

Lessons Learned from Scoring Student Work: 2018 – 2024

Introduction

Rangefinding, scoring, and reviewing data for Washington Comprehensive Assessment of Science (WCAS) questions provides opportunities to see thousands of student responses and evaluate data summarizing student performance. The Science Assessment Team would like to share observations from educator work groups about student responses and suggest actions that may improve student ability to demonstrate what they know and can do on the WCAS.

The WCAS measures the level of proficiency Washington students have achieved based on the [*Washington State 2013 K–12 Science Learning Standards*](#). The standards are the *Next Generation Science Standards* (NGSS) and are organized into four domains: Physical Sciences; Life Sciences; Earth and Space Sciences; and Engineering, Technology, and the Applications of Science. Each domain has three-dimensional Performance Expectations (PEs) that integrate science and engineering practices, disciplinary core ideas, and crosscutting concepts. Each WCAS question is aligned to two or three of those dimensions. Some WCAS questions have more than one part. For example, a question can have a part A that is multiple choice and a part B that is a multiple select. Multi-part questions are often needed to ensure a question is aligned to at least two dimensions of a PE. Multi-dimensional learning, teaching, and assessment in the classroom supports student success on WCAS questions.

Students should be familiar with the functionality of the question types used on the WCAS. The question types include multiple-choice, multiple-select, matching items, editing task inline choice, hot text, table input, grid items (graphing, drag and drop), simulation response, and short-answer. To support student understanding of how to respond to the different question types, the Tutorial can be viewed. Testing data shows approximately 1 in 5 students use the tutorials during the assessment.

Although the functionality and item types on the WCAS are similar to those on the Smarter Balanced English language arts (ELA) and mathematics assessments, there are a few differences. One difference is collapsing stimuli (information sections). Collapsing stimuli are used to ensure that once a stimulus is presented to a student, that stimulus is readily available as the student navigates through a cluster. Another difference is locking. The locking of questions allows subsequent questions or stimuli to update the student with correct information, which helps prevent students from carrying errors forward to the next questions. The locking of questions also limits clueing among questions in a cluster. Students cannot change their answer to these questions once they have moved to a different question. The student can return to the locked question to view the question and their answer. Data describing the difficulty of questions shows that students find questions following a locked question to be easier than the locked question, demonstrating that students are able to use the update with the correct information to continue answering questions in the cluster.



The WCAS Training Tests, available through the [WCAP Portal](#), should be used with students to familiarize them with the functionalities of locking questions, collapsing stimuli, and tools available on the WCAS. The Training Tests provide examples of most of the question types.

WCAS Training Test Lesson Plans and Videos for grades 5, 8, and 11, and the *WCAS Training Test Quick Start Guide* are posted on the [WCAS Educator Resources webpage](#). The lesson plan documents describe how to practice engaging with the different question types and using the embedded tools with students. The lesson plans also provides answer keys to training test questions and additional scoring information. The videos show educators how following the lesson plans could look for a Guest User. The quick start guide describes how to access the training tests as a Guest User or through the secure browser.

Starting with the Spring 2024 administration of the WCAS, the *Lessons Learned* document was created by combining all previous years' *Lessons Learned* documents. With each round of item development, field testing, and test administration, we will annually update and expand on the observations shared.

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General Observations

- Students should be encouraged to attempt every question on the WCAS. There is no penalty for guessing; on a question worth two points, students can earn zero, one, or two points.
- Students need to read a stimulus section thoroughly when it is presented in a cluster.
 - Stimulus sections can include information in the form of text, diagrams, graphs, tables, and/or animations that provide evidence that is used in questions. Students are encouraged to return to stimulus sections and re-read the information as needed.
 - Locking questions provide opportunities for students to use the new information instead of carrying forward misconceptions through a cluster.
 - Many types of devices with different-sized screens are used for online testing. To ensure that students see all material available for every stimulus section and every question, encourage students to:
 - Collapse and expand stimulus sections and questions to access information (tables, diagrams, text, etc.).
 - Scroll up, down, left, and right when interacting with stimulus sections and questions to not miss any information.
 - Use the Zoom tool to enhance the viewing of information.
 - Students should be prepared to combine information from more than one stimulus section within a cluster when answering a question.
 - When students are referred to specific tables, diagrams, graphs, etc. within a question, they should refer to the information in those tables, diagrams, graphs, etc. when answering the question.
- The parts of a multi-part question work together to achieve two- or three-dimensional alignment to a performance expectation. Multi-part questions can be worth one or two points.
 - Refer to the following one-point WCAS Training Test questions. For each question, notice how closely part B is connected to part A.
 - Grade 5: Question 4; Question 10; Question 11
 - Grade 11: Question 1; Question 3
 - Refer to the following two-point WCAS Training Test questions. In each of these questions, part A and part B work together to achieve two- or three-dimensional alignment to a performance expectation. However, the answer to part B does not depend on the answer to part A, so each part is worth one point.
 - Grade 5: Question 2
 - Grade 8: Question; Question 2
 - Grade 11: Question 2; Question 6; Question 7; Question 10

- Read directions carefully and answer each question thoroughly. Specific directions are included in some questions like drag and drop or matching items. Following those directions can help a student earn the point for a question. For example:
 - A matching item direction could include: “More than one box in each row may be selected.” This direction could help a student realize that they are not limited to one “check” per row.
 - A drag and drop item direction could include: “Move only one label into each box”. This direction could help ensure that the student’s answer can be interpreted by the scoring rubric as the student intended. If a student drags multiple labels into a box, the answer on top is scored. Students should place answer labels only in designated answer space(s). Refer to the following WCAS Grade Training Test questions. Notice the extra directions above the drag and drop answer space.
 - Grade 5: Question 4
 - Grade 8: Question 4
 - Grade 11: Question 2
- Students should be encouraged to complete an entire question before moving on. Students are required to interact with each question part at least once to move to the next question. The only exceptions are multiple select items, where students must make the specified number of selections before moving on, and editing task inline choice items, where every drop down must have a selection.
- Students should read all parts of a short answer question very carefully, ensuring their response addresses all parts of the question, including any bulleted directions. Students sometimes only address the first sentence or the first bulleted direction of a short answer question. Students sometimes write true statements that do not answer the question being asked. Encourage students to re-read the question and confirm that their response is a complete answer to that question. Refer to the following WCAS Training Test questions. Notice the bulleted directions above the answer box.
 - Grade 5: Question 9
 - Grade 11: Question 12
- Students should avoid vagueness in short answer responses. For example:
 - If a student response includes “size of the sample,” the word “size” could mean volume, mass/weight, area, number, etc.
 - If a student response includes “the number of organisms changes,” the word “changes” could mean increase or decrease.

- When asked to select the best solution to a problem based on evidence, students should make a complete comparison.
 - Refer to Grade 5: Question 8 on the WCAS Training Test and compare the following two responses for students who both chose “Dig a ditch.”
 - Student says: “The ditch is slower to install, but it costs less than the gate and lasts longer than just placing sandbags.” This student has written a complete comparison.
 - Student says: “The gate costs too much and the ditch is the slowest to install.” This is an incomplete comparison—scorers cannot infer the student’s reasoning.
- Refer to the *WCAS Training Test Hand Scoring Materials* on the [WCAS Educator Resources](#) webpage for additional information on student short answer responses.

Observations for Grade 5

- Students would benefit from additional practice with discussions about systems, functions of systems, inputs and outputs of systems, and how a change to one part of a system might affect the entire system.
- Students would benefit from additional practice interpreting and using evidence to support a claim, description, explanation, argument, and/or prediction. Some examples of evidence are similarities and differences among variables, or patterns observed in data tables, graphs, models, or diagrams.
- Students would benefit from additional practice using information from different formats to construct an explanation. For example, compiling information from text, animations, tables, models, etc. to order the steps in a process or to describe weather patterns.
- Students would benefit from additional practice interpreting diagrams, including those with keys, and graphs including units of measurement.
- Students would benefit from additional practice modeling particles too small to be seen and describing how particles mix compared to particles combining to form a new substance.
- Students would benefit from additional practice distinguishing among independent (manipulated), dependent (responding), and controlled variables when given a description of, or data from, an experiment.
- Students would benefit from additional practice using evidence (e.g., from patterns in rock formations, fossils, distribution of water) to describe changes to Earth’s features over time.
- Students would benefit from additional practice using models of orbits in the solar system to explain observable patterns on Earth, such as day and night, changes in shadows, and the position of celestial objects at different times.
- Students struggle with criteria and constraints when analyzing solutions to a design problem. Students would benefit from additional practice using the terms criteria and constraint, determining how well a solution meets the given criteria for a successful solution, and how a given constraint affects the outcomes of a solution.

- Students struggle when distinguishing between particles of matter (e.g., air, water) and energy (e.g., light) when asked about the cycling of matter or the flow of energy within or among systems.
- Students struggle with modeling the movement of matter in an ecosystem using a food web and the roles of producers, consumers, and decomposers.
- Students struggle with using patterns to describe cause and effect relationships in systems where unbalanced forces on an object change the motion of the object. This includes contact forces and simple wave properties as well as non-contact forces like electric and magnetic forces. Students would benefit from additional practice describing transfers and transformations of energy in a system.
- Students would benefit from additional practice modeling how internal and external macroscopic structures of plants and animals support survival, growth, behavior, and reproduction.

Observations for Grade 8

- Students would benefit from additional practice with interactions within a system and between systems, inputs and outputs within systems, and how a change to an input of an open system might affect the entire system.
- Students would benefit from additional practice interpreting and using evidence to support a claim, description, explanation, argument, and/or prediction. Some examples of evidence are relationships among variables from data tables or changes in graphs, models, and diagrams. Students would also benefit from practice distinguishing between statements which are true and statements which are true and support a specific claim.
- Students struggle with criteria and constraints when analyzing solutions to a design problem. Students would benefit from additional practice using the terms criteria and constraint, practice describing criteria for a successful solution, practice describing possible constraints on the success of a solution, and practice explaining how a constraint limits the success of a solution.
- Students would benefit from additional practice distinguishing among independent (manipulated), dependent (responding), and controlled variables when given a description of, or data from, an experiment.
- Students struggle to identify the direction of thermal energy flow between two objects with different temperatures.
- Students would benefit from additional practice using models to show how matter and energy are conserved during chemical reactions, including reactions with changes of state.
- Students would benefit from additional practice distinguishing between the inputs and outputs of cellular respiration and photosynthesis, as well identifying the importance of both processes to plants and animals.

- Students would benefit from additional practice describing changes to populations over time, including due to environmental changes, to clarify between effects to individuals versus the population of organisms.
- Students would benefit from additional practice making observations at different scales. For example, describing microscopic changes that cause a macroscopic change in a system, and using graphs and diagrams to describe the relative sizes or ages of objects in space.
- Students struggle with cause and effect relationships when describing forces and changes in motion during and after a collision.
- Students would benefit from practice with using models to show relationships between objects at various time and spatial scales (e.g., weathering and deposition).
- Students would benefit from additional practice using geologic evidence and hands-on models to support claims about Earth's history and geologic processes.
- Students would benefit from additional practice interpreting diagrams and graphs, including those with keys, to identify evidence that supports claims and explanations.
- Students would benefit from practice modeling connections between changes of state and changes in thermal energy.

Observations for Grade 11

- Students would benefit from additional practice with discussions about interactions within a system and among systems, subsystems, boundaries, inputs and outputs between systems, how a change to an input of an open system might affect the entire system, inputs and outputs of positive and negative feedback systems, and limitations of a model in making predictions about a system.
- Students would benefit from additional practice interpreting and using evidence to support a claim, description, explanation, argument, and/or prediction. Some examples of evidence are mathematical relationships among variables, such as proportional, inverse, direct, and indirect, relationships derived from data tables, graphs, models, or diagrams, and student's own experiences.
- Students struggle with criteria and constraints when analyzing solutions to a design problem. Students would benefit from additional practice using the terms criteria and constraint, describing quantitative and/or qualitative criteria for a successful solution and whether a solution meets criteria for success, describing the quantitative and/or qualitative constraints on the success of a solution, and how a constraint could limit the success of a solution.
- Students would benefit from additional practice using information from different formats to construct an explanation. For example, compiling information from text, animations, tables, models, etc. to order the steps in a process or the steps leading to a solution to a problem.
- Students would benefit from additional practice describing energy inputs, outputs, flows, transformations, and conservation within a system or among systems.

- Students would benefit from additional practice explaining the distribution of traits in a population, how some traits can lead to differences in performance among individuals, and how the distribution of traits changes over time.
- Students struggle to describe the cycling of matter and flow of energy in different scenarios, such as between Earth's systems, between trophic levels in an ecosystem, and in photosynthesis and cellular respiration.
- Students would benefit from additional practice describing chemical reaction systems based on changes in total bond energy, as well as describing changes to reaction systems at equilibrium to influence reaction rates.
- Students would benefit from analyzing relationships among variables from formulas like the gravitational or electrical force formulas or analyzing patterns in data tables.
- Students would benefit from additional practice using patterns from the periodic table or patterns in chemical properties to provide evidence to support claims, make predictions, or describe relationships among components of a system.
- Students would benefit from additional practice distinguishing among independent (manipulated), dependent (responding), and controlled variables when given a description of, or data from, an experiment. Students would also benefit from additional practice identifying potential sources of error in investigations and how sources of error could impact results.
- Students would benefit from additional practice with modeling relationships for, or analyzing data about, Earth's internal and surface processes at different scales (e.g., cycling of seafloor at ocean trenches, ocean acidification).
- Students would benefit from additional practice using geologic evidence and process (e.g., radioactive decay, meteorite impacts) to support claims about Earth's early history.