presents results of measurement problems in a line plot with accurately scaled units on the axes. • uses error analysis to critique the work of others.

Task 3: Item / Task Alignment

Key Question: How does the ACT Aspire test content measure the knowledge and skills defined within the Arkansas standards AND demonstrate a level of cognitive complexity consistent with the level deemed appropriate/necessary for that standard(s)?

Panelists reviewed 3 forms of the test for their grade/subject to determine:

» if the skills addressed in the questions on ACT Aspire were found in the Arkansas State Standards for their grade and subject

AND

» the DOK level of each question.

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Example - 6th Grade English

The following paragraphs may or may not be in the most logical order. Each paragraph is numbered in brackets, and question 7 will ask you to choose where Paragraph 4 should most logically be placed.

Bicycle Tour

[1]

After yesterday's smooth and easy 77-mile bike ride, we had high hopes for today's stretch of the annual cross-state bicycle tour. This day's ride, though, turned out to be a much different story.

[2]

We started out early, hoping to reach our next destination by nightfall. With 85 miles and 3,576 feet of elevation to cover, we knew we'd need a good start and a lot of energy to make it to our next destination. The route was gentle and tree shaded. We could hear the river, rushing past us, in its hurry to join the Mississippi still high after the previous week's storms.

[3]

About an hour into our ride, just as the heat and humidity were beginning to rise we left the riverside road and entered a large stretch of farm country.

The writer is considering replacing the highlighted transition word. Which of the following choices would provide a logical transition in the sentence? Drag the two best choices into the box.

unfortunately,

however,

therefore,

similarly,

Logical replacements for the highlighted word

English Language Arts

English Language Arts Results

» ACT Aspire contains a spread of DOK 1-3 questions.

Table 10. Percentage of ELA Items by DOK Level

Grade	DOK 1	DOK 2	DOK 3
3	28%	62%	10%
4	34%	50%	17%
5	7%	79%	15%
6	43%	55%	3%
7	33%	62%	4%
8	32%	54%	15%
EHS	31%	44%	24%

English Language Arts

» Average alignment to Arkansas standards by subject across the three test forms reviewed by panelists:

Reading		English		Writing	
Grade	Percent	Grade	Percent	Grade	Percent
3	77%	3	97%	3	100%
4	77%	4	90%	4	75%
5	88%	5	96%	5	75%
6	98%	6	100%	6	100%
7	99%	7	100%	7	100%
8	99%	8	100%	8	100%
EHS	100%	EHS	100%	EHS	100%

Pages 16 - 17
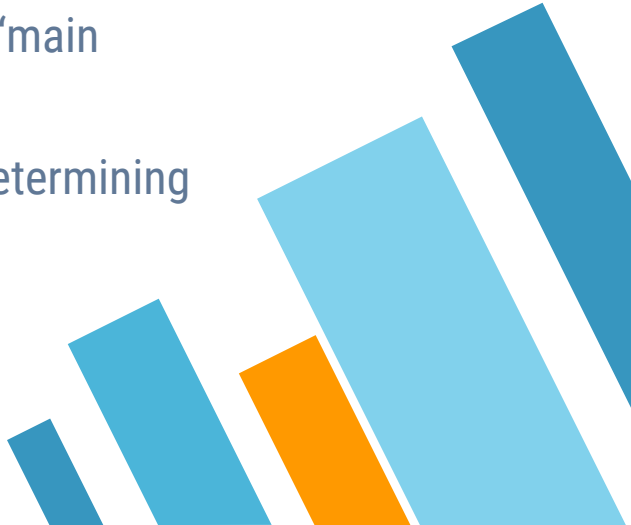
English Language Arts

» ACT Aspire contains a spread of DOK 1-3 questions.

» Average Alignment to AR Standards by Subject
   ◊ ELA - 94% alignment

» Work with ACT
   ◊ Consistent terminology within common stem patterns "main purpose," "main idea," and "central idea"

   ◊ ACT will share TC qualitative rubrics and process for determining text complexity.

Pages 13-22

Mathematics

Mathematics Results

» ACT Aspire contains a spread of DOK 1-3 questions.

Table 15. Percentage of Mathematics Items by DOK Level

Grade	DOK 1	DOK 2	DOK 3
3	28%	51%	21%
4	23%	57%	20%
5	53%	43%	4%
6	54%	36%	11%
7	17%	55%	28%
8	22%	61%	17%
EHS	17%	38%	44%

Mathematics Results
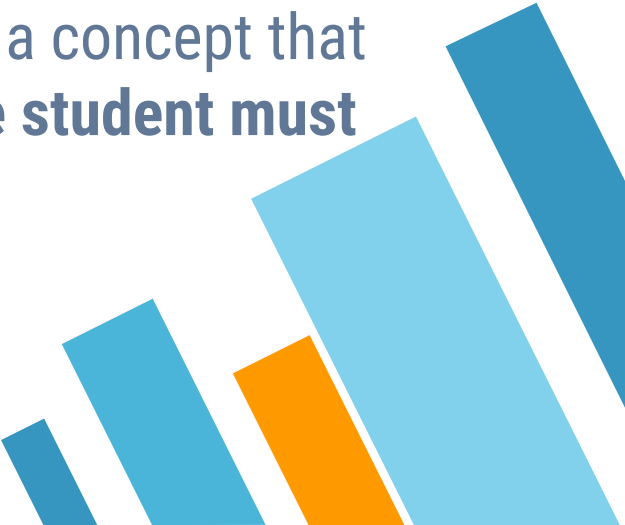
» Average alignment to Arkansas standards by subject across the three test forms reviewed by panelists:

Math		
Grade	Percent	Below
3	86%	12%
4	84%	10%
5	90%	10%
6	90%	10%
7	84%	16%
8	60%	40%
EHS	62%	28%

Mathematics

"Although measuring progress across grades occurs in all the subject tests, it can be illustrated most clearly by examining the design of the mathematics test. In each form, certain items contribute to Integrating Essential Skills (IES) scores. IES items are explicitly designed to elicit evidence about a concept that was **introduced in a previous year, but that the student must now apply in a more advanced context**."

ACT Aspire Summative Technical Manual 2019 version 6 section 2.1

Mathematics

Question: *What are the roles of intervention in mathematics teaching to support individual students in meeting grade-level goals?*

"Intervention should strengthen conceptual and procedural knowledge to close an existing gap so that students can move smoothly to and make connections with other mathematics...This approach to intervention leads to an emphasis on bigger ideas in mathematics **and their applications** so that important skills do not become trivial, isolated, or fragmented." (emphasis added)

Position Statement: Intervention, National Council of Teachers of Mathematics

Retrieved 8/22/19 from https://www.nctm.org/Standards-and-Positions/NCTM-Position-Statements/

Mathematics Summary

» ACT Aspire contains a spread of DOK 1-3 questions.

» Average Alignment to AR Standards by Subject

Grade specific - 79% alignment

Grade specific and including one grade below - 98% alignment

» Work with ACT

◊ A statistical study found that there was no adverse effect on a student's score due to the inclusion of the Integrating Essential Skills items

◊ ACT will focus on adding new items that are aligned to AR grade specific standards.

Science

Science

» ACT Aspire contains a spread of DOK 1-3 questions.

Table 20. Percentage of Science Items by DOK Level

Grade	DOK 1	DOK 2	DOK 3
3	21%	45%	34%
4	13%	62%	25%
5	24%	60%	16%
6	17%	59%	23%
7	8%	50%	42%
8	17%	46%	38%
EHS	13%	56%	31%

Science

» Average alignment to Arkansas standards by subject across the three test forms reviewed by panelists:

Science	
Grade	Percent
3	94%
4	97%
5	96%
6	98%
7	94%
8	98%
EHS	100%

GRADE FIVE

Earth's Systems

Students who demonstrate understanding can:

5-ESS2-1 **Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; or the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

5-ESS2-2 **Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.** [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

5-ESS3-1 **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an example to describe a scientific principle. (5-ESS2-1) **Using Mathematics and Computational Thinking** Mathematical and computational thinking	**ESS2.A: Earth Materials and Systems** • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in	**Scale, Proportion, and Quantity** ▪ Standard units are used to measure and describe physical quantities such as weight, and volume. (5-ESS2-2) **Systems and System Models** • A system can be described in terms of its components and their interactions. (5-ESS2-1, 5-ESS3-1) -- **Connections to Nature of Science**

Science Summary

» ACT Aspire contains a spread of DOK 1-3 questions.

» Average Alignment to AR Standards by Subject

Science - 97% alignment

» Work with ACT
◊ ACT will bolster the use of the NGSS DCI (topics) by grade level, utilizing grade-level topics in future item development.

Pages 13-22

Evaluation of the process

» The panelists felt prepared to complete each of the alignment tasks.

» They felt sufficient time was dedicated to training.

» They were confident in the tasks they had completed.

» They felt they had enough time to complete the alignment tasks.

» Panelists' perspectives on the process were collected and the evaluation responses were consistently positive.

Evaluation of the process

» The panel that was recruited included experienced educators and content specialists in various roles from across the state.

» They were independent of any development and validation activities for the ACT Aspire.

» The relationship between the developer's intent and the independent panelists serves as the cross-validation expected in an independent study.

» The summative information from the study suggests that the ACT Aspire test content meets the expectations outlined in the Arkansas standards at the domain level for ELA and Mathematics.

Collaboration with ACT

The Arkansas Department of Education (ADE) will continue to be involved in the ACT Aspire test development process. ADE currently reviews test forms and provides feedback to ACT that is used as part of item and form development in conjunction with other external content and bias panel reviews.

50 Arkansas educators reviewed ACT Aspire Interim forms in the summer of 2019.

More than 50 Arkansas educators traveled to Iowa for 5 days to participate in the ACT Aspire Classroom Item Writing Workshop in September of 2019.

Resources

ACT Aspire Information and Resources

» Test Design, Validity, Reliability, and Research
  ◇ ACT Aspire Periodic Technical Manual
  ◇ ACT Aspire Summative Technical Manual
» Knowledge and Skills Map

Performance Level Descriptors

Math

Reading

Science

English

"In terms of item-level alignment, there were substantial content connections between the ACT Aspire test forms and the Arkansas content standards…" Page 3