

NGSS Large Scale Assessment Alignment: Expectations, Challenges, and Solutions

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Presenters

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Introduction

How well can large scale assessment measure what is valued about the NGSS?

• Alignment in the context of NGSS

Leverage states' experience in developing NGSS aligned assessments to advance NGSS alignment thinking.



Delaware Assessment





Delaware's Philosophy





Delaware Science Assessment





Driving Claim: Students can make sense of a novel phenomenon by accurately engaging the three dimensions of scientific inquiry: disciplinary core ideas, practices and crosscutting concepts.





Item and Item Cluster Alignment

Requirements:

- All items must be aligned to at least 2 of the 3 dimensions (Exception: ER must be 3-D)
- Items are limited by the assessment boundary statement associated with a PE, when present.
- Item clusters are typically developed to align to a PE bundle of 2–3 PEs. The items that compose an item cluster must, as a set of items, include alignments to all three dimensions of each PE in the PE bundle.
 - Additional Science and Engineering Practices (SEPs) and Crosscutting Concepts (CCCs), beyond those specified in the PEs in the PE bundle, may be included in the alignment of items in an item cluster.



Item and Item Cluster Alignment

- Alignment begins at the PE level.
 - At the dimension level, the sub-bullets (elements) of the specific dimensions represented in a PE should be the basis of alignment decisions.
 - Dimension decisions should also be informed by the progressions documents (NGSS appendices E, F, and G),
 - SEPs and CCCs, outside the specified PEs, can—and, in many cases, should be included in the alignment. Any additional alignment(s) should be captured as metadata.



Item Organizations For Summative Assessments

	RIC (Regular Item Cluster)	IIC (Intergrative Item Cluster)	SAI (Stand Alone Items)
Online formats	AnimationsStatic Graphics	Simulations (2)AnimationsStatic graphics	Static graphics
Stimulus	Stimulus all upfront (light)Limited storyline	 Heavy stimulus Progressive storyline Stimulus can build with items 	No external stimulus
Item Sequence	RandomNot interdependent	PrescribedInterdependent items	N/A
Number of Items/Points	5 items (develop 8-10)7 points (operational)	6 items10-13 (operational)	N/A
Allowable Item Types	 SR (1 point) Two-part (2 points) CR (2 points) TEI (1 or 2 points) 	 SR (1 point) Two-part (2 points) ER (4 points) TEI (1 or 2 points) 	 SR (1 point) Two-part (2 points) TEI (1 or 2 points)
Time to complete	• 13-16 minutes	• 20-24 minutes	• 1-3 minutes



Alignment Considerations

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CCC Reference Pages and Progression



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SEP Reference Pages and Progression



Michigan Assessment





"The idea of an assessment system begins with a commonsense point: no one assessment – or assessment occasion – can meet all the needs for information about what student know and can do in science" (p.21 NASEM, 2017).



Evidence Centered Design: Michigan Science Assessment Claims

Equity Claim: Non-dominant and dominant groups of students have the opportunity to demonstrate grade band proficiency through the use of engineering, local contexts, and relevant phenomena.

Scientific Literacy Claim: Students demonstrate grade band proficiency in using the three dimensions to critically evaluate scientific and technological information in order to design solutions to problems and investigate phenomena.

Student Level Claim: Student has demonstrated grade band proficiency in: Life Science, Earth Science, & Physical Science Topic Bundles using all dimensions represented in the standards.





Example High School Topic Bundle

Space Systems

- HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
- HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
- HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements.
- HS-ESS1-4 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Dev/Use Models	ESS1.A Universe and Stars	Patterns
Construct Explanations	ESS1.B Earth and Solar System	Scale, Prop. Quant.
Communicate		Systems/Sytm. Models
Math and Comp Thk.		

Example Item Cluster Map



Phenomenon



Michigan Alignment Considerations

Alignment is at the Topic Bundle Level

► All items must be at least 2D

>All Stimuli must present a phenomenon

► Alignment is not bound to PEs



2020 Operational Test

- Multiple forms per grade (5, 8, 11)
- 7-8 Item Clusters per form
 - 2-Physical Science
 - 2- Earth Science

Operational

- 2- Life Science
- 1-2 Field Test Item Cluster(s)
- Estimated Time: 10-15 minutes per cluster



Questions for States

Q&A focused on alignment to clarify the states' contexts.





Foundational Alignment Questions

- 1. What is the overarching claim for the test?
- 2. What are we aligning to?
- 3. What is the role of an item specifications document?
- 4. What is the question that we are asking to determine alignment?
- 5. What is the process of making an alignment judgment?

What do we want to measure? Does the students' response provide evidence?

Is the evidence sufficient to measure what was intended?



General Alignment Questions

- **1.** What is the overarching claim for the test?
- 2. What are we aligning to?

3. What is the role of an item specifications document?

	Delaware	Michigan
Blueprints	Elem 3 clusters 10 SAI; Secondary 4 clusters 14 SAI	6 Clusters + 1-2 FT Clusters
Item Specifications	PE Bundles	Topic Bundles
Sampling Plan	Tiered Assessment System— Summative=Single form 5, 8, Bio	4 forms; matrix by student
Reporting Categories	Single score	Life, Physical, Earth





General Alignment Questions

4. What are the questions that we are asking to determine alignment?

5. What is the process of making an alignment judgment?





What do you think? Intended Alignment

PS1.A – Each pure substance has characteristic physical and chemical properties that can be used to identify it.

PS1.B – Substances react chemically in characteristic ways. In a chemical process, the atom that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

SEP 4 – Analyzing and Interpreting Data

CCC 1 – Patterns

Item Level Claim: The student uses the data table to determine if a chemical reaction occurred and provides the evidence to support their determination.



Grade 8 Science

Question 1



- Cut open the hand warMore Text Above
 Separate the materials by using a magnet to attract the iron.
- 4. Place the iron on a dish.

- 5. Make initial observations and calculations to record properties of the iron.
- 6. Leave the iron in the dish overnight.
- 7. Record final observations and calculations the next day.

Iron from Hand Warmer Bag



Hand Warmer Investigation Data

Property/ Calculation	Initial	Final	
Color	Gray	Red	
Texture	Powder	Powder	
Mass	21 g	30 g	
Volume	2.67 cm ³	5.73 cm ³	
Density	7.87 g/cm ³	5.24 g/cm ³	

This question has two parts.

Part A

Use the data table to complete the following statement.

The students can tell that a chemical reaction involving iron because a new substance

overnight.

▼ form

Part B

Choose one set of properties that best supports the completed statement in Part A.





(c) volume and texture

(d) texture and mass

(e) mass and density

Training Student

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Review/End Test





Grade 8 Science

Question 1



- Cut open the hand warMore Text Above
 Separate the materials by using a magnet to attract the iron.
- 4. Place the iron on a dish.

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Density	7.87 g/cm ³	5.24 g/cm ³

This question has two parts.

Part A

Use the data table to complete the following statement.

The students can tell that a chemical reaction involving iron ▼ form



Part B

Choose one set of properties that best supports the completed statement in Part A. (a) density and color



(c) volume and texture

(d) texture and mass

(e) mass and density

Training Student

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did not

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Pause







What do you think? Aligned Not Aligned

How do you know?



Perspectives to Consider

SEP Guidance and Questions CCC Guidance and Questions General Expectations

SEP Questions



1. Which practice is most specifically measured by the item in question?

2. Is the targeted practice aligned with a grade level appropriate progression(s)?

Appendix F: "Practices Matrix" for SEPs lists all possible practice progressions by grade band.

3. At what level is the practice being measured by this specific item?



1. Are/is a CCC(s) mentioned in the wording of this item?

2. Are/is a CCC(s) alluded to within the item without requirement of CCC evidence collection for a correct response?

3. Are/is a CCC(s) directly measured through this item as a knowledge or framing construct developed by students?

Do you feel this item is "ALIGNED" with a CCC?

General Expectations



1. Sense making

1. to what degree is the item cluster/item allowing students to sense make?

2. Phenomena

1. to what degree is the phenomena appropriate, and meeting the expectations of a phenomena?

What do you think?



Intended Alignment

PE 05-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

- SEP Analyzing and Interpreting Data
- CCC Energy and matter

Item Level Claim: The student is asked to analyze data (SEP) from a figure and select a statement to construct an explanation (SEP) using the crosscutting concepts of energy and matter and applying the core idea of energy in chemical processes (DCI).

Use the information in the tabs to answer the questions.

Tab 1—Ocean I	Ecosystem	Tab 2—Seasonal C	hanges
Tab 3—Algae	Tab 4—Fa	Il Migration	

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The scientists made the maps in **Figure 3** to show how the amount of algae in the North Atlantic Ocean changes from February to March to April and to May. The location of Delaware is shown on each map.



Use the information in Tab 3 to help you answer this question.

Part A

Based on the information in **Figure 3**, when will the scientists **most likely** find whales near Delaware?

A. February

B. March

C. April

D. May

Part B

Which three statements explain the answer to Part A?

- A. Less sunlight is available near Delaware during that month.
- B. More energy is available for algae near Delaware during that month.
- C. More matter is stored in algae near Delaware during that month.
- D. Less energy is stored in algae near Delaware during that month.
- E. More matter is available for whales near Delaware during that month.



What do you think? Aligned Not Aligned

How do you know?



Final thoughts on NGSS alignment challenges



We are five years in, what is the next frontier for NGSS assessments?

Making good ones...