

# 2017-2018: Lessons Learned from Scoring Student Work

## Introduction

Rangefinding, scoring, and reviewing data for Washington Comprehensive Assessment of Science (WCAS) items provided the opportunity to see thousands of student responses at each grade and to evaluate data summarizing student performance. The Science Assessment Team would like to share observations about student responses.

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 item is aligned to two or three of those dimensions. Multi-dimensional learning, teaching, and assessment in the classroom supports success on multi-dimensional WCAS items.

This *Lessons Learned from Scoring Student Work* document lists actions to improve student ability to demonstrate understanding of the science standards on the state science assessment. Because each item on the WCAS is aligned to two or three dimensions of a PE, it is sometimes challenging to pinpoint the reasons behind student performance. For example, is it the application of the science and engineering practice, the disciplinary core idea, or the crosscutting concept that causes students to miss a particular question, or a combination of these three dimensions?

Students should be familiar with the functionality of the item types used on the WCAS. The item types include: multiple-choice, multiple-select, matching items, editing task with choice, hot text, table input, grid items (graphing, drag and drop), simulation response, and short-answer. Some WCAS items have more than one part. For example, an item can have a part A that is multiple-choice and a part B that is a multiple-select. Multi-part items are often needed to achieve alignment to at least two dimensions of a PE.

Although the item types and functionality 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. 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 items. The locking of items also limits clueing among questions in a cluster. Students cannot change their answer to these questions once they have moved on to the next question.



The WCAS Training Tests, available through the [WCAP Portal](#), provide practice with most of the available item types. An Online Training Test Support document (no longer available) is posted on the [Science Assessment web page](#). The document provides information about accessing the training tests, descriptions of ways to practice using the tools for each item type, an answer key, and other information for each item. Students should also use the training tests to become comfortable with the locking item and collapsing stimuli functionalities. Currently, students should practice with all three training tests (Grade 5, Grade 8, and Grade 11) to experience the greatest variety of test functionalities. As the WCAS item bank expands, the science team will be able to add more material to the training tests, and more item types will be included at each grade level.

Students should be encouraged to make an attempt at every item on the WCAS. There is no penalty for guessing. Partial credit can be earned on many multi-part and short-answer items.

This *Lessons Learned* document is updated annually. With each round of item development, field testing, and test administration, we will update and refine the observations shared.

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## General Observations: Grade 5, Grade 8, Grade 11

- Students need to read a stimulus thoroughly when it is presented in a cluster.
  - Stimuli include information in the form of text, diagrams, graphs, tables, and/or animations that provide evidence that is used in items.
  - Many types of devices with different sized screens are used for online testing. To ensure that students see all material available for every stimulus and every item, encourage students to:
    - Collapse and expand stimuli and items to access information (tables, diagrams, text, etc.).
    - Scroll up and down, left and right, when interacting with a stimuli and items so as not to miss any information.
    - Use the Zoom tool to enhance viewing of diagrams, graphs, etc.
  - Students should be prepared to combine information from more than one stimulus within a cluster when answering a question.
  - When students are referred to tables, diagrams, graphs, etc. within an item, the information should be used to get to the answer.
  
- 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 1 or 2 points.
  - Refer to the WCAS Grade 5 [Training Test](#), Item 8. Notice how closely part B is connected to part A in this 1–point item. For information on how to access the WCAS Training tests see the Science Online Training Test Support Guide (no longer available).
  - Refer to the WCAS Grade 8 [Training Test](#), Item 1. Part A and part B work together to achieve 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.

- Read directions carefully and answer each item thoroughly. Specific directions are included in some technology-enhanced items like drag and drop or matching items. Following those directions can help a student earn the point for an item. For example:
  - A matching item direction could include: “More than one box in each row can 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 WCAS Grade 8 [Training Test](#), Item 2. Notice the extra directions above the drag and drop answer space.
- Students should be encouraged to complete an entire item before moving on. Students are required to interact with each item part at least once to move to the next item. The only exceptions are multiple-select items where students make the specified number of selections before moving on and editing task inline choice items where every drop down must have a selection.
  - The answer to a locking item cannot be changed once a student moves on from that item, so students should answer a locking item thoroughly before moving on.
- Students should read all parts of a short answer item very carefully—ensuring that the 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 item.

- Students should avoid vagueness in short answer responses. For example:
  - If a student response includes “amount of atoms,” that could mean number of atoms or mass of atoms.
  - If a student response includes “size of the sample,” that could mean volume, mass, area, number, etc.
  - If a student response includes “the number of organisms changes,” that could mean increase or decrease.
  
- When providing evidence from a given data table, students should use the exact evidence in the table, avoiding a summary or rewording of the evidence.
  
- When asked to select the best solution to a problem, based on evidence, students should make a complete comparison. Refer to the WCAS Grade 5 [Training Test](#), Item 6. Sample full-credit responses for this item include:
  - The student chooses “Add a gate”, and their description is: *The solution has a higher cost than the ditch and sandbags, but will last 100 years which is longer than the other two solutions. The time to install the gate is between the other two solutions.*
  - The student chooses “Dig a ditch”, and their description is: *Although the ditch takes the most time to install, the ditch lasts longer than the sandbags but not as long as a gate. The ditch costs more than the sandbags but less than the gate.*
  - The student chooses “Place sandbags”, and their description is: *Sandbags are the fastest to put in and have the lowest cost, even though they only last a year which is lower than the ditch and gate.*

## 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 using evidence to support a claim, description, explanation, argument, 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 scientific process or the steps leading to a solution to a problem.
- Students struggle with criteria and constraints when analyzing solutions to a design problem. Students would benefit from learning what the terms criteria and constraint mean and from practice determining how well a solution meets the given criteria for a successful solution and how a given constraint limits the success of a solution. Refer to the WCAS Grade 5 [Training Test](#), Item 6.
- When asked about the cycling of matter or the flow of energy within or among systems, students struggle when distinguishing between what is matter (e.g., air) and what is energy (e.g., light). Students also struggle with modeling the movement of matter in a system using a food web.
- Students struggle with cause and effect relationships when connecting balanced and unbalanced forces on an object to changes in the motion of the object. This includes contact forces as well as non-contact forces like electric and magnetic forces.

## Observations for Grade 8

- Students would benefit from additional practice with interactions within a system and among systems, subsystems, inputs and outputs between 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 and mathematical relationships from data tables, graphs, models, and diagrams.
- Students struggle with criteria and constraints when analyzing solutions to a design problem. Students would benefit from: learning what the terms criteria and constraint mean; practice describing criteria for a successful solution; practice describing the 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 practice with using models to show how matter and energy are conserved during chemical reactions.
- Students would benefit from 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 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.
- 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.
- Students would benefit from additional practice using geologic patterns as evidence to support claims about Earth's history and processes.

## 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 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 relationships among variables, mathematical relationships derived from data tables, graphs, models, or diagrams, and student's own experiences.
- 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 scientific process or the steps leading to a solution to a problem.
- Students struggle with criteria and constraints when analyzing solutions to a design problem. Students would benefit from: learning what the terms criteria and constraint mean; practice describing quantitative and/or qualitative criteria for a successful solution and whether a solution meets criteria for success; practice 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 describing energy inputs, outputs, flows, transformations, and conservation within a system or among systems.
- Students struggle to describe the movement of matter and flow of energy between Earth's systems as well as the transformation of energy for both photosynthesis and cellular respiration.
- Students demonstrate the ability to describe mathematical relationships among variables given a mathematical equation, but would benefit from practice using given equations in calculations. For example, calculating the frequency of a wave when given the wavelength and speed of the wave, or calculating the amount of thermal energy transferred into or out of a system when given mass, temperature change, and specific heat data.
- 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.