Hawaiʻi State Assessment – Science (NGSS) Interpretation and Action Guide

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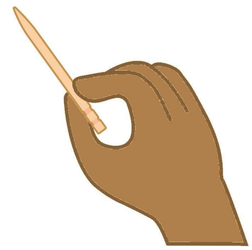
Preface and Purpose of Guide



Imagine baking a delicious cake. When the timer dings, you use a toothpick to test if the cake is done. If the toothpick comes out clean, you get excited! This is not because of the clean toothpick itself, but because it means your cake is ready. The toothpick is a tool to do a test, but a clean toothpick is not your end goal. A perfectly baked cake that you can eat (and maybe share) is what you really want.

Think of the Hawai‘i state summative assessment for science in the same way. The assessment is a tool that tests student proficiency. Assessment results are not a goal unto themselves. The ultimate goal is to develop scientifically-literate students through equitable and high-quality science teaching and learning practices. Like the toothpick, the science assessment is a tool that is designed to provide specific and limited information. It is not the desired outcome, but rather one indicator of students' science literacy.

The state summative assessments **cannot** measure all facets of what students know and can do. Hawai‘i state summative assessments **can** objectively measure student performance in a way that allows educators to compare students' knowledge and skills, uncover gaps, and make instructional shifts.

The purpose of this guide is to provide schools and complex areas with support to make meaning from assessment results so that they can translate data into practice for science teaching and learning. The guide is designed to help all educators continue to build capacity to work toward the vision for science teaching and learning in Hawai‘i, in line with the six areas of implementation for the Next Generation Science Standards (NGSS).

As you use this guide and resources, take time to reflect on the toothpick and the cake. Are you focused on the toothpick or are you using it as a tool to tell you something about your cake?

Mahalo

Mahalo to the participants of the Science Assessment for Learning Resource Development Group who were instrumental in creating this resource:

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Vision for Science Teaching and Learning

According to the *Framework for K–12 Science Education*, there are two goals of K–12 science education:

- educating all students in science and engineering so that they are critical consumers of scientific information related to their everyday lives, are capable of learning about science throughout their lives, and are able to engage in discussions on science-related issues; and
- providing the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future.

The vision of the State of Hawai‘i Department of Education (HIDOE) is to pursue these goals with an emphasis on:

- students learning science by engaging in the practices of science;
- connecting to students' interests, experiences, and identity;
- providing equitable opportunities to learn science from early childhood through high school; and
- equipping students to think critically, analyze information, and solve complex problems in order to be science-literate citizens and to pursue opportunities within and beyond Science, Technology, Engineering, and Mathematics (STEM).

State summative assessments are **one** part of the teaching and learning landscape. Results must be understood within the context of what students are expected to know and do within three-dimensional science. Science classrooms are student-centered, where educators strive toward the pedagogical shifts of the NGSS.

Shifts of the NGSS	
Science education will involve <u>less</u>:	**Science education will involve <u>more</u>:**
Learning of ideas disconnected from questions about phenomena	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teacher guidance
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
Student reading textbooks and answering questions at the end of each chapter	Students reading multiple sources and developing summaries of information
Worksheets	Student writing of journals, reports, posters, and media presentations that offer explanations and arguments
Oversimplification of activities for students who are perceived to be “less able” to do science and engineering	Provision of supports so that ALL students can engage in sophisticated science and engineering practices

Guide to Implementing the Next Generation Science Standards (2015)

Teaching and learning, including curriculum, instruction, and assessment, are aligned to the performance expectations (PEs) of NGSS. The educators of the Hawaiʻi State Science Work Group also identified six essential features of NGSS-aligned curricular materials, which extend more broadly to teaching and learning in the classroom.

Essential Features of NGSS Alignment		
Essential Feature		**Description**
A	**Three-Dimensional Learning**	Materials provide consistent opportunities to use the Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), and Disciplinary Core Ideas (DCIs) to make sense of problems and design solutions to problems. The three dimensions are integrated in both instruction and assessment.
B	**Phenomena and Problems**	Instructional sequences begin with a phenomenon or problem and allow students to work together to develop scientific explanations or engineering design solutions. When possible, as in teacher-designed materials, phenomena and problems should be locally-relevant.
C	**NGSS for ALL Students**	ALL students are required to engage in each of the dimensions to make sense of the natural and engineered world. Materials provide inclusive supports for all learners. Materials provide consistent opportunities for students to engage in discourse and argumentation. Relevant, real-world applications provide the context for active engagement in the SEPs. Students are provided opportunities to collectively engage in new experiences. Prior knowledge and multiple ways of knowing are acknowledged and respected, with allowances for flexibility and student choice.
D	**Assessments**	Materials provide multiple and varied three-dimensional formative and summative assessments. Assessments require students to demonstrate reasoning and use of evidence to explain phenomena or design solutions to engineering problems.
E	**Coherent and Adherent to Grade-Level/Course PEs**	Curricular programs should provide learning opportunities to cover the breadth and depth of grade-level or course PEs toward the goal of "ALL Standards, ALL Students." Units and curricular programs include purposefully sequenced experiences to work toward outcomes described by the PEs for the grade-level or course. Connections can be made between units and grades/courses. Units and lessons scaffold toward grade-level or course performance expectations. Individual lessons are designed to be included in coherent sequences, i.e. are not one-off activities.
F	**Cross-Content Connections**	Connections are made to disciplines within Science, and between Science and English Language Arts, Mathematics, Social Studies, or other content areas through authentic engagement and application of skills and content.

Science Assessment Design

The Hawaiʻi State Assessment (HSA) for Science (NGSS) is administered in Grade 5 (builds on Grades K–2 and includes PEs from Grades 3–5) and Grade 8 (includes PEs from Grades 6–8). The Biology End of Course (Bio EOC) is administered upon completion of Biology 1.

Each HSA Science (NGSS) test and Bio EOC is purposefully designed to adequately address the three-dimensional nature of NGSS, as well as multiple considerations and constraints required by the Every Student Succeeds Act (ESSA). Student participation in these assessments is part of Strive HI school accountability reporting, with a target of 95 percent participation for all students. Proficiency results from the NGSS assessments will be incorporated into state-level accountability.

Key features of the assessment include:

Valid and Reliable	All items on the assessment are reviewed by content experts and teachers for alignment to NGSS, field-tested with students, and screened to eliminate bias before they are included on any operational summative test.
Built on Phenomena	Driven by prompts that include a natural phenomenon or engineering problem, relevant to Hawaiʻi when possible.
Aligned to Performance Expectations (PEs)	Covers the full range of performance expectations aligned to the assessment grade band or course. Across the assessment, items address all three-dimensions of NGSS.
Computer Adaptive	The difficulty of items presented to a student will depend on their performance on earlier items.
Item Clusters	Multiple items related to one phenomenon, which address three dimensions.
Stand-Alone Items	Single items related to a phenomenon, which address one to two dimensions.
Matrix Design	Ensures that the breadth of NGSS is measured in each class. An individual student will not see items related to all PEs, but across a class of a minimum of 20 students, all PEs will be measured.

These key features come together in the design of the overall test blueprints, item specifications, individual items, and clusters. Examples of each follow.

Test Blueprints

Each assessment is built on a blueprint that lays out how clusters and items are distributed. With the matrix design, students will not see items related to every PE, but will see a set number of items from each domain. The test blueprint for Elementary School (Grade 5) follows; other blueprints can be found in the NGSS Resources Folder on the Hawaiʻi State Assessment Program (HSAP) Science Portal.

Elementary School (Grade 5) Blueprint

Legend
Aligned to PEs
Computer Adaptive
Matrix Design
Stand-Alone Items
Item Clusters

Grade 5			
The grade 5 test covers the NGSS performance expectations (PEs) for grades 3 through 5. PEs incorporate Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts. Students will be asked to apply their knowledge and skills to address 18 different phenomena during the assessment.			
	Clusters	**Stand-Alone Items**	**Total**
Physical Science	**2**	**4**	**6**
PS1: Matter and Its Interactions **PEs**: 5-PS1-1, 5-PS1-2, 5-PS1-3, 5-PS1-4 **PS2: Motion and Stability: Forces and Interactions** **PEs**: 3-PS2-1, 3-PS2-2, 3-PS2-3, 3-PS2-4, 5-PS2-1			
PS3: Energy **PEs**: 4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4, 5-PS3-1			
PS4: Waves and Their Applications in Technologies for Information Transfer **PEs**: 4-PS4-1, 4-PS4-2, 4-PS4-3			
Life Science	**2**	**4**	**6**
LS1: From Molecules to Organisms: Structure and Function **PEs**: 3-LS1-1, 4-LS1-1, 4-LS1-2, 5-LS1-1			
LS2: Ecosystems: Interactions, Energy, and Dynamics **PEs**: 3-LS2-1, 5-LS2-1			
LS3: Inheritance and Variation of Traits **PEs**: 3-LS3-1, 3-LS3-2			
LS4: Biological Evolution: Unity and Diversity **PEs**: 3-LS4-1, 3-LS4-2, 3-LS4-3, 3-LS4-4			
Earth and Space Science	**2**	**4**	**6**
ESS1: Earth's Place In the Universe **PEs**: 4-ESS1-1, 5-ESS1-1, 5-ESS1-2			
ESS2: Earth's Systems **PEs**: 3-ESS2-1, 3-ESS2-2, 4-ESS2-1, 4-ESS2-2, 5-ESS2-1, 5-ESS2-2			
ESS3: Earth and Human Activity **PEs**: 3-ESS3-1, 4-ESS3-2, 4-ESS3-1, 5-ESS3-1			
	Clusters	**Stand-Alone Items**	**Total**
Operational Total	**6**	**12**	**18**
Operational "Questions" Total **Each cluster asks student to respond to 5 to 7 questions**	**~36**	**12**	**~48**
Field Test Item Total	1 cluster or up to 6 stand-alone items		
Total Items on Test including questions within clusters	**Approximately 54**		

Cluster Specifications

Cluster specifications detail to the item writers how items and clusters should be designed. Unique to these specifications are task demands, which outline what proficient students should know and be able to do. A sample cluster specification for Elementary School (Grade 3) follows; go to the NGSS Resources Folder on the HSAP Science Portal for the complete set of item specifications for each assessment.

Elementary Earth Space Science 3-ESS3-1Cluster Specification

Aligned to PEs
Built on Phenomena
Valid and Reliable
Stand-Alone Items
Item clusters

Performance Expectation	**4-PS3-1** Use evidence to construct an explanation relating the speed of an object to the energy of that object.			
Dimensions	**Constructing Explanations and Designing Solutions** ● Use evidence (e.g., measurements, observations, patterns) to construct an explanation.	**PS3.A: Definitions of Energy** ● The faster a given object is moving, the more energy it possesses.	**Energy and Matter** ● Energy can be transferred in various ways and between objects.	
Clarifications and Content Limits	Content Limits ● Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy. ● Students are expected to know that energy can be expressed through sound, heat, light, and motion. ● <u>Students do not need to know</u>: Students do not need to know how to calculate speed, the change in speed (acceleration), or energy. This standard is limited to making strictly qualitative or comparative observations.			
Science Vocabulary Students Are Not Expected to Know	Potential energy, kinetic energy, thermal energy, acceleration, velocity.			
Phenomena				
Context/ Phenomena	Some example phenomena for 4-PS3-1: ● Craters on the moon vary greatly in size. ● One drum can be used to produce loud or quiet percussion sounds. ● A small bouncing basketball sounds louder than a large bouncing basketball. ● Damage caused during a high-speed collision is greater than when speeds are slower. ● A ceramic bowl dropped from a greater height will have a larger debris pattern. ● Similar water balloons can create different-sized splashes when they break.			
This Performance Expectation and associated Evidence Statements support the following Task Demands.				
Task Demands				
1. Articulate, describe, illustrate, or select the relationships, interactions, and/or processes to be explained. This may entail sorting relevant from irrelevant information or features. *(DCI/SEP)**				
2. Express or complete a causal chain explaining that changes in energy and speed are related. This may include indicating directions of causality in an incomplete model such as a flow chart or diagram, or completing cause-and-effect chains. *(DCI/SEP)				
3. Identify evidence supporting the inference of causation that is expressed in a causal chain.				
4. Use an explanation to predict how the speed of an object changes given a change in energy or how the expression of energy will change given a change in speed.				
5. Describe, identify, and/or select information needed to support an explanation.				

Items and Clusters

Clusters and stand-alone items are designed based on the specifications. All items are built on phenomena and require students to engage in the practices of science. Teachers and students are encouraged to try the practice tests and interim assessments in order to become familiar with the layout and navigation of these complex items. Sample items follow; the complete set of item specifications for each assessment can be found in the NGSS Resources Folder on the HSAP Science Portal.

Elementary School (Grade 5) Item Cluster PE 3-ESS3-1 “House on Stilts”

- Aligned to PEs
- Item Clusters
- Built on Phenomena

A house near the ocean in Surfside, New Jersey, is built on stilts.

Sometimes, when buildings are built near areas that are likely to flood, they are built on stilts. This allows the house and its contents to remain safe if the area floods. An example is shown in Figure 1.

Figure 1. Stilt House

Your Task

In the questions that follow, you will make a claim about the effectiveness of stilts as a solution to flooding.

Part A

Select the boxes to identify whether stilts on a house protect against or do **not** protect against each of the actions.

	Protects Against	Does Not Protect Against
Household objects being washed away	☐	☐
Water damage to floors	☐	☐
Water damage to household objects	☐	☐
Yard flooding	☐	☐

Elementary School (Grade 5) Item Cluster PE 3-ESS3-1 "House on Stilts" (*continued*)

- Aligned to PEs
- Item Clusters
- Built on Phenomena

Part B
Select **three** conditions that the stilts must meet to allow a building and its contents to stay safe if the area floods.

- ☐ cost a lot of money
- ☐ resist strong water current
- ☐ match the building's appearance
- ☐ support the weight of the building
- ☐ be tall enough to keep the building out of water

Part C
Choose **three** problems that could be caused by using stilts under buildings.

- ☐ Buildings with stilts provide a better view.
- ☐ The stilts will get wet during a storm or flooding.
- ☐ Buildings would be damaged if stilts were to fail.
- ☐ Buildings are harder to enter because of stairs and ramps.
- ☐ Stilts can cause buildings to move side to side in high winds.

Part D
Are stilts a good solution to allow a building and its contents to remain safe if an area floods?

Click on each blank box to select the word or phrase that completes the sentences.

Stilts could be a [ ] solution to flooding because they [ ]. This means that [ ].

Elementary School (Grade 5) Stand Alone Item

- Aligned to PEs
- Stand-Alone Items
- Built on Phenomena

An alpine marmot eats grass and seeds. In the fall, the marmot weighs more than it did in the spring.

Put the pictures in the correct order to show the flow of energy through the system.

- In Table 1, select a number for each picture to indicate the correct location in Figure 1.
- If a picture is **not** used in Figure 1, select "not used."

Figure 1. Energy Flow Model

[1] → [2] → [3]

Energy Source

Table 1. Energy Flow Model Order

	Sun	Water	Marmot	Grass and Seeds
Picture				
Location				

Science Assessment Scoring and Reporting

Scoring and reporting for the state summative assessments are designed to align with the vision of the NGSS and the key features of the assessments. The policy-level descriptor defines the overarching goal of the assessment and what it is intended to measure.

Policy Achievement Level Descriptor **(from the NGSS Vision)**	*Students demonstrate scientific literacy through the application of the science and engineering practices, crosscutting concepts within science, and core ideas of the science disciplines to engage in discussions on science-related issues; to be critical consumers of scientific information related to their everyday lives, and to continue to learn about science throughout their lives.*

Scoring and reporting are in line with many of the key features of the assessments, as follows:

Valid and Reliable	The assessments are deemed to be valid measures of the NGSS standards and lead to results that are reliable measures of students' knowledge and skills within the standard error of measure reported along with student scale scores.
Aligned to Performance Expectations (PEs)	Scoring assertions are aligned to the three dimensions of the PE. Overall reporting emphasizes that the assessments are designed to provide information about student performance in the three interconnected dimensions.
Computer Adaptive	The difficulty of items presented to a student depends on their performance on earlier items. This provides a more accurate measure of a student's knowledge and skills.
Item Clusters	All clusters and stand-alone items are scored using scoring assertions. The scoring assertions allow more detailed reporting than would otherwise be available.
Stand-Alone Items	

Scoring Assertions

Items are scored using scoring assertions that link items to the DCIs, SEPs, and CCCs. This enables *relational scoring*, meaning that students are not penalized for an earlier incorrect answer in a later part of an item cluster. The number of scoring assertions does not indicate the value or points of a cluster. A sample scoring assertion follows; scoring assertions for each item are found through Airways Reporting after administering an interim assessment.

Scoring Assertions for Elementary School (Grade 5) Item Cluster PE 3-ESS3-1 “House on Stilts”

- Item Clusters
- Aligned to PEs

Score Rationale	
When asked to identify whether stilts protect against each action or not, the student selected "Protects Against" for "Household objects being washed away", "Water damage to floors", "Water damage to household objects", and "Does not protect against" for "Yard flooding". This provides some evidence that the student understands how to assemble the relevant aspects of a hazard that the design solution resolves or improves.	✔
When asked to select three conditions that the stilts must meet to keep a building and its contents safe during a flood, the student selected "resist strong water current." This provides some evidence that the student understands how to identify constraints that the design solution must meet.	✔
When asked to select three conditions that the stilts must meet to keep a building and its contents safe during a flood, the student selected "support the weight of the building." This provides some evidence that the student understands how to identify constraints that the design solution must meet.	✔
When asked to select three conditions that the stilts must meet to keep a building and its contents safe during a flood, the student selected "be tall enough to keep the building out of water." This provides some evidence that the student understands how to identify constraints that the design solution must meet.	✔
When asked to select three problems that could be caused by having stilts under buildings, the student selected "Buildings would be damaged if stilts were to fail." This provides some evidence that the student understands how to identify the limitations of the design solution.	✔
When asked to select three problems that could be caused by having stilts under buildings, the student selected "Buildings are harder to enter because of stairs and ramps." This provides some evidence that the student understands how to identify the limitations of the design solution.	✔
When asked to select three problems that could be caused by having stilts under buildings, the student selected "Stilts cause buildings to move side to side in high winds." This provides some evidence that the student understands how to identify the limitations of the design solution.	✔
When asked to determine whether stilts are a good solution to keep a building and its contents safe if an area floods, the student selected a claim in the first dropdown, and defended it with an appropriate choice in the second dropdown. This provides some evidence that the student understands how to make a claim about the merit of a design solution to a natural hazard.	✔
When asked to determine whether stilts are a good solution to keep a building and its contents safe if an area floods, the student selected an explanation for the claim they made in the first sentence. This provides some evidence that the student understands how to explain the cause-and-effect relationships that determine if the design solution has merit.	✔

Reports

Reports are generated for individual students, schools, complex areas, and the state. The structure of these reports reflects Hawaiʻi's vision for science education and the three-dimensional nature of the NGSS.

Individual Student Reports and the School/Complex Area/State Aggregate reports include:

- An overall scale score and achievement level;
- Performance in the various domains of science; and,
- Fluency in using the SEPs and applying the CCCs.

In addition, the Aggregate reports will contain:

- Group performance by DCIs within each domain; and,
- Relative performance for each PE (when the group contains 20 or more students).

Individual Student Reports

Overall Scale Score
Level 4, 3, 2, and 1

Science Discipline
Earth/Space, Life, Physical

Practices and Crosscutting Concepts

Aggregate Reports (school and higher) Also include:

Core Ideas by Domain

Performance by Performance Expectation

Note for School Years 2019–2020 and 2020–2021

School Year 2019-2020 was ***supposed to be*** *the first year the HIDOE administered operational science tests based on the NGSS. After testing was completed, a group of community members, teachers, and other stakeholders would have met to identify achievement standards and set the cut scores for each performance level including meeting proficiency. Due to the COVID-19 response,* ***testing was not completed and there is not sufficient data to conduct an achievement standard setting.***

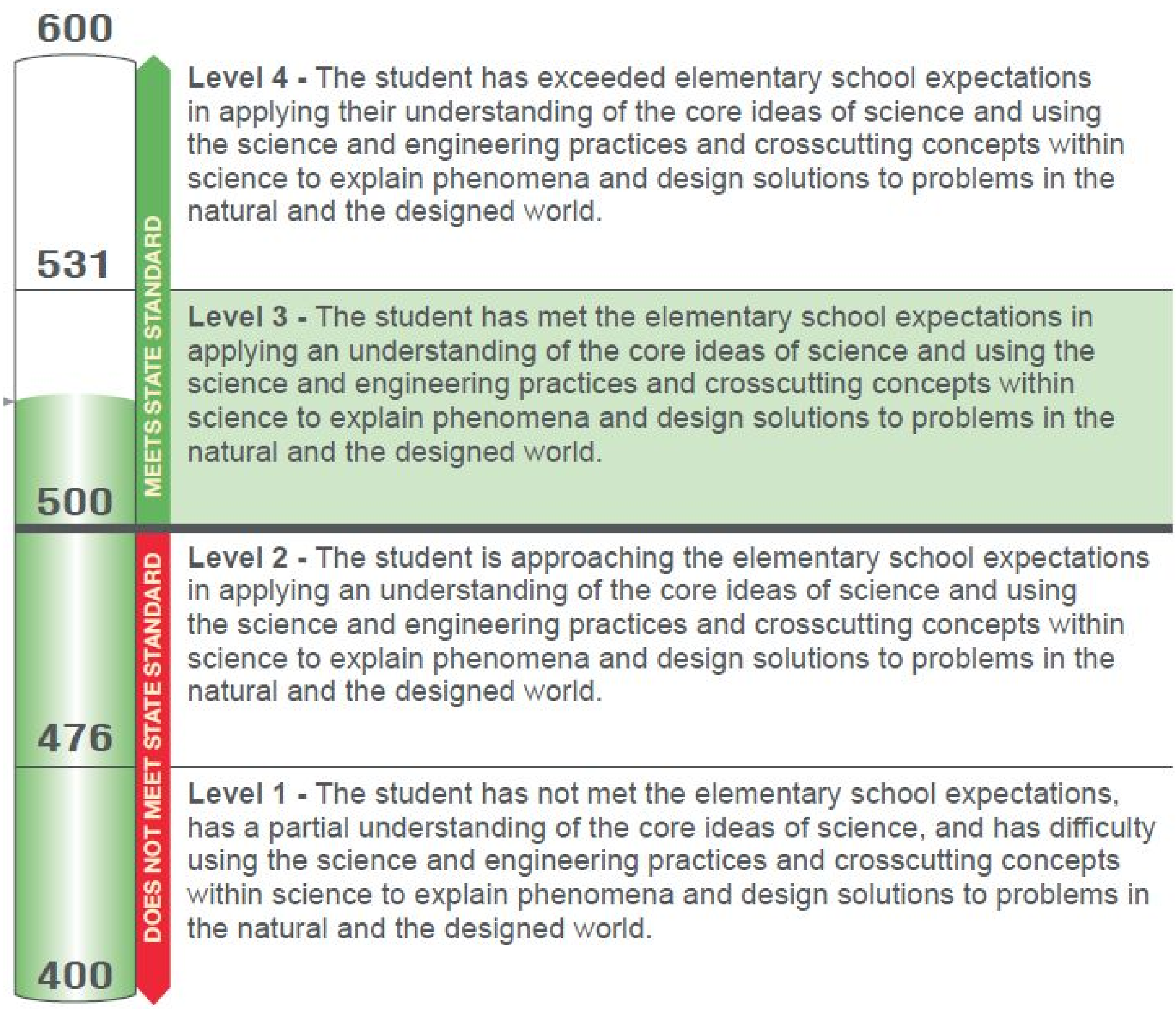
Based on the current circumstances, the ***available data will be used to generate an overall state performance report and summary reports for schools*** *where students completed some testing by March 15, 2020.* ***These reports are based on incomplete data sets*** *and should be used with appropriate care to reflect on teaching and learning but* ***should not be used*** *to make judgments regarding specific students or teachers.* ***There will be no individual student reports for science for the 2019–2020 school year.***

The following section describes reporting as it will be after standard-setting, currently planned for July 2021. Asterisks indicate information being reported for SY 2019–2020. Because HIDOE has not yet been able to set cut scores, performance levels are "estimates" based on cut scores from states sharing items with HIDOE and with similar blueprints who have completed achievement standard setting.

The information that follows, especially the descriptive text is considered “draft” until confirmed and approved during Achievement Standard-Setting which is now anticipated to occur in July 2021. Descriptions from the Elementary Science Reports are used here as examples. The Descriptors for all three tests can be found HSAP Science Portal

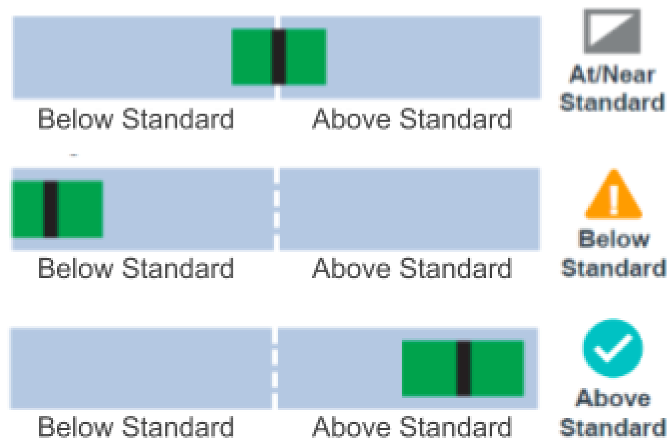
Overall Scale Score and Achievement Level

Overall scale scores for the HSA Science (NGSS) Grade 5 and Grade 8 and the Biology End of Course Exam will range from 400 to 600. Scores will be categorized as Levels 1, 2, 3, and 4. Students with a scale score of 500 or higher will have achievement levels of 3 or 4 and are considered proficient.



Performance in the Domains of Science

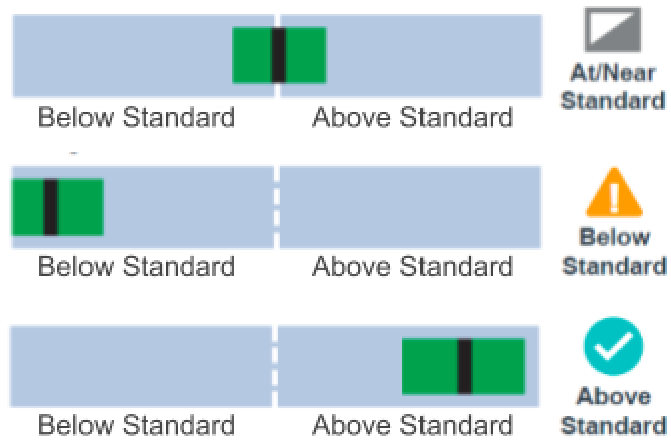
Proficiency in the domains is reported using a horizontal bar and symbol (see right). Each assessment has performance level descriptors at the domain level. An example from the elementary assessment follows; additional performance level descriptors will be available on the [HSAP Science Portal](https://alohahsap.org).



	Earth and Space Sciences
	Students can apply their understanding of the disciplinary core ideas of the Earth and space sciences and uses science and engineering practices as well as crosscutting concepts within science to explain phenomena in Earth and space systems. This includes: • Using data from patterns in shadows, daylight, and stars to explain Earth's movement in space; • Investigating and modelling interactions among Earth's systems that cause weather, climate, landforms, and geologic events; • Using evidence to describe interactions between human activities and Earth processes; and, • Designing solutions to problems resulting from the use of Earth's resources.
	Life Sciences
	Students can apply their understanding of the disciplinary core ideas of life science and uses science and engineering practices as well as crosscutting concepts within science to explain phenomena in living organisms and systems. This includes: • Using evidence to show that systems and processes help organisms survive and reproduce; • Using models to show the effects of matter flowing on an ecosystem; • Using patterns to explain that traits are inherited and can be influenced by the environment; • Using fossil data to explain how survival depends on traits and environment; and • Evaluating solutions to problems caused by environmental changes.
	Physical Sciences
	Students can apply their understanding of the disciplinary core ideas of physical science and uses science and engineering practices as well as crosscutting concepts within science to explain phenomena involving matter and its interactions, forces and motion, waves, and energy. This includes: • Using models to show that matter is made of particles and conserved during changes; • Using patterns to investigate changes in motion caused by forces; • Investigating moving objects that transfer energy; • Using models to show that waves cause objects to move and be seen; and, • Designing devices that maximize energy conversion, use magnets, or transfer information.

Performance in Science and Engineering Practices and Crosscutting Concepts
(*to be reported beginning in SY 2020–2021*)
Each assessment has performance level descriptors for the SEPs and the CCCs. An example from the Elementary Assessment follows; additional performance level descriptors will be available on the HSAP Science Portal.

These reports will use horizontal bars and symbols (see right).



	Gathering Data and Investigating Scientific Questions
	The student asks questions, obtains and uses information, and conducts investigations to determine cause and effect relationships, to describe patterns and relationships in the natural world, to describe energy transformations within systems and use standard units to describe physical quantities to describe patterns as evidence of phenomena.
	Developing and Using Models to Describe the Natural World
	The student develops and use models to describe patterns and interactions within a system, to describe cause and effect relationships at various scales, to describe the transformations of energy and matter within a system, and to show variations pertaining to the scale, proportion and quantity within a system.
	Using Mathematical Thinking to Analyze and Interpret Patterns in Data
	The student represents, analyzes and interprets patterns of data to describe relationships and make-predictions, to determine quantitative and qualitative relationships, to describe, measure and graph quantities using standard units, and uses mathematical thinking to explain phenomena at various scales and proportions.
	Use Scientific Reasoning to Construct Explanations and Arguments and to Design Solutions
	The student constructs an argument, explanation, or solution based on evidence to describe cause and effect relationships, to generate and/or compare claims to support solutions based on criteria and constraints and use patterns to sort and classify products, and to support claims about the transformations of energy and matter.

Aggregate Reports Only

Aggregate reports will be available for the school, complex, complex area, and state levels. In addition to a summary of the information described above, aggregate reports will include performance information related to the disciplinary core ideas (DCIs) within each science domain and related to each performance expectation (PE) addressed by the respective tests. PE data will only be available for classes with 20 or more students.

DCI and PE data will be reported as performance relative to student proficiency and relative to the test as a whole. These allow teachers to determine which PEs might need more focused attention. These measures will be reported using +, =, -, and * symbols (see below). Each of the DCIs will be followed by a list of the applicable PEs with the indicators for performance relative to proficiency and performance relative to the test. Following are elementary school life science DCI and related PEs as an example.

Legend: Performance Relative to Proficiency

- + Performance is above the Proficiency Standard
- = Performance is near the Proficiency Standard
- - Performance is below the Proficiency Standard
- * Insufficient Information

Legend: Performance Relative to the Test as a Whole

- + Performance is better than on the rest of the test as a whole
- = Performance is similar to performance on the test as a whole
- - Performance is worse than on the rest of the test as a whole
- * Insufficient Information

How did my school perform on each Elementary Disciplinary Core Idea and Performance Expectation?

Life Science	Performance Relative to Proficiency	Performance Relative to Test as a Whole
LS1 From Molecules to Organisms: Structure and Processes: Use, develop, revise, and evaluate models that describe patterns in the life cycles of organisms, and use evidence to construct an argument that explains how plants and animals need internal and external structures to live and grow.	=	=
3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	=	=
4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	=	=
4-LS1-2: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	+	+
5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.	=	=
LS2 Ecosystems: Support, construct, and evaluate models that describe the movement of matter through the interactions of the living and non-living components of an ecosystem.	=	=
3-LS2-1: Construct an argument that some animals form groups that help members survive.	-	-
5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	=	=
LS3 Heredity: Inheritance and Variation of Traits: Analyze and interpret data and use patterns in the evidence to construct an explanation that plants and animals inherit traits from their parents and that traits can vary within a group of similar organisms due to inheritance and the environment.	=	=
3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	=	+
3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.	*	*

The table below presents nine possible performance categories based on the performance categories in Relative to Proficiency and Relative to the Test as a Whole. This table is provided as guidance to teachers and other educators about how to interpret the results from the various performance categories for use in their instruction.

		Relative to Proficiency		
		+	=	−
Relative to the Test as a Whole	+	Students in this group are performing quite well. Leverage content measured by this DCI or PE to help teach content in other DCIs or PEs that need more focus.	Leverage content measured by this DCI or PE to help teach content in other DCIs or PEs that need focus.	Students in this group are struggling overall, but they are a bit stronger on this DCI or PE. Leverage content measured by this DCI or PE to help teach content in other DCIs or PEs that need focus.
	=	Students in this group are meeting grade-level expectations on the content measured by this DCI or PE. Focus attention on content from other DCIs or PEs with lower performance.	There is not enough information to determine if students in this group have mastered this content. Continue to teach content measured by this DCI or PE at this grade level.	Students in this group need more work on the content measured by this DCI or PE and with other DCIs or PEs at this grade level.
	−	Students in this group are meeting grade-level expectations, but they are weaker on this DCI or PE. Continue focusing on content expectations at this grade level with extra attention on content measured by this DCI or PE.	Focus extra attention on this DCI or PE for students in this group, starting with what is expected at this grade level.	Focus extra attention on content measured by this DCI or PE, at this grade level or the grade level below, for the majority of students in this group.

Interpreting and Acting on Results

In moving forward to interpret science assessment results to inform classroom practice, it is important to once again remember the toothpick. Like the toothpick, the science assessment is a tool that is designed to provide specific and limited information. It is not the desired outcome, but rather one indicator of student science literacy.

State summative assessment data ***can and should*** be used to:

- examine student achievement holistically (at the school, complex area, or state levels);
- identify patterns or trends, including gaps, across student groups;
- compare achievement from year to year by school, complex area, or state;
- evaluate standards alignment and implementation across grade levels;
- identify strengths and gaps in curriculum and instruction; and
- inform system-wide decisions about support and implementation.

State summative assessment data ***should not*** be used to provide a comprehensive evaluation of individual students or teachers. Teachers and schools should take into account many types of evidence of student learning, including classroom-based formal-, informal-, formative, and summative-assessments. Further, caution should be taken in making comparisons, as the state summative assessments for science are only administered once per grade band.

In addition to established data teams processes, consider the following process and resources when interpreting science assessment data and making plans to act.

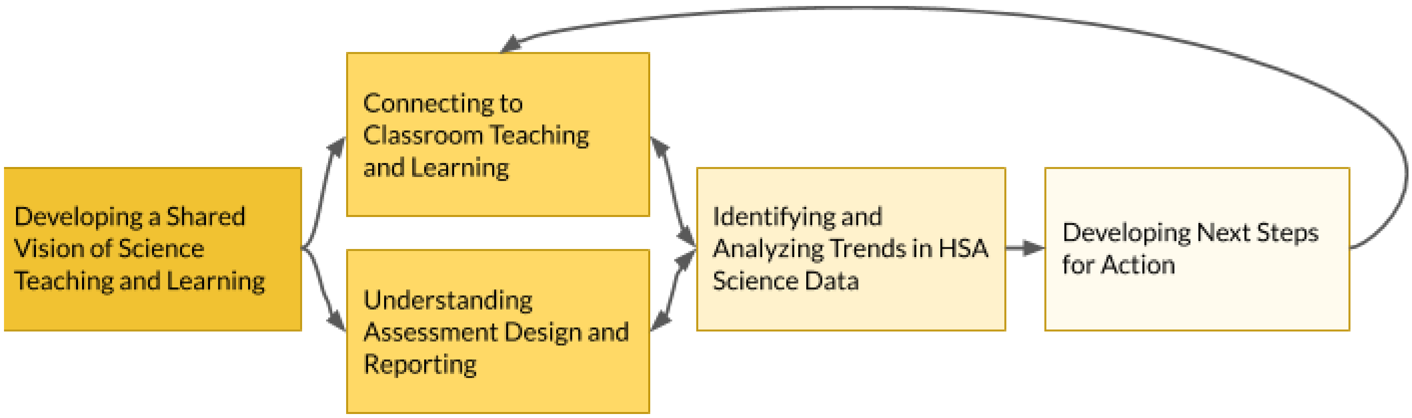
Purpose and Use of This Process

Remember the toothpick? If you were baking a cake, the toothpick test would give you a very limited amount of information about whether your cake was done and whether you needed to put it back in the oven.

Similarly, the state summative assessment gives finite information about student proficiency in the standards. The following steps are designed to help you make sense of the results of the science assessment. Part of this process is obtaining additional information, in order to decide what to do next in the classroom to move toward the goal of developing scientifically literate students through equitable and high-quality science teaching and learning.

This process is meant to support and complement, not replace, your existing data teams and review processes. These steps will work best when a foundation has been built to surmount the common technical and cultural barriers to data analysis, and when there are common understandings around the use of the data.

Process for Interpreting and Acting on HSA Science (NGSS) Results



This process is inherently interconnected and iterative. The steps below are numbered, but there should be a back-and-forth of revisiting each step across each school year.

Some suggestions for working through the steps:

- Work in a team, such as a school data team, grade-level, department, or complex area team.
- Review the following steps and resources as early in the school year as possible, in order to plan.
- Complete foundational Steps 1, 2, and 3 prior to receiving assessment results.
- Revisit each step as necessary to come to common understandings as a team.

Step 1: Developing a Shared Vision of Science Teaching and Learning

Overview

In Step 1, take the time to come to common understandings about your team's shared vision of science teaching and learning. This will frame your discussion about translating assessment results into practice.

Reflection Questions

- What is your shared vision for three-dimensional science teaching and learning?
- To what extent does NGSS currently inform your science curriculum, instruction, and assessment?
- How well do you understand the shifts and essential features of NGSS?
- Do ALL students currently have an opportunity to engage in quality science learning experiences?

Checkpoints

If you want to build on your vision for science →	If you feel comfortable with your shared vision →
• Revisit the Vision for Science Teaching and Learning • Review and discuss this STEM Teaching Tool • Use the NGSS Pre-Implementation Reflection Tool	• Move to Step 2

Step 2: Connecting to Classroom Teaching and Learning

Overview

In Step 2, examine teaching practice for alignment to the vision in Step 1. This will give you a baseline for understanding state summative assessment results.

Reflection Questions

First, answer the questions below using the lens of the Essential Features of NGSS:

To what extent does teaching and learning in your classroom...
• center students as learners and sensemakers (see Shifts)?
• integrate the SEPs, CCCs, and DCIs?
• provide equitable, inclusive, and engaging learning opportunities for all students?
• require students to demonstrate reasoning and use of evidence during classroom assessments?
• align to grade-level standards and scaffold over time?
• make strong connections to content and skills in other disciplines, such as ELA, Math, or Social Studies?

Then, answer these questions:

- How well do instructional materials reflect the Essential Features of NGSS?
- How familiar are teachers and administrators with NGSS?
- What structures are in place to provide time and professional learning opportunities for teachers?
- How are communication and collaboration facilitated within and across grades and content areas?
- How do formative instruction practices play a role in your classrooms?
- To what extent do teachers collaborate on common formative assessments, analyze data, and utilize strategies for student improvement, including in non-tested grades?

Step 2 Checkpoints

If you want to collect additional data →	**If you feel comfortable with your analysis →**
• Use tools to observe and reflect on classroom implementation ◦ Practices ◦ NAESP "Look Fors" ◦ Tools and Processes • Analyze curricular materials and classroom assessments for alignment to NGSS • Revisit the Performance Expectations (Elementary School; Middle School; Biology) and Evidence Statements covered by the assessment	• Move to Step 3

Step 3: Understanding Assessment Design and Reporting

Overview

In Step 3, ensure that your team understands the design of the assessment and the reporting. This will guide your understanding of the assessment data.

Reflection Questions

- What are the key features of the assessment and how do they reflect the NGSS?
- How might teachers taking a practice test or interim assessment help them get a feel for the interface and structure of the assessment?
- What are the reporting categories and how do they reflect the NGSS?

Checkpoints

If you want to build on your understanding of the assessment design and reporting →	If you feel comfortable the assessment design and reporting →
• Revisit the Science Assessment Design section and the Scoring and Reporting section • Review and discuss the Aloha HSA NGSS Resources	• Move to Step 4

Step 4: Identifying and Analyzing Trends in State Summative Assessment Data

Overview

In Step 4, explore the assessment data and analyze trends. This step should connect to your understanding of classroom practices and assessment design, and will guide your informed decision-making in the next step.

Reflection Questions

- **FIRST PREDICT – Based on your analysis of classroom practice and understanding of the assessment design, what do you anticipate for overall data and trends?**

- What is the distribution of students by overall proficiency/scale score?
- What is the distribution of student proficiency in each domain/DCI?
- What are the trends for each performance expectation? Use the following worksheets (*note that PRTP and PRTW reports will be generated in aggregate reports, but these worksheets can be used for collaborative analysis*):
    - Grade 5 (Grade 3–5 PEs by Domain)
    - Grade 5 (Grade 3–5 PEs by Grade)
    - Grade 8 (Grade 6–8 PEs by Domain)
    - Grade 8 (Grade 6–8 PEs by Grade)
    - Biology End of Course

- What are the trends for proficiency in the practices/crosscutting concepts (starting in SY 2020–2021)?
- What are the gaps between the overall proficiency and proficiency of subgroups?
- Based on the trends, the PEs, and the task demands, what do you know about what students know and are able to do?
- What are the possible relationships between instructional practices and assessment results?
- How does your assessment data support or challenge your perceptions of your existing instructional practices (See Step 2)?

Checkpoints

If you want to do a deeper dive with the data →	If you feel comfortable with the analysis →
• Use your existing data teams tools and protocols to further analyze the science assessment data • Cross-reference Science assessment data to English Language Arts and Mathematics assessment data • Expand your conversations to larger teams, for example across complex areas, schools, or grade-levels	• Move to Step 5

Step 5: Developing Next Steps for Action

Overview

In Step 5, make a plan for your next steps. This will be the basis for moving forward to translate data into practice, so your actions should connect to classroom teaching and learning.

Reflection Questions

- What additional data might you need to collect?
- What are your strengths and your areas of need? Use this self-assessment to gauge your needs and connect to resources.
- What resources are available to you? See the following section for resources for instruction, curriculum, assessment, and professional learning.
- What outcomes would you like to see?
- How will you measure your progress?
- What strategies will you use?
- What is your timeline and what are your next steps?

Checkpoints

If you need more information →	If you feel comfortable with your plan →
• Revisit Steps 1–4 • Include new team members for a different perspective	• Implement your plan! • Return to your plan for continual observation and improvement

Resources for Acting on Assessment Results

The following resources are provided to support planning for next steps. Each section contains reflection questions, pitfalls to avoid from the *Guide to Implementing the NGSS*, and relevant resources. Take sufficient time to review the resources and select with purpose those that will be most beneficial to you.

Instructional Resources

Reflection Questions

- What structures and routines do teachers use to support three-dimensional teaching and learning?
- Do teachers employ inclusive instructional strategies that attend to equity?

Pitfalls to Avoid (from the *Guide to Implementing the NGSS*)

- Providing insufficient support for students
- Assigning unproductive student tasks
- Being reluctant to let go of familiar units or favorite activities

NGSS Tools and Strategies		
These resources provide tools and strategies for NGSS-aligned classroom teaching.		
All Grades	Ambitious Science Teaching	Tools, videos, and unit starters for equitable teaching centered on student ideas
	Doing and Talking Math and Science	Talk and collaboration strategies, with an emphasis on English Learners
	Instructional Leadership for Science Practices	Tools, strategies, and resources for integration of science practices into classrooms
	STEM Teaching Tools – Instruction	Practice and research briefs with strategies for powerful STEM learning experiences
	The Winning Equation: Access + Attitude = Success in Math and Science	Strategies and resources for providing equitable access to high-quality science learning for students with disabilities
	Using Crosscutting Concepts to Prompt Student Discussion	Examples of prompts aligned to crosscutting concepts and formative assessment

Curriculum Resources

Reflection Questions
- Do curricular materials align to a cohesive learning progression within and across grades?
- Do teachers have access to the resources needed for teaching science beyond curriculum materials?
- Do materials engage and support all students?

Pitfalls to Avoid (from the *Guide to Implementing the NGSS*)
- Asking "which standard are you teaching today?"
- Failing to provide resources to support students' investigations and design projects

Curriculum Review Tools and Processes		
These are tools for reviewing lessons, units, and curricular programs.		
All Grades	OCID Curricular Review Materials	Tools for reviewing lessons, units, and curricular programs for alignment to the Essential Features of NGSS
	NextGen Time	Tools and processes that support educators to evaluate, select, and implement instructional materials
	NGSS EQuIP Rubric for Science	Criteria by which to measure how well lessons and units are designed for the NGSS
	NGSS Lesson Screener	Quick way to look at a lesson and determine its level of NGSS design for full EQuIP Rubric for Science evaluation
	STEM Teaching Tool – Curriculum Adaptation	Strategies for using curriculum adaptation to help teachers develop aligned instructional materials

Phenomena Resources		
These are strategies and resources for incorporating phenomena into instruction.		
All Grades	Using Phenomena in NGSS Lessons and Units	Overview of phenomena for teaching and learning
	Qualities of a Good Anchor Phenomenon	Overview of qualities of phenomena and problems that can be used to drive instruction
	Phenomena for NGSS	Library of phenomena and related resources
	Using Phenomena Rubric	Video overview of NGSS phenomena
	Project Phenomena	Database of phenomena and aligned lesson ideas
	Choosing Phenomena	Resource for unwrapping and aligning phenomena

Lessons, Units, and Curricular Programs		
These lessons and units are NGSS-aligned, either having been vetted or created by experts. Teachers should still review for alignment and appropriateness to their contexts. Many, but not all, of these resources are free.		
All Grades	NSTA Classroom Resources	*Vetted* lessons
	Going 3D With GRC	*Teacher- and expert-developed* lessons, many Hawaiʻi-based
	Peer-Reviewed Units	*Vetted* units
	Next Gen Storylines	*Teacher- and expert-developed* units
	Oregon Adopted Materials	Instructional materials adopted by the Oregon State Board of Education. Oregon is an NGSS-adopted state. (2016)
K–5	Wonders of Science and STEM	*Local teacher- and expert-developed* lessons
K–8	California Science Instructional Materials	CDE state-level review of instructional programs for Grades K–8. California is an NGSS-adopted state. (2018)
	EdReports Science	Reviews by independent nonprofit EdReports. Ongoing reviews currently available for 6–8, expanding to K–5.
6	Stanford Learning Through Performance	*Expert-developed* year-long curriculum
6–8	OpenSciEd	*Expert-developed* units
6-8	Stanford NGSS Integrated Curriculum	*Expert-developed* year-long curricula
9–12 Physical Science	Interactions	*Expert-developed* year-long curriculum
9–12 Biology	iHub Biology	*Expert-developed* year-long curriculum

Assessment Resources

Reflection Questions

- To what extent are teachers creating/implementing NGSS-aligned classroom assessments?
- Are assessments used purposefully as part of a cohesive learning progression within and across grades?

Pitfalls to Avoid (from the *Guide to Implementing the NGSS*)

- Failing to differentiate the purposes of assessment
- Failing to respond to assessment results
- Using old assessments for new instructional methods

Assessment Alignment		
These resources are designed to help teachers create and review assessments for alignment to NGSS.		
All Grades	STEM Teaching Tools – Assessment	Practice and research briefs with strategies for powerful STEM learning experiences
	Science Assessment Task Screening Tools	Tools intended to assist educators in evaluating science assessment tasks for three-dimensional science design
	Evidence Statements	NGSS Evidence Statements provide additional detail on what students should know and be able to do in line with the PEs
6–8	Scientific Argument Assessments	Strategies and sample assessments for reading, writing, and talking about science using evidence and reasoning

Formative Instruction Resources		
These resources provide general support for formative instruction.		
All Grades	7 Actions of Assessment for Learning	7 Actions for quality assessment for learning from connect2learning
	"How Am I Doing?"	Article by Jan Chappuis on effective feedback strategies
	OCID LDR – Assessment, Evaluation and Reporting	High-level summary of classroom assessment and related resources
	Fundamental Insights About Formative Assessment	Summary document of why formative assessment is important and the kinds of supports that will be needed to lead and scale its effective implementation from FAST SCASS

NGSS-Aligned Classroom Assessments		
These resources are free and have been developed to be aligned to NGSS. Teachers should still review for alignment and appropriateness to their contexts.		
All Grades	Kentucky Through Course Tasks	Three-dimensional, formative assessments, organized by phenomena with related practices and crosscutting concepts
	The Wonder of Science Performance Assessments	Draft performance assessments and performance assessment ideas
K–8	SNAP Assessments for NGSS	Sample short-response, performance, and instructionally-embedded assessments
6–8	Next Generation Science Assessments	Assessment for 6–8 physical and life science performance expectations, with phenomenon master list and related PEs
6–12	NGSS Classroom Sample Tasks	Tasks integrate content, practices, and concepts from NGSS and the Common Core State Standards in Mathematics

State Summative Assessments		
These resources are specific to the Hawaiʻi State Summative Assessment (HSA) Science (NGSS).		
3–8, High School Biology	HIDOE Assessment Toolkit	NGSS assessment resources for staff and administrators
	HSA Science Factsheet	One page overview of the HSA Science (NGSS)
	Aloha HSA Science	Portal for HSA Science (NGSS)
	Aloha HSA Science Resources	Direct link for HSA Science (NGSS) resources, including cluster specifications and blueprints

Professional Learning Resources

Reflection Questions
- What strengths do teachers have that can be built on?
- What are teachers' needs?

Pitfalls to Avoid (from the *Guide to Implementing the NGSS*)
- Underestimating the shifts needed in one's own practice
- Underestimating the need for ongoing support

Document Library	
These are foundational and ancillary documents for NGSS and NGSS implementation.	
All Grades	A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas
	Next Generation Science Standards: For States, By States
	Guide to Implementing the Next Generation Science Standards
	Developing Assessments for the NGSS
	Seeing Students Learn Science: Integrating Assessment and Instruction in the Classroom
	English Learners in STEM Subjects: Transforming Classrooms, Schools, and Lives
	Science Teachers' Learning: Enhancing Opportunities, Creating Supportive Contexts
	Science and Engineering for Grades 6–12: Investigation and Design at the Center
	NGSS Resource Library
	STEM Teaching Tools

Professional Learning Materials		
These learning materials are designed to support teachers with NGSS understanding and implementation.		
All Grades	STEM Teaching Tools PD	Open education resources for professional development
	NGSS Demystified	Resources designed to help facilitate successful NGSS training for a team of educators
	NGSS@NSTA Hub and NSTA Learning Center	NGSS professional learning resources designed by the National Science Teaching Association
	NGSS Video Hub	NGSS videos that Achieve created or co-created.
	Five Tools and Processes for Translating the NGSS	Tools and processes designed to help professional development leaders work with teachers
	The Wonder of Science Videos	Videos designed to help teachers understand the dimensions of the NGSS
	NGSNavigators Podcast	Podcast featuring interviews with NGSS experts
K–5	Elementary Science video workshop	Professional learning for elementary principals from the Association of Washington School Principals