FALL 2015

Summative Assessment

TECHNICAL BULLETIN #1

ACT® Aspire®

actaspire.org

ACT endorses the *Code of Fair Testing Practices in Education* and the *Code of Professional Responsibilities in Educational Measurement*, guides to the conduct of those involved in educational testing. ACT is committed to ensuring that each of its testing programs upholds the guidelines in each *Code*.

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Overview

ACT Aspire® includes a vertically scaled battery of achievement tests designed to measure student growth in a longitudinal assessment system for Grades 3–10 in English, reading, writing, mathematics, and science. ACT Aspire is designed to measure students' progress toward college and career readiness. The scale scores are linked to college and career data through scores on the ACT® test and the ACT National Career Readiness Certificate™ (ACT NCRC®) program. Empirically based ACT College Readiness Benchmarks provide information about whether students are on target for readiness at the appropriate grade/subject levels. To enhance score interpretation, reporting categories for ACT Aspire use the same terminology as the ACT College and Career Readiness Standards (ACT CCRS) and other standards that target college and career readiness (including the standards of many states and the Common Core State Standards [CCSS]). Some reporting categories are unique to ACT Aspire. These include science, technology, engineering, and mathematics (STEM), justification and explanation in mathematics, progress with text complexity in reading, and a progress toward career readiness indicator.

The types of items based on a given construct are determined by considering the amount and nature of the evidence needed to support an inference. These requirements are balanced with maintaining manageable administration conditions. The ACT Aspire design includes several item types (i.e., selected-response, constructed-response, technology-enhanced) and a range of item difficulties at varying depths of knowledge. ACT Aspire assessments cover learning progressions from foundational concepts to sophisticated applications.

Taken as individual subject tests or as a battery, ACT Aspire can be delivered online or as a paper administration.

ACT Aspire Scores

ACT Aspire scores reflect the knowledge and skills students develop over time—across grades—and link these results to readiness for college and career.

English Language Arts

Inferences about students' knowledge and skills related to reading, language, and writing can be made by analyzing their scores on the ACT Aspire reading, English, and writing assessments, respectively. In addition to an overall reading score, each student will receive an indication of progress with text complexity. While the overall reading score provides a measure of comprehension skills, the Text Complexity Progress Measure is an indication of the level of text complexity to which students can successfully apply comprehension skills. ACT Aspire English Language Arts will also report on constructs and practices consistent with college and career readiness standards. ACT Aspire reporting categories are found in the reading, language, and writing strands (e.g., Key Ideas and Details, Craft and Structure, Integration of Knowledge and Ideas, Conventions of Standard English, Knowledge of Language, Production of Writing).

Mathematics

ACT Aspire mathematics assessments were designed to measure critical college and career readiness constructs and practices and use language consistent with college and career readiness standards (including the ACT CCRS and the CCSS, among others). These reporting categories include Number and Operations in Base 10, The Number System, Operations and Algebraic Thinking, Expressions and Equations, Ratios and Proportional Relationships, Functions, Geometry, Measurement and Data, Statistics

and Probability, and Modeling. For Early High School (EHS) (Grades 9–10) these reporting categories include: Number and Quantity, Algebra, Functions, Geometry, Statistics and Probability, and Modeling. In addition, students will receive information about their foundational skills and grade-level progress. Given its critical role in mathematics understanding, a separate justification and explanation score will be provided to students.

Science

ACT Aspire science assessments are based on research evidence about what students need to know and to be able to do in order to be on a trajectory toward success, whether they enter college or a workplace training program. ACT Aspire science assessments measure science practices in the context of science content. The reporting categories are identical to ACT College and Career Readiness Standards strands (e.g., Interpretation of Data, Scientific Investigation, Evaluation of Models, Inferences, and Experimental Results).

Additional ACT Aspire Scores

Students who take the Grade 8 or EHS English, Reading, Science, and Mathematics assessments will receive ACT Aspire Composite scores and a progress toward career readiness indicator. Students who take the EHS ACT Aspire assessments will receive predicted ACT subject scores and, if they test in the necessary subjects, a predicted ACT Composite score. Students who take the English, reading, and writing assessments will receive a combined ELA score to see how their effort compares with students who have been identified as college and career ready. Students who take the science and mathematics assessments will receive a STEM score.

Describing Student Performance in Terms of Reporting Categories

To provide instructionally insightful and actionable results, student performance is also described in terms of the ACT Aspire reporting categories described above. These categories largely incorporate the same language found in standards targeting college and career readiness (such as the ACT CCRS, the CCSS, or many states' standards). Score reports describe the percent and number of points students earn out of the total number of points possible in each reporting category. Student performance in each category will also be compared to *how* students who meet the ACT College Readiness Benchmarks *score* (described as the ACT Readiness Range) to infer whether students are on the trajectory toward college and career readiness. Reporting student performance in this way provides meaningful insights into students' areas of strength as well as areas that may need additional attention.

ACT Aspire and Standards

ACT Aspire and the ACT College and Career Readiness Standards

The ACT College and Career Readiness Standards (currently only available for Grades 8 and above) are based on research evidence associated with college and career readiness. Content and measurement experts developed statements that capture what students know and are able to do with respect to relevant skills and knowledge associated with college and career readiness (as identified through research including the ACT National Curriculum Survey®) at specific score bands on the ACT English, Reading, Writing, Mathematics, and Science tests. Paired with ACT College Readiness Benchmarks (minimum scores associated with a high likelihood of success at Grade 10 and postsecondary levels in each content area), students gain insight into what they need to know and should be able to do to succeed in college and career.

ACT Aspire science assessments at Grades 3–7 are associated with the draft ACT Readiness Standards in Science. (See samples in Appendix A.) The first step in developing these standards was to backmap the ACT College and Career Readiness standards (CCRS). Content and measurement specialists then consulted several sources including ACT's evidence, relevant research in science education, the National Science Education Standards, NAEP findings, and input from well-respected experts in science education in the elementary grades.

Similar work is ongoing to establish ACT Readiness Standards for ELA and Mathematics in Grades 3–7. Draft backmap documents for these content areas should be available in the near future. Currently, the ACT Aspire ELA and mathematics assessments are consistent with many states' standards that are focused on college and career readiness (such as the CCSS) for Grades 3–7.

ACT Aspire Science Assessments and the Next Generation Science Standards (NGSS)

ACT closely monitored the development of the Next Generation Science Standards (NGSS) and shared with developers ACT research on science curricula and career and college readiness. While considerable alignment between ACT Aspire and the NGSS does exist, the ACT Aspire assessments are not based on the NGSS, and they do not directly assess the NGSS. The ACT Aspire science assessments are based on ACT research on current curricula at the elementary, middle, and high school levels as well as ACT research on college and career readiness.

Some areas of achievement are not measured on ACT Aspire summative assessments. Standards that require extended time, advanced uses of technology, active research, collaboration, producing evidence of a practice over time, or speaking and listening are not currently assessed.

ACT Aspire Alignment

Many sets of standards target college and career readiness including the ACT CCRS, the CCSS, and others from states across the US. The purpose of these standards is to articulate the requisite knowledge and skills needed to prepare students for postsecondary success. Assessments are constructed to measure progress and provide evidence to back up the claim, in this case, that students are on target for college and career readiness. ACT Aspire assessments are constructed for this very purpose.

Alignment studies are often used to ensure that the assessments are measuring those skills and knowledge identified as critical for the college-and-career-ready claim. The design of many alignment studies involves bringing in subject-matter experts who study the standards and forms of the assessments and report their opinions about how much overlap exists. If assessments employ domain sampling or are adaptive, alignment studies require close analysis of the test/pool content and statistical specifications since any single collection of items represents just a sample of the full domain of skills and knowledge being assessed.

In addition to subject-matter-expert opinion, ACT used the ACT in the creation of the ACT Aspire score scales for English, math, reading, and science, thereby creating an empirical link between the ACT Aspire scores and the ACT College Readiness Benchmarks, which relate scores on the ACT assessment directly to performance in college courses. A link has also been established between the ACT Aspire Composite score and the ACT NCRC, which provides information about student achievement and employable skills in reading, math, and locating information. These research-based connections to real-world college and real-world career readiness contribute direct evidence of alignment from ACT Aspire to college and career readiness skills and knowledge.

Claims, Interpretations, and Uses of ACT Aspire

Principal Claims, Interpretations, and Uses of the ACT Aspire Battery

1. To identify students' readiness on an empirically derived college readiness trajectory. (Note that students taking the ACT Aspire battery will receive scores that can be compared to ACT College Readiness Benchmarks that are linked to the ACT.)
2. To identify students' readiness on a career readiness trajectory.

Secondary Claims, Interpretations, and Uses of the ACT Aspire Battery

1. To provide instructionally actionable information to educators. Data from the ACT Aspire summative assessments can be used to identify areas of student strength and weakness in content areas at student, classroom, and school levels. Data can inform instruction and identify interventions.
2. To provide empirical data for inferences related to accountability. ACT Aspire data can be one of multiple measures for making inferences about student progress and growth with respect to college and career readiness in reading, language, writing, mathematics, and science, as reported in terms of ACT College and Career Readiness Standards. ACT Aspire can also be used for accountability reporting where college and career readiness standards (such as the CCSS) have been adopted.

3. To provide empirical support for inferences about international comparisons. Building on ACT research that mark ACT College Readiness Benchmarks as internationally competitive, ACT Aspire scores also will be linked to scores on the Programme for International Student Assessment (PISA) for comparisons on an international scale. Results will be available in the near future.

Over the last decade some uses and interpretations of individual student scores and aggregate score results have been common. Such uses and interpretations probably will continue. At the student level some of these include (a) student proficiency (e.g., is a student above a "satisfactory" cut score on the Grade 7 Mathematics test), (b) student growth across grade levels within a particular subject, (c) predicting performance (e.g., how might a student do on the ACT), (d) student level diagnostic information for instructional purposes, and (e) ranking students (e.g., for selection into special programs). Some uses and interpretations of aggregate scores at the group level during the same period have included (a) school and district accountability (e.g., percentage of students above a "satisfactory" cut score), (b) school, district, classroom growth, and (c) aggregate diagnostic and instructional information that reflect the impact of the curriculum or special programs. At times high stakes are attached to individual and aggregate score results. Best practices require that high-stakes decisions be based upon multiple sources of information.

Validity evidence to support score use is important. ACT will be releasing initial validity evidence soon.

ACT Aspire Test Development

Assessment Design Elements Across Tests

Construct Coherence in ACT Aspire Assessments

A fundamental and recurring theme in education is the call for coherence. However, many alignment procedures focus only on discrete item-to-standard and grade-level-test to grade-level-standard connections. In designing ACT Aspire assessments, ACT did not treat each grade level as a discrete set of skills isolated only to that grade level. ACT Aspire assessments and items were designed to elicit evidence across the construct and across the learning trajectory. From a measurement perspective, this design strengthens the vertical scale and supports the collection of evidence from students of all ability levels. Refer to the Content Specifications section of this document for additional alignment information.

Although sampling constructs across grades occurs in all the assessments, it can be illustrated most clearly by examining the design of the ACT Aspire mathematics assessments. In them, certain items contribute to Foundation scores. Foundation items are designed to collect evidence about a concept that was introduced in a previous year but that the student must now apply in a more advanced context. An illustration of this for the ACT Aspire mathematics assessments is provided in Appendix B. These items are important for understanding where a student in the current grade actually falls on the learning trajectory.

As illustrated in Appendix B, the ACT Aspire assessments are designed to be developmentally and conceptually linked across grade levels. To reflect that linkage,

the assessment names are the same across all ACT Aspire levels and the scores are on the same vertical score scale. Higher grade levels of ACT Aspire are directly connected with the ACT and, therefore, offer an empirical bridge to understanding college and career readiness.

ACT Aspire Item Types

The goal of assessment is to collect relevant evidence from the student as authentically as possible while sampling enough of the construct to support inferences based on the test's scores. ACT Aspire uses multiple item types to achieve this goal. Selected-response items offer an efficient, reliable way to sample a wide range of content skills and understandings. Constructed-response (CR) tasks require students to explain, justify, critique, create, propose, produce, design, or otherwise demonstrate knowledge and understanding by generating a response. When appropriate, context is provided to reinforce students' practical applications of concepts, theories, principles, and processes. Technology-enhanced (TE) items and tasks incorporate computer interfaces to ask questions and pose scenarios that are not possible in traditional paper-based formats. They also present conventional items in fresh, innovative ways that motivate students. Technology-enhanced items may require students to generate their responses, or they may present students with a wider and more complex set of answer options.

Using multiple item types on ACT Aspire assessment yields the evidence needed to support inferences about student achievement.

Depth of Knowledge (DOK) and the Cognitive Complexity Dimension of ACT Aspire Assessments

The ACT College and Career Readiness Standards communicate expectations that students will think, reason, and analyze at higher levels of cognitive complexity in order to be college and career ready. ACT Aspire items and tasks require the sampling of different levels of cognitive complexity, with most items at upper levels. Due to the wide use of Norman Webb's depth-of-knowledge terminology, this document reports the cognitive complexity of items in terms of depth of knowledge (DOK). Given the various interpretations of DOK levels, understanding ACT's interpretation of DOK levels is important.

Similar to Webb's definition, DOK levels are assigned to reflect the complexity of the cognitive process required, not the "difficulty." Unlike other DOK interpretations, ACT only assigns a DOK level 4 value to describe multiday, possibly collaborative classroom activities and assessments designed for learning purposes. By this definition, DOK assignments on any summative assessment (including ACT Aspire) are limited to values of 1 to 3.

ACT's DOK level 1 corresponds to Webb's level 1 where students are primarily actively using knowledge and skills with limited extended processing. ACT's DOK level 2 extends beyond level 1 and involves applying these cognitive processes to many situations, including real-world situations. Therefore, ACT's DOK level 2 actually aligns with Webb's DOK level 2 and some of Webb's DOK level 3. ACT's DOK level 3 involves situations where the student must apply high-level, strategic thinking skills to short- and long-term situations. Some of these situations are novel and some require generating something like a graph, but all involve higher-level thinking skills. Given this interpretation, ACT's DOK level 3 aligns with Webb's DOK level 3 and DOK level 4.

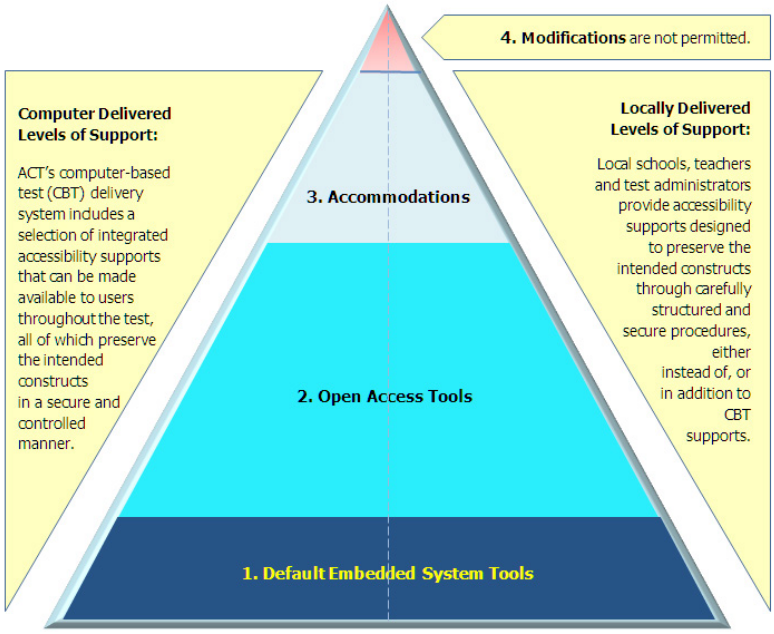
Note that Webb's model is most accurately suited to a strict "item-to-standard" model, to which the ACT Aspire assessments do not directly adhere. ACT Aspire assessments do not treat standards as discrete statements. Instead, ACT Aspire assessments measure constructs that continue across grades. Sometimes items are designed to measure the construct described in the reporting category that may not be precisely associated with any single standard statement.

Accessibility in Test Development

Accessibility refers to providing both deep construct-level test validity and equitable opportunity for all students to demonstrate what they truly know and can do as they develop the skills that lead to readiness for college and career. In ACT Aspire item and test development, attention to accessibility is important and plays a key role in the personalized design and delivery of all ACT Aspire assessments. All students have tools they need and use every day to engage in the classroom and to communicate effectively what they have learned and what they can do. The ACT Aspire Accessibility Support System incorporates this universal need for effective communication tools for each and every student into the fundamental design architecture of the assessment. This design choice was based upon nationally recognized work on the concept of Universal Design for Learning (i.e., Mace, R., 1998; Rose, D., Meyer, A., & Hitchcock, C., 2005; Russell, M., T. Hoffmann, and J. Higgins, 2009). This design choice also was influenced by a recent conceptual work, *Access by Design* (Fedorchak, G., 2012; Higgins, J., Fedorchak, G., & Katz, M., 2012), which offers structural elements for conceptualizing how Universal Design can be built out. *Access by Design* offers an approach anchored in human cognition and information processing research.

ACT Aspire assessments are designed to level the playing field for all students by acknowledging that all students need different levels of communication support (not just "accommodations") to demonstrate what they know and can do.

Figure 1. ACT Aspire Levels of Accessibility Support



Width of the triangle above shows the proportionate number of students who use that set of accessibility tools.

Support Level 1: Default Embedded System Tools. These basic supports are automatically available to all users without advance request. Embedded system tools meet the common, routine accessibility needs of the most typical students. Users who have no documented Personal Needs Profile (PNP) are provided these tools, as are all other students. These tools are either embedded in the basic online test delivery platform or are provided at the local level automatically. Like all support tools permitted in the ACT Aspire assessments, embedded system tools honor and preserve the intended test construct. They are the accessibility tools that nearly everyone uses routinely and assumes will be made available, although we seldom think of them in this way. These tools serve a basic accessibility function for all.

Support Level 2: Open Access Tools. These supports are available to all users but must be identified in advance, planned for, and selected from the pull-down menu inside the test to activate them (online version), or they must be planned in advance and provided locally. The majority of students' unique sensory and communication accessibility needs are predictable and can be met through a certain set of accessibility features designed into the underlying structure and delivery format of test items. Rather than overwhelm the user with all possible tools, Open Access Tools provide only those tools specifically needed by the individual user. Items administered using these tools are designed to remain faithful to all defined test constructs and

required performance elements. Once designed and engineered into the system, Open Access Tools are easily delivered in a fully standardized manner that is valid, appropriate, and personalized to the specific access needs identified in an individual student's profile.

Support Level 3: Accommodations. Accommodations are high-level accessibility tools needed by relatively few students. The ACT Aspire Accessibility Support System requires accommodation-level supports to be requested by educational personnel on behalf of the student through the online ACT Aspire Personal Needs Profile (PNP) process. This will allow any needed online resources to be activated for the student. A responsible educational authority is expected to determine qualifying procedures or required documentation for a request of accommodation-level support during ACT Aspire testing. ACT's only requirement is that accommodation-level supports be requested through the online PNP process prior to testing. Typically, students who receive this high level of support have a formally documented need for specialized resources or equipment that requires professional expertise, specialized training, and/or extensive monitoring to select and administer the support effectively and securely. Examples of this support include braille or tactile graphics, English text audio, sign language interpretation, or other language translation. Decisions about accommodation-level supports are typically made by an educational team including and on behalf of the student and are normally based on a formal, documented evaluation of specialized need. Accommodation supports always preserve and honor the construct being tested. These supports require substantial additional local resources or highly specialized, expert knowledge to administer the ACT Aspire assessments successfully and securely.

Support Level 4: Modifications. Modifications are supports that are sometimes used during the earliest phase of instruction but are not permitted during ACT Aspire testing for any student. Modifications are provided in the rarest of circumstances in school testing situations only to support a student to nominally engage with the test, thus providing student access to the "*test experience.*" However, modifications alter what the test is attempting to measure and therefore do not provide access to the construct being tested or claimed by the test. This extreme level of support violates the construct being tested, invalidates performance results, and if treated as a valid performance would communicate low expectations of student achievement. Supports that provide this much assistance should be used with extreme caution and decisions to use must be made with very careful and documented team deliberation considering the potential long term effects of lowering expectations for this student and subsequent learning outcomes. Modification-level supports actually prevent meaningful access to performance of the construct being tested, thus removing any ability for the user to demonstrate actual skill levels that might be present. Modifications, therefore, represent a barrier to independent performance of competence. (More discussion of modifications is provided in the *ACT Aspire Accessibility User's Guide*.)

Table 1. ACT Aspire Personal Needs Accessibility Supports[1,2,3]

Presentation Supports		Interaction/Navigation Supports		Response Supports		General Test Condition Supports	
English Text Audio for Sighted	A	Abacus	A	Respond in Test Booklet	O	Breaks—Unsupervised	A
English Audio for Blind	A	Answer Masking	O	Dictate Responses	O	Extra Time	A
Spanish Text + Audio	A	Custom Masking	O	Keyboard or AAC Device + Local Print	O	Breaks—Supervised	O
Spanish Text + Audio: Directions Only	A	Answer Eliminator	E	Mark Item for Review	E	Special Seating/ Grouping	O
Word-to-Word Dictionary	A	Highlighting	E			Location for Movement	O
English Text + ASL Full Translation	A	Browser Cut/ Copy/Paste	E			Individual Administration	O
English Text + ASL: Directions Only	A	Scratch Paper	E			Home Administration	O
Braille Contracted	A	Calculator	E			Other Setting	O
Braille Uncontracted	A					Audio Environment	O
Large Print	O					Visual Environment	O
Line Reader	O					Physical/Motor Equipment	O
Contrast Colors	O						
Browser Zoom	E						
Magnifier Tool	E						

[1] The Personal Needs Profile (PNP) is the *unique combination* of selected supports used by a *single individual*.

[2] Key to support levels shown in Table 1: A (Accommodation), O (Open Access), E (Embedded Default)

[3] This list of features shows supports *permitted*, some are provided in platform, some are provided locally. For further information, see the *ACT Aspire Accessibility User's Guide*.

ACT Aspire Test Development Processes

Selecting and Training Item Writers

Item writers are chosen from a pool of well-qualified currently practicing US educators (e.g., science specialists, curriculum coordinators, department chairs) who have extensive content and pedagogical knowledge and who teach at the grade levels covered by the ACT Aspire assessments. Most of these educators are actively engaged in teaching at various levels, from elementary school to postsecondary levels, and at a variety of institutions, from small private schools to large public schools. ACT makes every attempt to include item writers who represent the diversity found in the United States with respect to ethnic background, gender, English-language proficiency, and geographic location.

Designing Items That Elicit Student Evidence

Item writers consider the entire construct when crafting assessment tasks and items. Items are designed to elicit evidence about knowledge and skills that span the larger construct, which in many cases, is above the standard level. Item writers use templates that frame what knowledge, skills, and abilities are of greatest interest in construct measurement while calling out the unintentional knowledge, skills, and abilities that should not be measured. Items must fulfill task template requirements (e.g., content, DOK, word count, accessibility), reflect diversity, and meet fairness standards.

All items undergo rigorous content reviews by internal and external content experts to ensure that they solicit sufficient student evidence, are developmentally appropriate, and that the contents and contexts are error-free. The process includes internal peer reviews, internal senior-level reviews, and external reviews. The content reviews also ensure that each item or task measures what is intended and functions at the intended DOK. External experts conduct fairness reviews to ensure that items are fair and will not offend any students.

Initial forms are constructed to conform to test specifications. Once constructed, forms are reviewed by ACT staff and external content panelists. These panelists evaluate items for content accuracy and evaluate the test form for context appropriateness and representation. They also confirm that the form will collect the necessary evidence to support the intended inferences from scores.

After forms are finalized, they are administered operationally, and they are equated. Before students receive scores, data is carefully checked to ensure items and forms are working as intended.

Content Specifications

Content specifications for ACT Aspire assessments specify the required number, type, and DOK level of items to support inferences about the content in each reporting category. The reporting categories describe the construct being measured and signal the standards to be sampled in each domain. Content specifications drive all of the item, task, and test templates, ensuring that the right amount and the right kind of evidence is elicited to support inferences about achievement related to content. Tables of content specifications are provided, by test, in the next section.

Testing Times

If the ACT Aspire battery administered includes all 5 content areas, total testing time will be approximately 4 hours.

Table 2. Timing Information

	Timing (in minutes)					
Grade	**English**	**Writing**	**Reading**	**Math**	**Science**	**Total**
3	30	30	60	55	55	230
4	30	30	60	55	55	230
5	30	30	60	55	55	230
6	35	30	60	60	55	240
7	35	30	60	60	55	240
8	35	30	60	65	55	245
EHS	40	30	60	65	55	250

Note. These time limits were established after an initial field test of the ACT Aspire Summative forms. They will be further evaluated during the first operational administration of the forms in the spring of 2014.

ACT Aspire Assessments Content Descriptions

English Language Arts

Inferences about student abilities in reading, English, and writing can be made by analyzing ACT Aspire reading, English, and writing assessment scores, respectively. Empirically based ACT Readiness Benchmarks provide information about whether students are on target for readiness at the appropriate grade/subject levels. ACT Aspire reporting uses the language consistent with many college and career readiness standards (such as the ACT CCRS and the CCSS) to communicate student performance across content areas.

ACT Aspire reading assessments are designed to support the Text Complexity Progress Measure, which tells students whether they are making sufficient progress toward reading the complex texts they will encounter in college and their careers. In addition, students who take ACT Aspire English, reading, and writing assessments will receive a Composite ELA score showing how their performance compares to students who have been empirically identified as college and career ready. The Composite scores are reported in an effort to provide insight about student skills that are integrated across content areas.

ACT Aspire uses high-quality test materials to measure student progress toward college and career readiness in English Language Arts and literacy across content areas. (ACT test development staff understands the evidence that underlies the ACT CCRS. This deep understanding enables staff to craft tasks across grade levels that draw out evidence of the constructs behind the standards.) ACT Aspire is designed to offer a deliberate, evidence-based, coherent assessment experience.

English Assessments

ACT Aspire English assessments put the student in a position to revise and edit. Various passage types provide a variety of rhetorical situations. Students must use the rich context of the passage to make editorial choices, providing direct evidence of their understanding of the language and writing constructs described in the ACT CCRS and other college and career readiness standards. ACT Aspire English assessments are designed to collect evidence associated with the requisite skills associated with error-free communication, such as knowledge of language conventions, punctuation, and grammar. Additionally, students must make choices about how to structure and organize sentences and paragraphs for optimal communication, depending on the purpose of a particular mode of writing. Student appreciation of concision and consistency in style and tone also is expected.

The ACT Aspire English assessments measure student knowledge and abilities in the following areas.

Conventions of Standard English

The items in this category require students to apply an understanding of the conventions of standard English grammar, usage, and mechanics to revise and edit text.

Punctuation and Usage Conventions

These items require students to edit text to conform to standard English punctuation and usage.

Sentence Structure and Formation

Items in this category test understanding of relationships between and among clauses, placement of modifiers, and shifts in construction.

Production of Writing

The items in this category require students to apply their understanding of the rhetorical purpose and focus of a piece of writing to develop a topic effectively and to use various strategies to achieve logical organization, topical unity, and general cohesion.

Topic Development

These items require students to demonstrate an understanding of, and control over, the rhetorical aspects of texts by identifying the purposes of parts of texts, determining whether a text has met its intended goal, and evaluating the relevance of material in terms of a text's focus.

Organization, Unity, and Cohesion

These items require students to use various strategies to ensure that a text is logically organized, flows smoothly, and has an effective introduction and conclusion.

Knowledge of Language

The items in this category require students to demonstrate effective language use through ensuring precision and concision in word choice and maintaining consistency in style and tone.

Table 3. Points and Proportion of Points by Item Type for ACT Aspire English Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	25	25	25	35	35	35	50
MC	21–22	21–22	21–22	31–33	31–33	33–35	48–50
	.84–.88	.84–.88	.84–.88	.89–.94	.89–.94	.94–1.0	.96–1.0
TE	3–4	3–4	3–4	2–4	2–4	0–2	0–2
	.12–.16	.12–.16	.12–.16	.06–.11	.06–.11	0–.06	0–.04

Note. EHS = Early High School (Grades 9 and 10); MC = Multiple-Choice; TE = Technology-Enhanced. Paper tests do not have TE items. MC items are used in their place.

Table 4. Points and Proportion of Points by Content Category for the ACT Aspire English Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	25	25	25	35	35	35	50
POW	9–11	6–8	6–8	11–13	9–11	9–11	12–14
	.36–.44	.24–.32	.24–.32	.31–.37	.26–.31	.26–.31	.24–.28
KLA		2–4	2–4	2–4	4–6	4–6	6–8
		.08–.16	.08–.16	.06–.11	.11–.17	.11–.17	.12–.16
CSE	14–16	14–16	14–16	19–21	19–21	19–21	29–31
	.56–.64	.56–.64	.56–.64	.54–.6	.54–.6	.54–.6	.58–.62

Note. POW = Production of Writing; KLA = Knowledge of Language; CSE = Conventions of Standard English.

Table 5. Percentage of Points by DOK for the ACT Aspire English Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
DOK 1	44–52%	44–52%	44–52%	37–49%	40–46%	40–49%	40–48%
DOK 2	20–24%	20–24%	20–24%	20–25%	20–25%	17–23%	20–24%
DOK 3	28–32%	28–32%	28–32%	31–37%	34–37%	34–37%	32–36%

Note. In addition to operational questions that contribute to student scores, each English form also contains pretest questions and any associated materials. These questions do not contribute to student scores.

Reading Assessments

The ACT Aspire reading assessments measure students' ability to derive meaning from, and reason logically about, text passages. Passages in the ACT Aspire reading assessment include both literary narratives, such as prose fiction, memoirs, and personal essays, and informational texts from the natural sciences and social sciences. Within and across grade levels, the passages span a range of complexity levels in order to provide students, teachers, and parents with information about how well students can read and understand increasingly complex texts.

Items on the reading assessments ask students to determine main ideas, locate and interpret significant details, understand sequences of events, make comparisons, comprehend cause-effect relationships, determine the meaning of context-dependent words, draw generalizations, and analyze the author's method or the narrator's voice. In addition, ACT Aspire reading items assess the student's ability to complete reading-related tasks at various depth-of-knowledge levels and reflect a range of difficulty appropriate for the grade level.

The ACT Aspire reading assessment contains the following types of items:

- Selected-response items that are designed to collect evidence of student skill level in specific domains
- Constructed-response items, or short-answer questions, that specifically test reading comprehension rather than writing skills
- Technology-enhanced items (if administered in an online testing environment)

Examples of constructed-response tasks in the ACT Aspire reading assessments include:

- Formulate a conclusion by making connections within a passage and provide support using specific details from the text.
- Formulate a conclusion by making connections between a pair of passages and provide support using specific details from both texts.

- Identify cause and effect relationships within a passage and provide support using specific details from the text.
- Identify similarities and differences between the key ideas of paired passages and provide support using specific details from both texts.

Constructed-response tasks are scored according to rubrics that give students varying amounts of credit for responses that are correct or partially correct, enabling differentiation between multiple skill levels.

ACT Aspire reading assessments assess skills in the following reporting categories.

Key Ideas and Details

The items in this category require students to read texts closely; to determine central ideas and themes, and summarize information and ideas accurately; and to understand sequential, comparative, and cause–effect relationships.

Craft and Structure

The items in this category require students to determine word and phrase meanings and to analyze an author's word choice rhetorically as well as influences on the English language; to analyze text structure; and to understand purpose and point of view.

Integration of Knowledge and Ideas

The items in this category require students to understand how arguments are constructed, and to make connections to prior knowledge and between and among texts.

Table 6. Points and Proportion of Points by Item Type for the ACT Aspire Reading Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	29	29	29	29	29	31	31
MC	18–19	18–19	18–19	18–19	18–19	20–21	20–21
	.62–.66	.62–.66	.62–.66	.62–.66	.62–.66	.65–.68	.65–.68
TE	2–3	2–3	2–3	2–3	2–3	0–1	0–1
	.07–.1	.07–.1	.07–.1	.07–.1	.07–.1	0–.03	0–.03
CR	8	8	8	8	8	10	10
	0.28	0.28	0.28	0.28	0.28	0.32	0.32

Note. EHS = Early High School (Grades 9 and 10); MC = Multiple-Choice; TE = Technology-Enhanced. Paper tests do not have TE items. MC items are used in their place.

Table 7. Points and Proportion of Points by Content Category for the ACT Aspire Reading Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	29	29	29	29	29	31	31
KID	13–18	13–18	13–18	13–18	13–18	13–20	13–20
	.45–.62	.45–.62	.45–.62	.45–.62	.45–.62	.42–.65	.42–.65
CS	6–11	6–11	6–11	6–11	6–11	6–12	6–12
	.21–.38	.21–.38	.21–.38	.21–.38	.21–.38	.19–.39	.19–.39
IKI	3–6	3–6	3–6	3–6	3–6	4–8	4–8
	.10–.21	.10–.21	.10–.21	.10–.21	.10–.21	.13–.26	.13–.26

Note. KID = Key Ideas and Details; CS = Craft and Structure; IKI = Integration of Knowledge and Ideas.

Table 8. Items by Passage Type for the ACT Aspire Reading Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
LN	10–11	10–11	10–11	7	7	7	7
INFO	10–11	10–11	10–11	14	14	14	14
SSC	5–6	5–6	5–6	7	7	7	7
NSC	5–6	5–6	5–6	7	7	7	7

Note. LN = Literary Narrative (prose fiction, memoirs, personal essays); INFO = Informational Text (SSC = Social Science and NSC = Natural Science)

Table 9. Percentage of Points by DOK for the ACT Aspire Reading Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
DOK 1	14–24%	14–24%	14–24%	14–24%	14–24%	14–24%	14–24%
DOK 2	38–62%	38–62%	38–62%	38–62%	38–62%	38–62%	38–62%
DOK 3	24–48%	24–48%	24–48%	24–48%	24–48%	24–48%	24–48%

Note. In addition to operational questions that contribute to student scores, each Reading form also contains pretest questions and associated passages. These questions do not contribute to student scores.

Text Complexity

During the development of ACT Aspire reading assessments, ACT collected information about reading passages using both computer analysis and human expert evaluation. This information was used to determine the levels of text complexity of passages and to build assessments with ranges of text complexity at each grade level.

Table 10. Number of Passages by Text Complexity for the ACT Aspire Reading Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Basic	3	2	1	0	0	0	0
Straightforward	1	2	2	1	1	0	0
Somewhat challenging	0	0	1	2	2	2	1
More challenging	0	0	0	0	0	1	1
Complex	0	0	0	0	0	0	1

The labels used in Table 10 reflect progressions of passage complexity that are consistent with the grade bands specified and described in Appendix A of the CCSS in ELA. ACT Aspire reading assessments include ranges of text complexities at each grade level, up to texts classified as Complex in Early High School. Note that texts classified as Highly Complex are only included on the ACT.

ACT research staff has analyzed the effect of text complexity on reading comprehension across grade levels. Drawing on this research, ACT designed a measure to test the ability to read and understand increasingly complex texts. In addition to an overall reading score, each student receives an indication of progress with text complexity. While the overall reading score provides a measure of important comprehension skills, the Text Complexity Progress Measure is an indication of the level of text complexity to which students can successfully apply those skills.

Performance on the Text Complexity Progress Measure will be compared to a readiness level empirically derived from ACT College Readiness Benchmarks. Students who perform above the benchmark level will receive an indication that they are making sufficient progress toward reading the complex texts they will encounter in college and career. Students who perform below the benchmark level will receive recommendations for improvement such as practicing reading increasingly complex texts from a variety of genres, checking for understanding, and using strategies to problem-solve challenging texts.

Writing Assessments

The ACT Aspire writing assessments consist of a 30-minute summative writing task for Grades 3–EHS. Students at each grade level respond in essay form to a single writing stimulus. The assessments are designed to provide an indication of whether students have the writing skills they will need to succeed at the next level.

Taken as a whole, the ACT Aspire writing assessments are designed to measure an integrated continuum of writing ability that advances in skill and complexity grade by grade, culminating in the ACT Writing test, which provides a measure of student readiness for the writing demands of college. The ACT Aspire writing assessments cover Common Core State Standards that pertain to writing, as well as ACT's research-based Career and College Readiness Standards.

Ideas are the underlying currency of the writing students need to be able to produce in their academic careers and in their future workplaces. Competent student writing entails generating, developing, sustaining, organizing, and communicating ideas. This model of writing is similar to other widely accepted models, including the Six + 1 model (Culham, 2003) that has been adapted by the National Writing Project (Swain and LeMahieu, 2012). The ACT model is also based, in large part, on the 2011 NAEP Writing Framework, which ACT developed. The ACT Aspire writing assessment measures students' writing ability according to these competencies.

- **Generating Ideas:** Regardless of the topic or content of a piece of writing, the student writer must think of something to say about the subject. That "something" consists of ideas that arise through the student's invention, in response to a rhetorical situation that prompts the student to explain, to persuade, or to give a narrative account. The quality of the ideas generated by the student can be judged according to how acutely the student addresses the rhetorical situation, and by how productive students are of judgment, analysis, or reflection. Competent student writers understand the rhetorical situation—the issue or question they are invited to respond to; the purpose for which they are writing; the audience for their work—and they generate ideas that are pertinent and that fit the given situation. Students with greater levels of ability generate ideas in consideration of the implications and complications surrounding their topic, the values that underlie particular positions or actions, or the multiple perspectives that complicate an issue. It does not matter whether the focus of the student's ideas is grand or mundane, familiar or highly original; what matters most is the degree to which the student's ideas lead to astute judgment, insightful analysis, or meaningful reflection.
- **Developing Ideas:** Student writers make their ideas clear to readers by explaining and exploring them, discussing their implications, or illustrating them through example. In developing ideas, competent student writers draw general principles from specific, detailed discussion. Development is the means by which the student supports the thesis, arrives at insights into the topic, or conveys the meaning and significance of the narrative.

- **Sustaining Ideas**: For a piece of writing to succeed in its purpose, it must keep its ideas in focus. Competent student writers are judicious in presenting their ideas, and they will make productive use of all of them. Effective essays exhibit a sustained treatment of relevant ideas from beginning to end.
- **Organizing Ideas:** A competent piece of writing is skillfully organized. Ideas are presented in a sequence that makes clear their relationship to one another and guides the reader through the essay in a purposeful way. Students must organize their ideas successfully in order to build a logical argument, provide a clear explanation, or relay a coherent sequence of events. More skillful student writers organize ideas in ways that create unity in the essay and that enhance purpose. For example, an argumentative essay persuades through the momentum it achieves in sequencing logical inferences; an expository essay arrives at insight through progressively finer distinctions; a narrative essay braids the student's reflection throughout the telling of the story. Organizational choices are integral to effective writing.
- **Communicating Ideas:** At the minimum, competent writing must make use of the conventions of grammar, syntax, word usage, and mechanics. Better student writers vary their sentence structures, use more precise vocabulary, and generally demonstrate greater command of language to enhance their readers' understanding and express nuanced ideas. Competent student writers are also intentional about the style and tone of their writing, aware of how the rhetorical situation shapes readers' expectations of what is appropriate and effective. Style and tone are used by skilled students to enhance their purpose and ethos. Good student writers make thoughtful choices about style and tone in light of their writing aims.

Writing Assessment Rubrics

Each rubric includes four domains. Development, Organization, and Language Use are in the rubrics at all grade levels. Depending on the grade level, the fourth domain is Reflective Narrative, Analysis, or Argument.

At each grade level, and in each domain, a score of 4 is associated with "adequate," which indicates that a student who achieves this score is on track for succeeding upon moving to the next grade level.

At Grade 6 and above, the rubrics differentiate among six performance levels; this allows for two degrees of differentiation above "adequate." A score of 5 at these grades indicates an advancing level of skill in identifying and addressing the complexities of the topic. A score of 6 indicates a more advanced ability in each of these areas.

The 5-point rubrics for Grades 3–5 allow for only one degree of performance above "adequate." Finer distinctions above "adequate" in the lower grades are not evident in student responses. Nevertheless, even third graders can demonstrate higher order thinking skills by reflecting in a meaningful way on their own experiences, or those of others. The 5-point ACT Aspire writing assessment rubric provides a means for recognizing these skills.

Table 11. Points by Content Category for the ACT Aspire Writing Assessments

	Grade Level						
Writing	**3**	**4**	**5**	**6**	**7**	**8**	**EHS**
Total Points	20	20	20	24	24	24	24
Ideas and Analysis	5	5	5	6	6	6	6
Development and Support	5	5	5	6	6	6	6
Organization	5	5	5	6	6	6	6
Language Use and Conventions	5	5	5	6	6	6	6

Note. All writing prompts have been assigned to DOK Level 3.

ACT Aspire writing assessments align with three text types found in college and career readiness standards. "Production and Distribution of Writing" is the anchor standard. Nested beneath is information about text type, i.e., writing arguments, writing informative/explanatory texts, and writing narratives. ACT Aspire includes tasks for all of these text types, but rotates through them by grade (e.g., one grade will write narratives, another grade will write expository). Students need to know how to call upon and combine different writing strategies. For example, proficient writers should be able, where appropriate, to employ narrative techniques in argumentative writing, to support an argument within an expository essay. This is discussed more in ACT's Writing Framework document and instantiated in ACT Aspire tasks and rubrics.

Mathematics Assessments

ACT Aspire mathematics assessments are developed to reflect students' knowledge and skill accumulation over time; capturing what each student can do—across grades—and linking the results to being on track for college and career readiness. Score reports present results in a number of ways to indicate student strengths and areas in need of growth.

ACT Aspire mathematics questions are carefully developed for the full range of grade-appropriate content and require a variety of cognitive skills that fill depth-of-knowledge categories up through Webb's DOK Level 3. Modeling skills are measured

using contexts ranging from numbers and operations to number models (including the number line), geometric shapes, and statistical charts, and for higher grades, including algebraic expressions, coordinate graphs, functions, and probability. ACT Aspire mathematics assessments also include constructed-response tasks focusing on justification and explanation, for explaining why mathematical results hold.

ACT Aspire mathematics reporting categories are consistent with many college and career readiness strands (e.g., ACT CCRS, CCSS) (depending on grade level): Number and Operations in Base 10; Number and Operations–Fractions; The Number System; Number and Quantity; Operations & Algebraic Thinking; Expressions and Equations; Ratios and Proportional Relationships; Algebra; Functions; Measurement and Data; Geometry; Statistics and Probability. Appendix B of this document illustrates the progression of these skills across grade levels. ACT Aspire mathematics assessments were designed to measure constructs and practices identified as important for college and career readiness. The ACT Aspire mathematics assessments also report on (a) Justification and Explanation, capturing evidence about a student's ability to support and explain their mathematical reasoning, which will come from constructed-response tasks, (b) Modeling, which is derived using all items with a strong modeling component to show how students can apply mathematics in modeling situations, (c) Grade Level Progress, which indicates how students are progressing specifically on topics from grade-level standards in order to be on target for success in future grades as well as their readiness for college and career, and (d) Foundation, which requires students to apply and integrate mathematics topics based on content from previous grade levels.

The ACT Aspire mathematics assessments emphasize quantitative reasoning frequently applied to real-world contexts rather than memorization of formulas or computational skills. Part of learning and doing mathematics is understanding mathematical formulas: knowing how to make sense of them, when to apply them, and how to use them.

Some ACT Aspire mathematics items give students the formula(s) they need. An item of this type goes beyond the recall of the formula so that the focus is on using the formula appropriately. Some ACT Aspire mathematics items do not include a formula even though one might be used in the problem. This item type collects evidence of the student coming up with the relationship needed to solve the problem. The result is that ACT Aspire mathematics assessments have a good balance across the dimensions of understanding and using mathematical formulas.

Calculators and the ACT Aspire Mathematics Assessments

Students are allowed and expected to strategically use acceptable calculators on the ACT Aspire mathematics assessments for Grade 6 and above. (A calculator tool is available in the online version.) For Grades 3–5, direct evidence of students executing important computational skills, practices, and understandings is required, so calculators are not permitted.

Table 12. Points and Proportion of Points by Item Type for ACT Aspire Mathematics Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	37	37	37	46	46	53	53
MC	15–16	15–16	15–16	24–25	24–25	27–29	27–29
	.41–.43	.41–.43	.41–.43	.52–.54	.52–.54	.51–.55	.51–.55
TE	5–6	5–6	5–6	5–6	5–6	4–6	4–6
	.14–.16	.14–.16	.14–.16	.11–.13	.11–.13	.08–.11	.08–.11
CR	16	16	16	16	16	20	20
	0.43	0.43	0.43	0.35	0.35	0.38	0.38

Note. EHS = Early High School (Grades 9 and 10); MC = Multiple-Choice; TE = Technology-Enhanced; CR = Constructed-Response. Paper tests do not have TE items. MC items are used in their place.

Table 13. Points by Content Category for the ACT Aspire Mathematics Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	37	37	37	46	46	53	53
Base 10	5–7	3–5	3–5	1–3	1–3	1–3	0–2
Fractions	2–4	4–6	4–6	1–3	1–3	1–3	0–2
NS				3–5	3–5	2–4	1–3
NQ							1–3
OAT	3–5	3–5	3–5	1–3	1–3	0–2	0–2
EE				3–5	3–5	5–7	2–4
RP				3–5	3–5	0–2	1–3
Alg.							2–4
Functions						3–5	3–5
Meas.				0–2	0–2	1–3	1–3
Geo.	3–5	3–5	3–5	5–7	4–6	6–8	5–7
MD	3–5	3–5	3–5				
Data				0–2	1–3	1–3	1–3
SP				3–5	3–5	4–6	4–7
JE	16	16	16	16	16	20	20

Note.

Base 10: Number & Operations in Base 10
Fractions: Number & Operations–Fractions
NS: The Number System
NQ: Number & Quantity

OAT: Operations & Algebraic Thinking
EE: Expressions & Equations
RP: Ratios & Proportional Relationships
Alg: Algebra

Meas: Measurement & Data (Measurement)
Geo: Geometry
Base 10: Number & Operations in Base 10

MD: Measurement & Data
Data: Measurement & Data (Data)
SP: Statistics & Probability
JE: Justification and Explanation

Table 14. Percentage of Points by DOK for the ACT Aspire Mathematics Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
DOK 1	5–16%	5–16%	5–16%	7–15%	7–15%	8–15%	8–15%
DOK 2	27–38%	27–38%	27–38%	33–41%	33–41%	30–38%	30–38%
DOK 3	51–62%	51–62%	51–62%	48–57%	48–57%	51–58%	51–58%

Note. In addition to operational questions that contribute to student scores, each Mathematics form also contains pretest questions and associated materials. These questions do not contribute to student scores.

Science Assessments

ACT Aspire science assessments are designed based on research evidence about what students need to know and be able to do in order to be on a trajectory that will have them ready for success in college or in a workplace training program. ACT Aspire focuses on science practices that encompass three domains: Interpretation of Data; Scientific Investigation; and Evaluation of Models, Inferences, and Experimental Results. While science practices are emphasized, the assessments also assess fundamental science content knowledge. The scientific scenarios on which items and tasks are based are rich in science content.

ACT Aspire science test development processes and item designs are informed by science education research in learning progressions and misconceptions. This research informs the item task designs and test designs to assure that skills and knowledge are tested at developmentally appropriate times and in appropriate ways and at increasing levels of sophistication from Grade 3 through EHS.

ACT Aspire science assessments focus on assessing science practices using rich, real-world scientific scenarios. The scenarios in the upper-grade assessments include student investigations, formal scientific research, formal scientific data from references, and students or scientists providing competing explanations for real scientific phenomena. In line with ACT National Curriculum Survey results, topics at the lower grades generally focus on everyday student "backyard investigation" rather than formal science.

ACT Aspire science items and tasks require students to apply what they have learned in their science classes to novel, richly contextualized problems. ACT Aspire assessments are structured to collect evidence about students' ability to, for example, evaluate the validity of competing scientific arguments or to scrutinize the designs of experiments, and to find relationships in the results of those experiments. Technology-enhanced items and tasks provide various ways to collect evidence about how students engage with scientific material.

ACT Aspire science assessments require students to critically examine scientific situations. Assessment experiences are designed to elicit evidence about how students analyze and interpret data. Items require students to analyze the design of an investigation in light of findings from and stated purpose of the investigation. Students examine the relationships between the information provided and conclusions drawn or hypotheses developed. They consider the evidence and generalize from given information to gain new information, and to draw conclusions.

The content of the science assessments includes biology (life sciences at the earlier grades), chemistry and physics (physical science at the earlier grades), and Earth/space sciences (e.g., geology, astronomy, and meteorology). Advanced knowledge in these areas is not required, but background knowledge acquired in general, introductory science courses may be needed to correctly respond to some of the items in the upper-grade assessments. The assessments do not, however, sample specific content knowledge with enough regularity to make inferences about a student's attainment of content knowledge in any broad area, or specific part, of the science content domain. The ACT Aspire science assessments stress science practices over recall of scientific content, complex mathematics skills, and reading ability. The ACT Aspire reporting categories for science are interpretation of data, scientific investigation, evaluation of models, inferences, and experimental results. Scores in mathematics and science will be combined as a STEM score.

Table 15. Points and Proportion of Points by Item Type for ACT Aspire Science Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	36	36	36	40	40	40	40
MC	18–19	18–19	18–19	22–23	22–23	23–24	23–24
	.50–.53	.50–.53	.50–.53	.55–.58	.55–.58	.58–.60	.58–.60
TE	3–4	3–4	3–4	3–4	3–4	3–4	3–4
	.08–.11	.08–.11	.08–.11	.08–.10	.08–.10	.08–.10	.08–.10
CR	14	14	14	14	14	13	13
	0.39	0.39	0.39	0.35	0.35	0.33	0.33

Note. EHS = Early High School (Grades 9 and 10); MC = Multiple-Choice; TE = Technology-Enhanced; CR = Constructed-Response. Paper tests do not have TE items. MC items are used in their place.

Table 16. Points and Proportion of Points by Domain for the ACT Aspire Science Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
Total	36	36	36	40	40	40	40
IOD	18–22	18–22	18–22	20–22	20–22	18–20	16–18
	.50–.60	.50–.60	.50–.60	.50–.55	.50–.55	.45–.50	.40–.45
SIN	7–9	7–9	7–9	6–10	6–10	8–10	10–12
	.20–.25	.20–.25	.20–.25	.15–.25	.15–.25	.20–.25	.25–.30
EMI	7–9	7–9	7–9	10–12	10–12	12–14	12–14
	.20–.25	.20–.25	.20–.25	.25–.30	.25–.30	.30–.35	.30–.35

Note. IOD: Interpretation of Data; SIN: Scientific Investigation; EMI: Evaluation of Models, Inferences, and Experimental Results. Scores in Mathematics and Science will be used to provide a *STEM* score.

Table 17. Percentage of Points by DOK for the ACT Aspire Science Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
DOK 1	10–20%	10–20%	10–20%	5–15%	5–15%	5–15%	5–15%
DOK 2	45–65%	45–65%	45–65%	45–65%	45–65%	45–65%	45–65%
DOK 3	25–35%	25–35%	25–35%	30–40%	30–40%	30–40%	30–40%

Note. In addition to operational questions that contribute to student scores, each Science form also contains pretest questions and associated passage. These questions do not contribute to student scores.

Stimulus Formats Used on the ACT Aspire Science Assessments

Data Representation: A passage (stimulus) format in which a brief description (100 words or less, graphics not counted) is given for one or more graphs, tables, and/or diagrams. Items focus on obtaining and analyzing data and drawing conclusions from the data. Technology enhancements include videos, animations, and data manipulations (e.g., moving data points to affect a trend).

Research Summaries: A passage format involving a detailed experimental procedure (275 words, including those in graphics) along with one or more graphs, tables, and/or diagrams for experimental setups and results. (Technology enhancements involve gathering the data by manipulating variables.) Items focus on aspects of experimental design, accompanying procedures, obtaining and analyzing data, and drawing conclusions from the data.

Conflicting Viewpoints: A passage format in which two or more differing scientific explanations/arguments (350 words counting graphics) on the same topic are given, sometimes with one or more graphs, tables, and/or diagrams. Items focus on understanding the explicit and implicit points of each explanation, comparing and contrasting the explanations, drawing conclusions from the arguments, and evaluating the validity of the arguments.

Data Presentation: A passage format used at the earlier grades that is analogous to data representation, but data sources are simpler (and rarely more than two per unit) and more related to everyday life, with briefer descriptions (60 words or less, not counting graphics). Technology enhancements include videos, animations, and data manipulations (e.g., moving data points to affect a trend).

Science Investigation: A passage format used at the earlier grades that is analogous to research summaries but is shorter (fewer than 200 words, not counting graphics), simpler, more student-centered experimental procedures along with one to two graphs, tables, and/or diagrams for experimental setups and results. (Technology enhancements involve gathering the data by manipulating variables.) Items are focused on aspects of experimental design, accompanying procedures, obtaining and analyzing data, and drawing conclusions from the data.

Student Viewpoints: A passage format used at the early grades that is analogous to conflicting viewpoints but with one to three brief and simple explanations/arguments (fewer than 150 words, not counting graphics) that support an observation (e.g., students may have differing interpretations of a data set or teacher demonstration). Items focus on understanding the explicit and implicit points of the argument(s), drawing conclusions from an argument, and evaluating the validity of an argument.

Table 18. Stimulus Formats for ACT Aspire Science Assessments

	Grade Level						
	3	**4**	**5**	**6**	**7**	**8**	**EHS**
DR				1	1	2	2
RS					1	2	2
CV						1	1
DP	2	2	2				
SI	2	2	2	2	1		
SV				1	1		

Note. DR = Data Representation, RS = Research Summaries, CV = Conflicting Viewpoints, DP = Data Presentation, SI = Science Investigation, SV = Student Viewpoints.

Scoring Constructed-Response Tasks

Student responses to constructed-response tasks are read and scored by trained raters. Training materials for field-testing of constructed-response tasks were created during range finding. Range finding involves test development specialists, content experts, and expert raters previewing student responses to determine whether the content-specific scoring criteria for each task accurately reflect and encompass all of the acceptable student responses. The initial round of range finding also includes analysis and validation of the scoring rubrics used across tasks. Once the tryout tasks are scored, they undergo statistical analysis focusing on difficulty, validity, and accessibility to determine whether they are suitable for operational use.

During range finding, student responses are individually rated by multiple raters using the scoring criteria and the appropriate rubric. Responses that do not receive the same score by all raters are discussed by the entire group and a consensus score is reached. Additions and clarifications to the scoring criteria can be made at this time, if necessary.

After test development specialists and expert raters have completed range finding, responses are sorted and put together into training sets. Training materials for the qualification item include an anchor set, multiple practice sets, and at least two qualification sets that prospective raters must score accurately in order to be eligible to score field-test responses.

Responses chosen for the anchor set represent clear examples of each score point. When possible, these responses represent the full range of student responses typically seen during range finding. Practice set and qualification set responses also include clear examples; however, these sets also contain responses that are not as perfectly aligned to the scoring criteria; they fall either slightly high or low within each score point. An ACT test development specialist includes particular response types that occur frequently and that will be challenging to score.

Each response included in the training materials is analyzed during range finding. An articulation (rationale) explaining why a particular score was assigned accompanies the response. The articulation explains how the rubric and scoring criteria were used to determine the score; citations from the exemplar response are included, where appropriate, to illustrate the claims made in the articulation.

Operational data and analysis will be included in the full *ACT Aspire Technical Report* to be released following the first operational administration.

Performance Scoring Quality Control

Scorer Qualifications and Experience

Scoring quality starts with the recruitment process and extends through screening and placement (assigning scorers to items based on their skills and experience), training, qualification, and scoring.

Priority is given to scorers with previous experience in scoring similar assessments. In most cases, these professional scorers have specialized educational and professional experience, including valuable experience in performance scoring. All scorers have, at a minimum, a four-year college degree.

The pool of scorers typically reflects a cross section in terms of age, ethnicity, and gender, although placement and retention of scorers is based upon their qualifications and the quality and accuracy of their scoring.

Summaries of performance scoring statistics will be included in the full technical report, which will be available after the first operational administration.

Managing Scoring Quality

Scorer exception processing is used at defined intervals to check scorer accuracy. Scorers who fall below predetermined standards receive automatically generated messages that interrupt their scoring and direct them to work with a scoring supervisor to review anchor papers or take other steps to improve their scoring accuracy.

Validity responses are prescored responses strategically interspersed in the pool of live responses in order to gauge scorer accuracy. These responses are not distinguishable from live responses, but scores are compared to the true scores assigned by scoring supervisors and do not factor into final student scores in any way. The validity mechanism provides an objective and systematic check of accuracy. It verifies that scorers are applying the same standards throughout the project and, therefore, guards against scorer drift and ultimately group drift.

Backreading is the primary tool for proactively guarding against scorer drift. Scoring supervisory staff review these responses to confirm that the scores were correctly assigned and to give customized feedback and remedial training to individual scorers. Backreading scores will override the first score.

Frequency distribution reports show a breakdown of score points assigned on a given task. Expressed in percentages, data in these reports show how often scorers, individually and as a group, assign each score point. A project may have general expectations for frequency distribution ranges, which are typically based on historical data.

Ten percent of ACT Aspire CR student responses will be read and scored independently by two different scorers. Second scoring allows scoring supervisors to closely monitor the performance of scorers, though these scores do not contribute to a student's final reported score. Supervisors will use the second scores to provide scoring inter-rater reliability statistics and monitor scorer performance.

Inter-rater reliability is the agreement between the first and second scores assigned to student responses. Inter-rater reliability measurements include exact, adjacent, and nonadjacent agreement. Scoring supervisors use inter-rater reliability statistics as one factor in determining the needs for continuing training and intervention on both individual and group levels.

The electronic scoring system is capable of purging the scores assigned by a scorer whose work is deemed substandard. Scoring supervisors can reset scores by individual scorer, date range, or item, whereby the scores assigned by an individual are cleared from the database and the affected responses are reset. The responses are then randomly rerouted to qualified scorers and rescored according to the original scoring design.

Reports used to monitor quality and project completion status are generated and updated automatically and are available to scoring supervisors at any time via the digital scoring system. The reports give daily and cumulative statistics and provide individual and group average agreement percentages. Table 19 summarizes the reports.

Calibration sets are used to reinforce range finding standards, communicate scoring decisions, or correct scoring issues and trends. The primary goal of calibration is to continue training and reinforce the scoring standards. Calibration set responses may be "on the line" between score points, or they may contain unusual examples that are challenging to score, and therefore useful for reinforcing the scoring rubric.

Table 19. Scorer Performance Reports

Report Name	Description
Daily/Cumulative Inter-Rater Reliability Summary	Group-level summary of both daily and cumulative inter-rater reliability statistics for each day of the scoring project.
Frequency Distribution Report	Task-level summary of score point distribution percentages on both a daily and a cumulative basis.
Daily/Cumulative Validity Summary	Summary of agreement for validity reads of a given task on both a daily and a cumulative basis.
Completion Report	Breakdown of the number of responses scored and the number of responses in each stage of scoring (first score, second score, resolution).
Performance Scoring Quality Management Report	Summary of task-level validity and inter-rater reliability on a daily and cumulative basis. This report also shows the number of resolutions required and completed, and task-level frequency distribution.

Appendix A: Samples of Draft ACT Readiness Standards in Science

Table A1. Sample ACT Readiness Standards in Science, Grades 3–5

Interpretation of Data	Scientific Investigation	Evaluation of Models, Inferences, And Experimental results
▪ Given data, constructs a line plot, pictograph, or simple bar graph based on that data ▪ Describes how one factor affects another factor (e.g., pushing a cart harder makes the cart travel farther) ▪ Orders data collected for multiple objects (e.g., germination rates of various seed types, height of bounce of dropped balls) ▪ Constructs a data table from collected data ▪ Constructs a line plot, pictograph, or simple bar graph from their collected data ▪ Converts a data table into a simple line graph ▪ Describes a relationship between two variables in a simple line graph	▪ Develops testable questions ▪ Identifies factors that might affect the result of a simple investigation ▪ Conducts a "fair test" by controlling a variable in a simple investigation ▪ Interprets readings from simple scientific instruments (e.g., rain gauges, scales, thermometers) ▪ Conducts simple investigations involving methods other than controlled experimentation (e.g., identifying different birds that come during different seasons, cataloguing organisms found in a particular plot) ▪ Uses multiple trials when conducting tests ▪ Identifies possible weaknesses in the design of a simple investigation ▪ Understands that investigations may involve retesting, revising the guiding questions, or changing procedures	▪ Understands that predictions and explanations may need to be changed based on additional evidence and observations ▪ Defends "I think" explanations using data ▪ Develops simple conclusions based on collected data ▪ Makes predictions based on a simple data table ▪ Identifies data that supports or does not support a simple prediction ▪ Draws simple conclusions from collected data represented in a simple chart, table, or graph

Examples of Life Science contexts

- Some animals eat: only plants, only animals, plants and animals, dead plant or animal material.
- Living things in an environment are interrelated. Changing one organism in the environment may affect many other organisms.
- Some resources are basic materials (e.g., sunlight, air, water, and soil); some are produced from basic resources (e.g., food, fuel, shelter); and some are nonmaterial (e.g., safety).

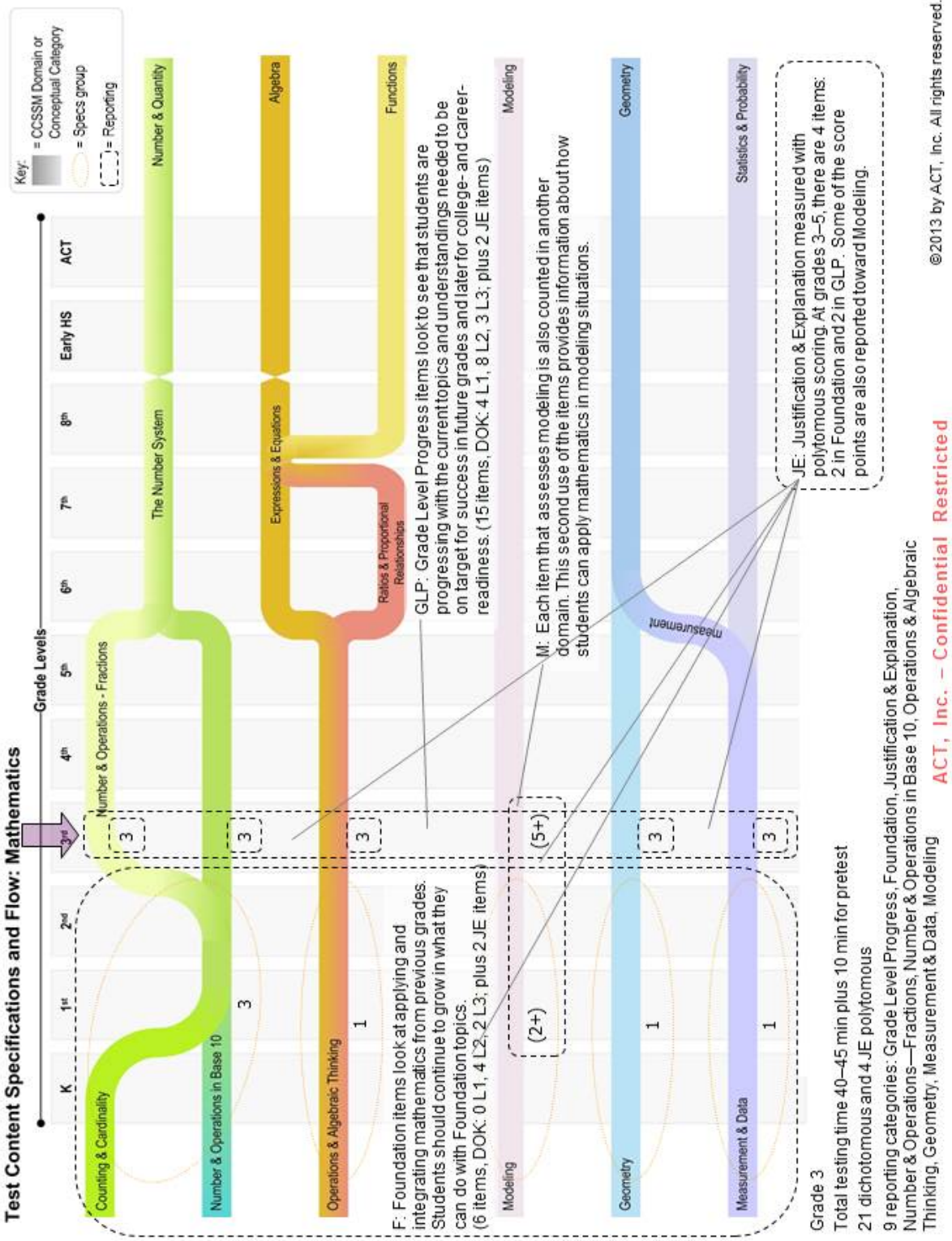
Examples of Earth and Space Science contexts

- Weather can be described by measuring quantities (e.g., temperature, wind direction and speed, and precipitation).
- Earth materials are rocks and soils, water, and the gases in the atmosphere. Their various properties can make them useful to humans (e.g., as building materials, as sources of fuel, and for growing plants).
- The surface of Earth can change over time due to slow processes (e.g., erosion and weathering) and due to rapid processes (e.g., volcanic eruptions, and earthquakes).

Examples of Physical Science contexts

- The position and motion of an object can be changed by pushing or pulling. The size of the change is related to the strength of the push or the pull.
- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented by a graph.
- Heat, electricity, light, and sound are forms of energy.

Appendix B: Illustration of the ACT Aspire Mathematics Assessments


Test Content Specifications and Flow: Mathematics
Grade Levels
K
1st
2nd
3rd
4th
5th
6th
7th
8th
Early HS
ACT
Key:
= CCSSM Domain or Conceptual Category
= Specs group
= Reporting
Counting & Cardinality
Number & Operations - Fractions
Number & Quantity
The Number System
Number & Operations in Base 10
3
3
3
Operations & Algebraic Thinking
1
3
Ratios & Proportional Relationships
Expressions & Equations
Algebra
Functions
F: Foundation items look at applying and integrating mathematics from previous grades. Students should continue to grow in what they can do with Foundation topics. (6 items, DOK: 0 L1, 4 L2, 2 L3; plus 2 JE items)
GLP: Grade Level Progress items look to see that students are progressing with the current topics and understandings needed to be on target for success in future grades and later for college- and career-readiness. (15 items, DOK: 4 L1, 8 L2, 3 L3; plus 2 JE items)
Modeling
(2+)
(5+)
Modeling
M: Each item that assesses modeling is also counted in another domain. This second use of the items provides information about how students can apply mathematics in modeling situations.
Geometry
1
3
Geometry
Measurement & Data
1
3
Measurement
Statistics & Probability
JE: Justification & Explanation measured with polytomous scoring. At grades 3–5, there are 4 items: 2 in Foundation and 2 in GLP. Some of the score points are also reported toward Modeling.
Grade 3
Total testing time 40–45 min plus 10 min for pretest
21 dichotomous and 4 JE polytomous
9 reporting categories: Grade Level Progress, Foundation, Justification & Explanation, Number & Operations—Fractions, Number & Operations in Base 10, Operations & Algebraic Thinking, Geometry, Measurement & Data, Modeling
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