ARIZONA SCIENCE TEST

AzSCI Item Specifications Grade Band 3–5

Created October 2021; updated November 2022
Prepared by the Arizona Department of Education

Table of Contents

Introduction

The Arizona Statewide Achievement Assessment for Science (AzSCI) is Arizona's statewide science achievement test. AzSCI assesses the Arizona Science Standards (AzSS) adopted by the Arizona State Board of Education in 2018. AzSCI is a computer-based assessment that allows for the use of a variety of innovative item types where students can apply critical thinking skills to demonstrate a deeper understanding of the three dimensions of the Arizona Science Standards.

During the item-development process, all AzSCI items are written in accordance with the Item Specifications and are reviewed and approved by a committee of Arizona educators to confirm alignment and appropriateness for inclusion in the test. AzSCI item review committee members are generally representative of Arizona's geographic regions and culturally diverse population. Items are reviewed for the following kinds of bias: gender, racial, ethnic, linguistic, religious, geographic, and socioeconomic. Item reviews also include consideration of issues related to individuals with disabilities. Arizona community members also have an opportunity to review items for issues of potential concern to members of the community at large. Reviewers are asked to consider the variety of cultural, regional, philosophical, political, and religious backgrounds throughout Arizona, and then to determine whether the subject matter will be acceptable to Arizona students, families, and other members of Arizona communities.

The AzSCI Item Specifications provide resource documents that define the content and format of the test and test items for item writers and reviewers. Each Item Specifications document indicates the alignment of items with the Arizona Science Standards. It also serves to provide all stakeholders with information about the scope and function of assessment items. This document can also serve to assist educators in understanding how assessment items are developed in alignment with the standards for science.

These item specifications for AzSCI are intended to provide information regarding standards, item formats, and response types. The descriptions of blueprints and cognitive complexity in this document are meant to provide an overview of the test. Item specifications are meant for the purposes of assessment, not instruction. They are not intended to be tools for instruction or the basis for curricula. AzSCI has a test blueprint that was developed by Arizona and is different from any other state or consortium test blueprint.

Standards Description

Purpose of the Arizona Science Standards

The Arizona Science Standards present a vision of what it means to be scientifically literate as well as college and career ready. These standards outline what all students need to know, understand, and be able to do by the end of high school, and reflect the following shifts for science education:

- Organize standards around thirteen core ideas and develop learning progressions to coherently and logically build scientific literacy from kindergarten through high school.
- Connect core ideas, crosscutting concepts, and science and engineering practices to make sense of the natural world and understand how science and engineering are practiced and experienced.
- Focus on fewer, broader standards that allow for greater depth, more connections, deeper understanding, and more applications of content.

Core Ideas

AzSCI examines students' performance of scientific and engineering practices in the context of core ideas and crosscutting concepts. Although described separately, they generally function in concert. The ten core ideas for Knowing Science center on understanding the causes of phenomena in physical, Earth and space, and life science. The three core ideas for Using Science connect scientific principles, theories, and models; engineering and technological applications; and societal implications to the content knowledge in order to support that understanding.

Core Ideas for Knowing Science		Core Ideas for Using Science
Physical Science P1: All matter in the Universe is made of very small particles. P2: Objects can affect other objects at a distance. P3: Changing the movement of an object requires a net force to be acting on it. P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event. **Earth and Space Science** E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate. E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe. **Life Science** L1: Organisms are organized on a cellular basis and have a finite life span. L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms. L3: Genetic information is passed down from one generation of organisms to another. L4: The unity and diversity of organisms, living and extinct, is the result of evolution. *Adapted from ***Working with Big Ideas in Science Education***[2]		U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

Scientific and Engineering Practices (SEPs)

The science and engineering practices (SEPs) describe a robust process for how scientists investigate and build models and theories of the natural world or how engineers design and build. These practices reflect science and engineering as they are practiced and experienced.

The SEPs are grouped into eight categories, each describing how students should engage in the practices used by scientists and engineers. Each SEP is grouped into a practice type subcategory: sensemaking, investigating, or critiquing. Students engage in all eight of the SEPs throughout each grade band. As students progress from the lower to the upper grades, the complexity and sophistication of the SEPs increase in order to reflect the progression in students' abilities to use each practice and in their increased understanding of the core ideas.

SEP	Science and Engineering Practice	SEP Reporting Category
INV	Planning and Carrying Out Investigations	Investigating
Q/P	Asking Questions and Defining Problems	Investigating
MCT	Using Mathematical and Computational Thinking	Investigating
DATA	Analyzing and Interpreting Data	Investigating**
MOD	Developing and Using Models	Sensemaking
E/S	Constructing Explanations and Designing Solutions	Sensemaking
ARG	Engaging in Argument from Evidence	Critiquing
INFO	Obtaining, Evaluating, and Communicating Information	Critiquing

**Assessment purpose only.

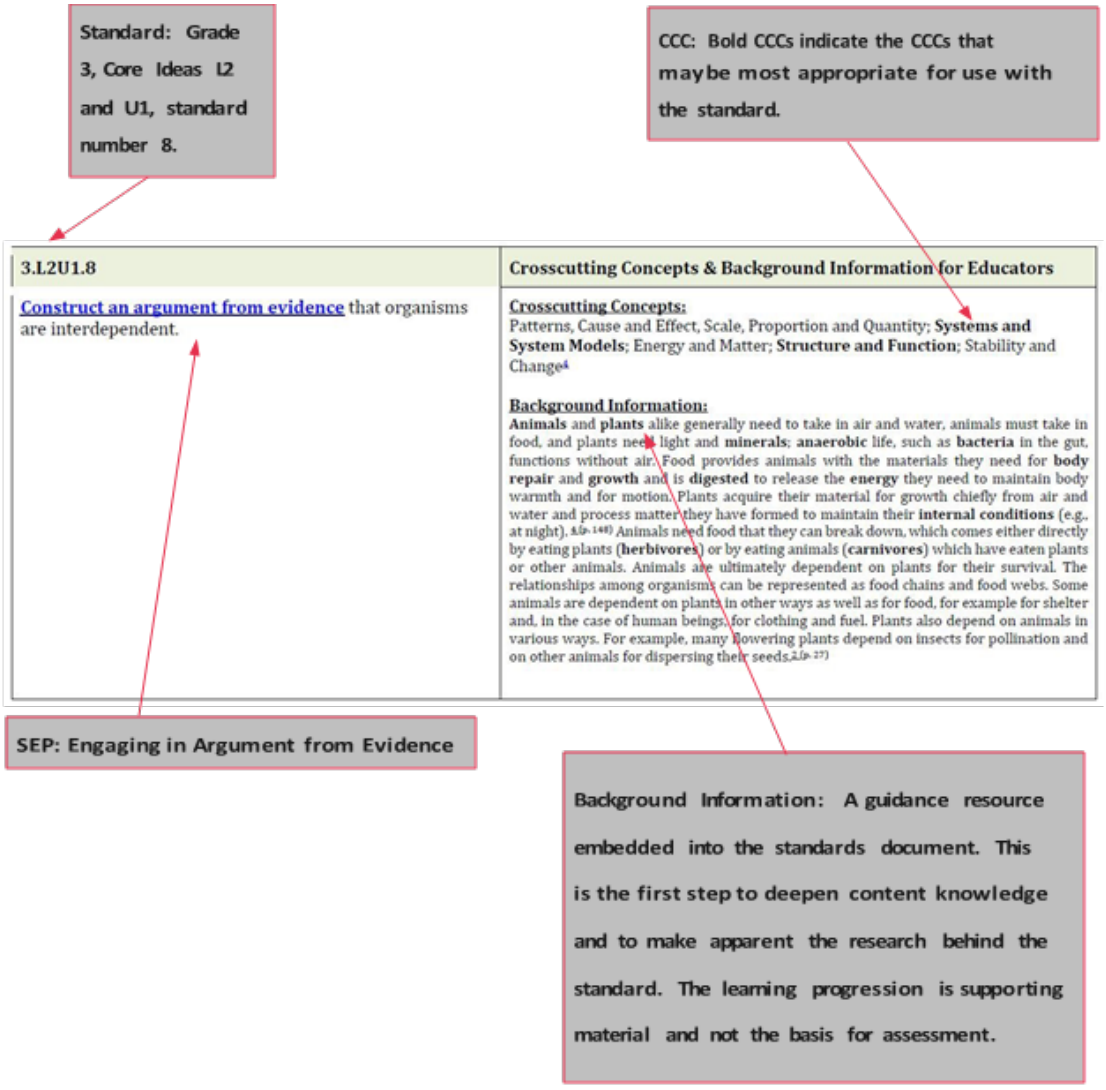
Crosscutting Concepts (CCCs)

Crosscutting concepts (CCCs) cross boundaries between science disciplines and provide an organizational framework to connect knowledge from various disciplines into a coherent and scientifically based view of the world. They build bridges between science and other disciplines and connect core ideas and practices throughout the fields of science and engineering. Their purpose is to provide a lens to help students deepen their understanding of the core ideas as they make sense of phenomena in the natural and designed worlds. The CCCs are applied across all domains of science and act as a mechanism for linking the different domains. Throughout each grade band, students will engage in all seven CCCs. As with the SEPs, the complexity and sophistication of the CCCs will increase as students increase their understanding of the core ideas while moving from the lower to the upper grades.

CCC	Crosscutting Concept	CCC	Crosscutting Concept
PAT	Patterns	E/M	Energy and Matter
C/E	Cause and Effect	S/F	Structure and Function
SPQ	Scale, Proportion, and Quantity	S/C	Stability and Change

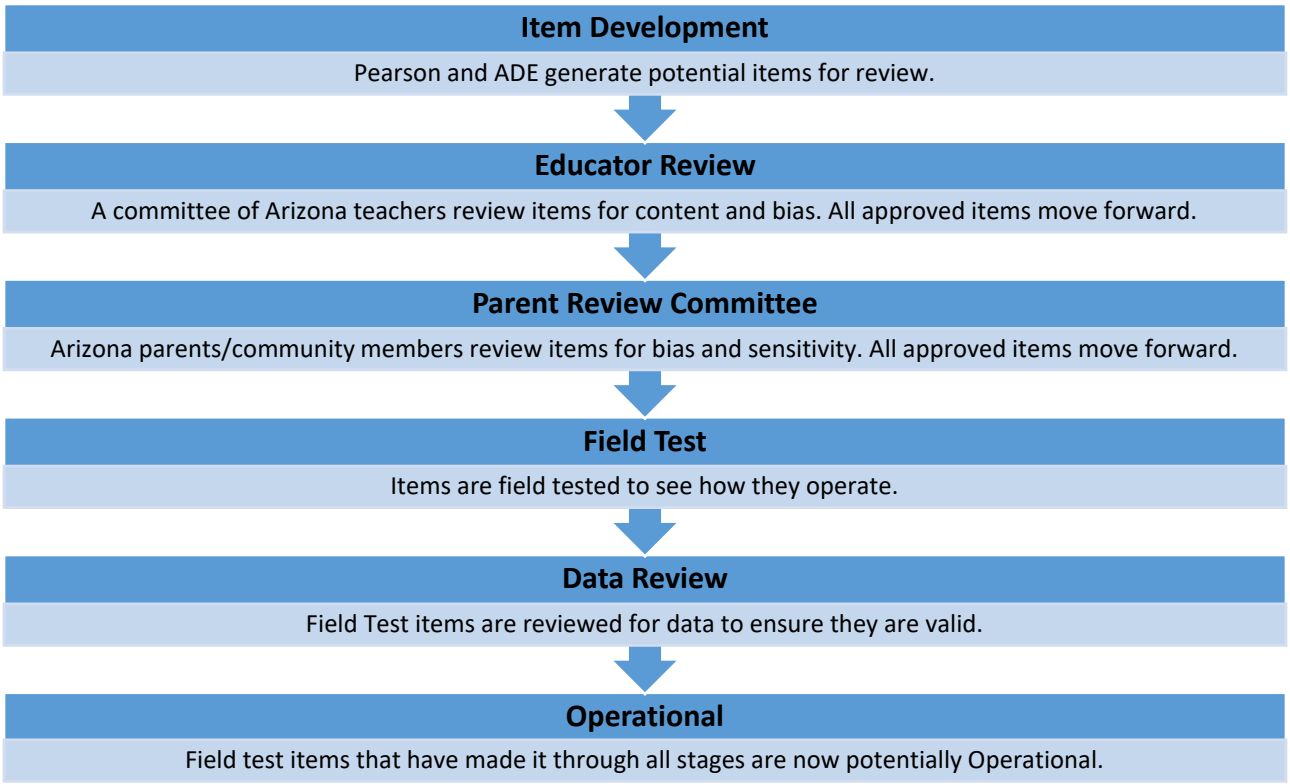
CCC	Crosscutting Concept	CCC	Crosscutting Concept
SYS	System and System Models		

Coding and Navigating the Standards



Item Development Process

AzSCI items go through a rigorous review before they are operational. When an item is "operational" it means it is used to determine a student's score on the assessment. This is a description of the process every item must go through before it is operational on AzSCI.



Sample tests are available online for the science portion of AzSCI. To access the AzSCI Sample Tests, go to: https://home.testnav.com/, select "Arizona," and then select "Mic Check and Sample Tests."

Test Design and Blueprint Tables

AzSCI is a grade-band assessment where each of the Core Ideas is assessed in each grade band, 3–5, 6–8, and high school. The new assessment consists of a combination of independent and cluster items. AzSCI will ask students to do more than answer recall questions about science; they will apply the practices, or behaviors, of scientists and engineers to investigate each real-world phenomenon and design solutions to problems.

Each assessment form is composed of 60 items. There are three test units with 20 items in each unit. The approximate time for each test unit is 60 minutes.

The 2018 Arizona Science Standards were developed using a three-dimensional approach to K–12 science education that captures students' interests and provides them with the necessary foundational knowledge for basic proficiency and continuing study in science.

AzSCI Blueprint

AzSCI identifies what it means to be proficient in science; it rests on a view of science as both a body of knowledge and an evidence-based, model- and theory-building enterprise that continually extends, refines, and revises knowledge. AzSCI reflects the three dimensions that are combined to form each standard and item. The construction of the AzSCI assessment is guided by the depth and rigor of the Arizona Science Standards. Items are created to address key components of the standards and assess a range of important skills. The AzSCI Blueprint provides an overview of the distribution of items on the AzSCI according to the standards. The standards for SEPs and CCCs are embedded within all AzSCI items. Further, the AzSCI blueprint outlines the Depth of Knowledge (replaced with the Task Analysis Guide in Science [TAGS]), SEP and CCC coverage, and distribution of items.

AzSCI Assessment Grade Band 3–5 Blueprint

Domain	Percent Range
Science and Engineering Practices and Crosscutting Concepts in Physical Sciences	40%–48%
Science and Engineering Practices and Crosscutting Concepts in Life Sciences	28%–36%
Science and Engineering Practices and Crosscutting Concepts in Earth and Space Sciences	20%–28%

Every standard in each grade band will be assessed over a three-year period.

AzSCI TAGS

Task	Percent Range
Doing tasks	0%–5%
Guided tasks	66%–84%
Scripted tasks	16%–28%

SEP Coverage

Practice	Percent Range
Investigating	20%–42%
Sensemaking	26%–42%
Critiquing	20%–34%

Investigating Practices	Sensemaking Practices	Critiquing Practices
Asking Questions and Defining Problems	Developing and Using Models	Engaging in Argument from Evidence

Investigating Practices	Sensemaking Practices	Critiquing Practices
Planning and Carrying Out Investigations	Constructing Explanations and Designing Solutions	Obtaining, Evaluating, and Communicating Information
Using Mathematical and Computational Thinking		
Analyzing and Interpreting Data***		

***Assessment Reporting Categories for Science Engineering Practices (SEP) may vary.

Cognitive Complexity

Conventional cognitive complexity models, such as Depth of Knowledge (DOK), evaluate based on individual cognitive actions (memorization, application, evaluation, and analysis). This works well with one-dimensional standards. This does not work as well with multidimensional standards, such as the Arizona Science Standards, because each dimension being assessed could have its own cognitive level. To sufficiently evaluate a student's range of proficiency, Arizona needed a scale that goes beyond a singular focus and takes into account three-dimensionality.

The Task Analysis Guide in Science (TAGS) was developed for classroom use to evaluate cognitive demand with integration of practices and content (see Tekkumsu-Kisa, Stein, & Schunn, *A Framework for Analyzing Cognitive Demand and Content-Practices Integration: Task Analysis Guide in Science [TAGS],* 2015). The classroom model is now being adapted for use on assessments (see Center on Standards and Assessment Implementation, *Cognitive Loading in Three-Dimensional NGSS Assessment: Knowledge, Skills, and Know-How,* 2019).

Arizona modified these models for the AzSCI assessment in order to more accurately recognize that cognitive demand increases as the number of integrated dimensions increases.

AZ Task Analysis Guide in Science

TAGS	Az TAGS Example	TAGS Coding	
		Students must use 2 Dimensions	Students must use 3 Dimensions
Doing Science Tasks: Students are required to DO science by using practices to DEVELOP an understanding of a scientific or engineering phenomenon. Students must develop a model, explanation or argument from raw data or information. Students must be able to determine which data or information is appropriate and how to use it.	Doing Science items will typically not direct the students to specific information to use. *Use the information to explain the patterns observed.* OR *Which graph best represents the changes in X?* (Students then must look through all information/tabs to determine what information is relevant.)	D2	D3
Guided Science Tasks: Students use higher-level thinking to work through guided or scaffolded tasks. Students are told what information (model, data etc.) to use or are provided with information and then required to develop the actual answer.	Guided items will typically direct the students to the information to use (Tab 2, Graph 1, etc.), but the method for completing the task is left for the student to develop/ determine with minimal if any further instruction. *Based on Graph 1, which statement explains when X event will happen?*	G2	G3
Scripted Science Tasks: Students follow a script (defined actions or procedure) to complete a task.	Scripted items will typically direct the student to the information to use (Tab 1, Table 1, etc.) AND provide a set of well-defined actions or procedures to perform in order to complete a given task. Drag and drop (*Drag the arrows to complete the food chain*), hot spots, etc.	S2	S3

These models are intended to enable a user to navigate AzSCI items and focus on how to use the principle of developing AzSCI Item Sets and Item Types.

Item Sets and Item Types

An item set is a group of items that share the same stimulus centered on a specific science and/or engineering phenomenon. The AzSCI assessment uses two different types of item sets: independent and cluster. Sets of questions assess student application of knowledge across the domains of science for a comprehensive picture of student readiness for their next grade or course in science.

Independent Item Set	Cluster Item Set
Aligns to at least one standard	Aligns to at least one standard
Three or more associated items	Five associated items
Items must function independently and do not need to be related.	All five items will be placed on the same form and should work together to show understanding of the phenomena.
Items can target various difficulty levels.	Avoid large differences in difficulty levels of items within a cluster set of five items.
Stimulus has a maximum of two tabs.	Stimulus has a maximum of four tabs.

Item Types

AzSCI assessments are composed of item formats that include traditional multiple-choice response items (MC) and technology-enhanced response items (TEI).

For paper-based assessments (including those for students with an IEP or 504 plan that specifies a paper-based accommodation), TEIs will be modified so that they can be key-entered and scored electronically.

Item Type	Specifications
Multiple Choice (MC)	Four image, math, or text-based choices with a single correct choice
Multiple Response (MR)	Five to six image, math, or text-based choices with two or three correct choices
Inline Choice	Multiple drop-down menus are used within a range of text to provide several options consisting of words or phrases.
Bar Graph	Vertical bar graph
Point Graph	Points are plotted on a graph.
Hot Spot	Object Selection, Graphic Change. One or more images or portions of an image are selected.
Match	Responses are dragged into text gaps.
Gap Match	Drag and Drop. Responses are dragged into categories.
Graphic Gap Match	Graphic Gap Match interactions are drag and drop that include responses that are images.
Gap Match - Table	Responses are dragged into a table grid.

Item Type	Specifications
Match - Table Grid	Responses are indicated by selecting radio buttons or checkboxes within a table grid.
Two-Part Independent (TPI)	Any combination of item types. Two-part independent items will be weighted as two points, one point awarded for each part. TPI items ask the student to demonstrate a deeper understanding of the standard by completing two separate thought processes.
Two-Part Dependent (TPD)	Any combination of item types. Two-part dependent items will be weighted as one point (no partial credit). TPD items ask students to demonstrate their understanding of the standard by selecting a claim in Part A and identifying supporting evidence in Part B. Correctly answering Part B is dependent on correctly answering Part A and is part of the same thought process.

Universal Tools

The following tools will be available in the online test administration platform to assist each student while taking the AzSCI.

Text to Speech: Text to speech is available to all students who take the AzSCI assessment in the online platform.

Answer Eliminator: Students can use this tool to cross out answers they believe are incorrect.

Notepad: Allows students to take notes on each item screen.

Ruler: Students measure objects on the screen using either a standard or metric ruler.

Highlighter: Students select words on the screen to highlight.

Zoom: If pictures and words on the screen are too small, students can make them larger using buttons on the keyboard.

Protractor: Students measure angles on the screen using the protractor tool.

Calculator:

Grade 5: A four-function calculator is permitted on AzSCI. The Desmos four-function calculator is embedded in the online AzSCI test.

Grades 8 and 11: A scientific calculator is permitted on AzSCI. The scientific calculator should include these functions: standard four functions (addition, subtraction, multiplication, and division), decimal,

change sign (+/-), parentheses, square root, and π. They may NOT include: any problem-solving or programming capabilities, place values, or inequalities. Sample acceptable calculator: TI-30X IIS or similar. The Desmos Scientific calculator is embedded in the online AzSCI test.

Exhibits: Exhibits are information sheets available to help students answer some questions. The AzSCI assessment will provide the AzSCI Periodic Table of the Elements (https://www.azed.gov/assessments/sci) on both the Grade 8 and Grade 11 assessments. The Grade 11 assessment will also have the AzSCI Formula Reference Guide (https://www.azed.gov/assessments/sci) available to assist students on questions that require the use of a specific formula. This document is NOT intended to dictate information that should be taught as part of Arizona Science Standards or curriculum. This reference sheet is intended to cover a list of all potential HS symbols, equations, terminology, and formulas that students may encounter on the AzSCI assessment.

Development

The AzSCI stimuli and items go through rigorous development and review processes before being used on an assessment. All stimuli and items are approved by Arizona educators and community members as part of the processes.

The development process begins with developing a phenomenon. Once it is determined that the phenomenon is a good fit to assess the intended standards and dimensions, the stimuli and then items are developed using the phenomenon document as the focus and starting point.

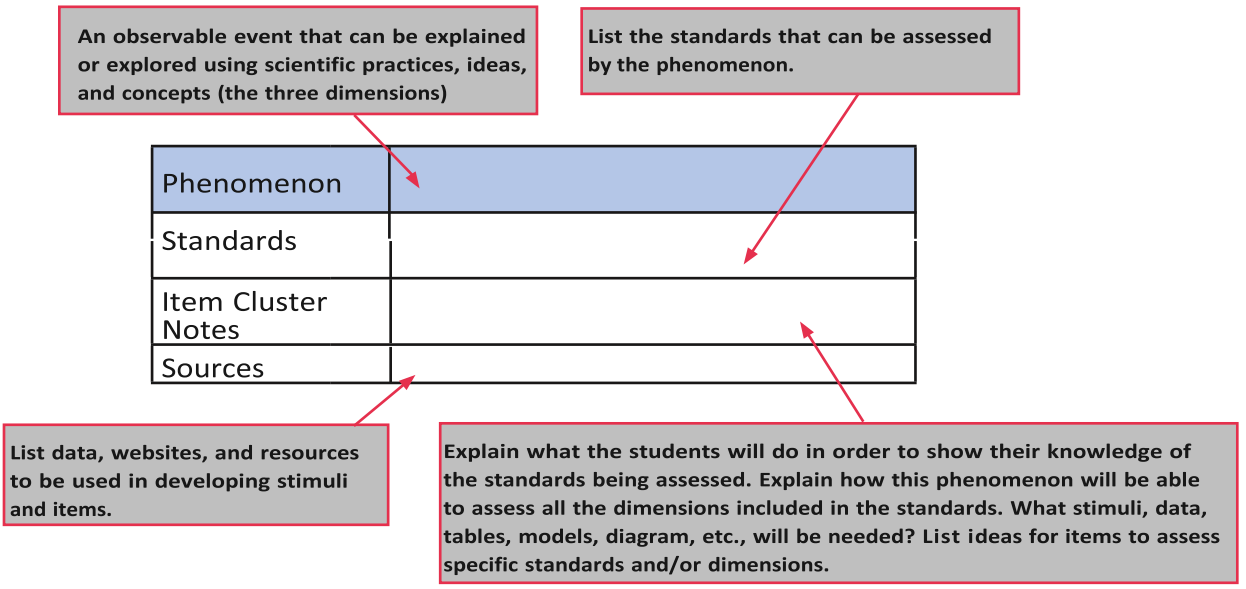
Phenomena Outline

The Arizona Science Standards are not intended to be taught or assessed one at a time or in isolation. Therefore, cluster item sets can be a useful step in organizing phenomena. Item developers group standards together in manageable arrangements to help students and teachers look for the connections between ideas that naturally exist in the sciences.

AzSCI stimuli and items are designed by first developing phenomena documents such as the ones shown here. These documents help focus the topic and guide the development of stimuli and items.

Stimuli Development Criteria

- Have a phenomenon statement that incorporates the standards and three dimensions to explain
- Based on real verifiable data
- Creative and interesting to students
- Free of bias and sensitivity concerns
- Concise with only necessary information



Examples of Phenomena Development

An example and template of Phenomena Development is provided to demonstrate some of the many ways Arizona Science Standards can be grouped together to support the development of a cohesive assessment cluster.

This is an example of Phenomena Development for an item set. Actual items can be viewed for practice on the AzSCI Sample Test at https://www.azed.gov/assessment/resources.

Grade 5 Independent Item Set

Phenomenon	A student sees a red car in a parking lot on a sunny day. When the student touches the hood of the car, the surface is hot.
Standards	**3.P2U1.3: Develop and use models** to describe how light and sound waves transfer energy. **4.P4U1.1 Develop and use models** to demonstrate how a system transfers energy from one object to another even when the objects are not touching. **3.P2U1.1: Ask questions and investigate** the relationship between light, objects, and the human eye.
Item Cluster Notes	Students will investigate and possibly develop/use a model to show how light is transferred (3.P2U1.1) to explain how the student can see the car. The student will identify evidence of energy transfer (3.P2U1.3, 4.P4U1.1) by explaining why the car feels hot to the touch. Stimulus will begin with a simple explanation and a picture student viewing a red car. The items will then take the students through investigating and explaining what is happening in the picture.
Sources	Inspiration for picture/models: https://player.slideplayer.com/85/13710706/slides/slide_7.jpg https://www.physicsclassroom.com/class/refln/Lesson-1/The-Role-of-Light-to-Sight

Phenomena Template

Phenomenon	
Standards	
Item Cluster Notes	
Sources	

Key Terms

- ***Cluster.*** A group of stimuli and 5 items assessed together on the assessment.
- ***Crosscutting Concept*** *(CCC).* There are seven crosscutting concepts in the Arizona Science Standards.
- ***Grade Band.*** A grade band is a set of grades for elementary grades (K–2 and 3–5), middle school (6–8), or high school (9–12).
- ***Independent Item Set.*** A group of stimuli with associated items designed to be assessed independently from each other.
- ***Phenomenon.*** Something observable that happens in the real world, whether natural or man-made. Student inquiry about phenomena—together with student-driven designing of solutions to problems—should drive instruction.
- ***Science and Engineering Practice*** *(SEP).* There are eight practices described by the Arizona Science Standards.
- ***Standard Core Idea*** *(CI).* The CIs are defined by the Arizona Science Standards, with the associated elements identified as the foundation of each standard.
- ***Task Analysis Guide in Science*** *(TAGS).* TAGS was developed for classroom use to evaluate cognitive demand with integration of practices and content.

AZ Grades 3–5 Item/Standard Specifications

Standard	**3.P2U1.1** **Ask questions and investigate** the relationship between light, objects, and the human eye
SEPs	**Asking Questions and Defining Problems**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR

Standard	**3.P2U1.2** **Plan and carry out an investigation** to explore how sound waves affect objects at varying distances.
SEPs	**Planning and Carrying Out Investigations**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice, Match - Table Grid

Standard	**3.P4U1.3** **Develop and use models** to describe how light and sound waves transfer energy.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	At this grade level, no attempt is made to give a precise or complete definition of energy.
Stimulus Materials	Models, Figures, Diagrams
Item Types	MC, MR, Bar Graph, Point Graph, Hot Spot, Graphic Gap Match

Standard	**3.E1U1.4** **Construct an explanation** describing how the Sun is the primary source of energy impacting Earth Systems.
SEPs	**Constructing Explanations and Designing Solutions**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice

Standard	**3.L1U1.5** **Develop and use models** to explain that plants and animals (including humans) have internal and external structures that serve various functions that aid in growth, survival, behavior, and reproduction.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; Energy and Matter; **Structure and Function**; Stability and Change
Assessment Boundaries	Stress at this grade level focus is on understanding the macroscale systems and their function, not microscopic processes.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Bar Graph, Point Graph, Hot Spot, Graphic Gap Match

Standard	**3.L1U1.6** **Plan and carry out investigations** to demonstrate ways plants and animals react to stimuli.
SEPs	**Planning and Carrying Out Investigations**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	Stress at this grade level focus is on understanding the macroscale systems and their function, not microscopic processes.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match, Inline Choice

Standard	**3.L2U1.7** **Develop and use system models** to describe the flow of energy from the Sun to and among living organisms.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Graphic Gap Match, Gap Match, Hot Spot

Standard	**3.L2U1.8** **Construct an argument from evidence** that organisms are interdependent.
SEPs	**Engaging in Argument from Evidence**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models;** Energy and Matter; **Structure and Function;** Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match, Match - Table Grid, Inline Choice

Standard	**4.P4U1.1** **Develop and use a model** to demonstrate how a system transfers energy from one object to another even when the objects are not touching.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	• At this grade level, no attempt is made to give a precise or complete definition of energy. • The fact that plants capture energy from sunlight is introduced at this grade level, but details of photosynthesis are not.
Stimulus Materials	Models, Figures, Diagrams
Item Types	MC, MR, Graphic Gap Match

Standard	**4.P4U1.2** **Develop and use a model** that explains how energy is moved from place to place through electric currents.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	• At this grade level, no attempt is made to give a precise or complete definition of energy. • The fact that plants capture energy from sunlight is introduced at this grade level, but details of photosynthesis are not.
Stimulus Materials	Models, Figures, Diagrams
Item Types	MC, MR, Graphic Gap Match

Standard	**4.P2U1.3** **Develop and use a model** to demonstrate magnetic forces.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	At this grade level, no attempt is made to give a precise or complete definition of energy.
Stimulus Materials	Models, Figures, Diagrams
Item Types	MC, MR, Graphic Gap Match

Standard	**4.P4U3.4** **Engage in argument from evidence** on the use and impact of renewable and nonrenewable resources to generate electricity.
SEPs	**Engaging in Argument from Evidence**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	• At this grade level, no attempt is made to give a precise or complete definition of energy. • The fact that plants capture energy from sunlight is introduced at this grade level, but details of photosynthesis are not.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Gap Match - Table, Match - Table Grid, Inline Choice

Standard	**4.E1U1.5** **Use models** to explain seismic waves and their effect on the Earth.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice

Standard	**4.E1U1.6** **Plan and carry out an investigation** to explore and explain the interactions between Earth's major Systems and the impact on Earth's surface materials and processes.
SEPs	**Planning and Carrying Out Investigations**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match, Match - Table Grid

Standard	**4.E1U1.7** **Develop and/or revise a model** using various rock types, fossil location, and landforms to show evidence that Earth's surface has changed over time.
SEPs	**Developing and Using Models**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice, Graphic Gap Match

Standard	**4.E1U1.8** **Collect, analyze, and interpret data** to explain weather and climate patterns.
SEPs	**Analyzing and Interpreting Data**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice, Hot Spot, Match, Match - Table Grid, Graphic Gap Match

Standard	**4.E1U3.9** **Construct and support an evidence-based argument** about the availability of water and its impact on life.
SEPs	**Engaging in Argument from Evidence**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Graphic Gap Match

Standard	**4.E1U2.10** **Define problem(s) and design solution(s)** to minimize the effects of natural hazards.
SEPs	**Asking Questions and Defining Problems** **Constructing Explanations and Designing Solutions**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match, Graphic Gap Match, Inline Choice

Standard	**4.L4U1.11** **Analyze and interpret** environmental **data** to demonstrate that species either adapt and survive or go extinct over time.
SEPs	**Analyzing and Interpreting Data**
CCCs	Patterns; Cause and Effect; Scale, Proportion and Quantity; **Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Hot Spot, Inline Choice

Standard	**5.P1U1.1** **Analyze and interpret data** to explain that matter of any type can be subdivided into particles too small to see and, in a closed system, if properties change or chemical reactions occur, the amount of matter stays the same.
SEPs	**Analyzing and Interpreting Data**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	• At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation. • Mass and weight are not distinguished at this grade level.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match - Table Grid, Inline Choice

Standard	**5.P1U1.2** **Plan and carry out investigations** to demonstrate that some substances combine to form new substances with different properties and others can be mixed without taking on new properties.
SEPs	**Planning and Carrying Out Investigations**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	• At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation. • Mass and weight are not distinguished at this grade level.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Bar Graph, Gap Match Table, Match - Table Grid, Inline Choice

Standard	**5.P2U1.3** **Construct an explanation** using evidence to demonstrate that objects can affect other objects even when they are not touching.
SEPs	**Constructing Explanations and Designing Solutions**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match - Table Grid, Graphic Gap Match, Inline Choice

Standard	**5.P3U1.4** **Obtain, analyze, and communicate evidence** of the effects that balanced and unbalanced forces have on the motion of objects.
SEPs	**Obtaining, Evaluating, and Communicating Information**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	• Qualitative and conceptual forces, but not quantitative addition of forces, are used at this level. • Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice

Standard	**5.P3U2.5** **Define Problems** and **design solutions** pertaining to force and motion.
SEPs	**Constructing Explanations and Designing Solutions**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	• Qualitative and conceptual forces, but not quantitative addition of forces, are used at this level. • Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Gap Match - Table, Inline Choice

Standard	**5.P4U1.6** **Analyze and interpret data** to determine how and where energy is transferred when objects move.
SEPs	**Analyzing and Interpreting Data**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	At this grade level, no attempt is made to give a precise or complete definition of energy.
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match - Table Grid, Inline Choice

Standard	**5.E2U1.7** **Develop, revise, and use models** based on evidence to **construct explanations** about the movement of the Earth and Moon within our solar system.
SEPs	**Developing and Using Models** **Constructing Explanations and Designing Solutions**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Hot Spot, Match - Table Grid, Graphic Gap Match, Inline Choice

Standard	**5.E2U1.8** **Obtain, analyze, and communicate evidence** to support an explanation that the gravitational force of Earth on objects is directed toward the planet's center.
SEPs	**Obtaining, Evaluating, and Communicating Information**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Hot Spot, Inline Choice

Standard	**5.L3U1.9** **Obtain, evaluate, and communicate information** about patterns between the offspring of plants, and the offspring of animals (including humans); **construct an explanation** of how genetic information is passed from one generation to the next.
SEPs	**Obtaining, Evaluating, and Communicating Information** **Constructing Explanations and Designing Solutions**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, Bar Graph, Inline Choice, Text Entry, Match - Table Grid, Gap Match

Standard	**5.L3U1.10** **Construct an explanation** based on evidence that the changes in an environment can affect the development of the traits in a population of organisms.
SEPs	**Constructing Explanations and Designing Solutions**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Inline Choice

Standard	**5.L4U3.11** **Obtain, evaluate, and communicate evidence** about how natural and human-caused changes to habitats or climate can impact populations.
SEPs	**Obtaining, Evaluating, and Communicating Information**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match, Gap Match, Match - Table Grid, Hot Spot, Inline Choice

Standard	**5.L4U3.12** **Construct an argument based on evidence** that inherited characteristics can be affected by behavior and/or environmental conditions.
SEPs	**Engaging in Argument from Evidence**
CCCs	**Patterns;** Cause and Effect; **Scale, Proportion and Quantity**; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change
Assessment Boundaries	Not applicable
Stimulus Materials	Figures, Graphs, Tables
Item Types	MC, MR, Match, Inline Choice

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