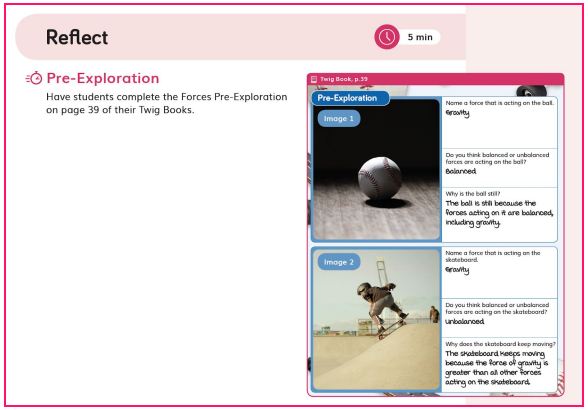
twig Science

SCALE
Stanford Center for Assessment, Learning, & Equity

Introduction to Assessment

The Twig Science Assessment System has been developed in partnership with Stanford University's SCALE team. It is designed to provide a three-dimensional assessment system that allows teachers to evaluate student attainment of the three dimensions and Performance Expectations (PEs) of the NGSS.



The assessment strategies measure students' knowledge and ability. They favor Performance Tasks over rote memorization and include a rich variety of measures, such as written assignments, collaborative engineering design challenges, and oral presentations. There are also lots of informal ways to quickly evaluate student progress.

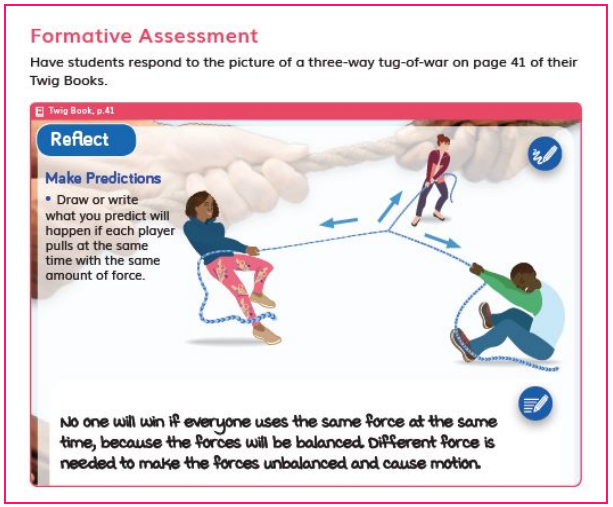
Full details of the assessment opportunities in each module are provided in the Module Assessment Overviews.

Pre-Explorations (Diagnostic Pre-Assessment)

Near the start of each module, students complete a Pre-Exploration (Diagnostic Pre-Assessment). Pre-Explorations enable teachers to identify student prior knowledge and misconceptions. Progress Trackers support teachers to track how students address their misconceptions as they gain new understanding. Additional Pre-Explorations are integrated at strategic points throughout the module where they add most value.

Formative Assessments (Informal Assessment)

Ongoing Formative Assessment, sometimes referred to as Informal Assessments, are woven into each lesson. These are quick way to gauge student understanding, allowing teachers to tailor their instruction accordingly. They include class discussions, constructed responses (written and drawn), self and peer assessment, and teacher observations.



Summative Assessments

Summative Performance Tasks are rich and highly engaging activities designed to motivate students to show off their attainment level of the module PEs. Rubrics support easy grading. Leveled rubrics are provided from Grade 2 Grade 2 onwards to give students a clear understanding of what success looks like.

Modules in Grades 3–6 include SCALE Benchmark Assessments, which assess students' ability to apply the knowledge and skills gained throughout the module to new contexts. This gives students exposure to the types of assessment items they will face in the state test. Leveled rubrics support easy grading with sample student answers provided in the form of "Look Fors." Student versions of these rubrics are available without the "Look Fors."

Grades 3–6 also include 3-D Multiple Choice Assessments, which quickly assess student understanding of a range of dimensions covered in the module. An extended section (Part C) has been designed to stretch GATE students.

In this Program-Level Student Progress Rubric, examples of assessment items have been cited from Grade 1 Module 1, Grade 3 Module 3, and Grade 4 Module 4 to provide a sample of the breadth and quality of the assessment items over all of K–6. Module-level rubrics are also available..

Museum of Leafology Assessment Story

In this module students figure out the Module Phenomenon: How are all plants alike and how are they different? Through a series of hands-on and data investigations, and nature explorations, including growing plants from seed, students gain understanding of the different parts of plants and their shapes and functions. At the same time, they develop valuable skills in making observations and comparisons, and identifying patterns.

Students investigate what plants need and how a plant's parts help it to grow and survive. They go on to explore the many methods that plants use to distribute seeds away from the parent plant. Students work in teams to tackle their first Engineering Design Challenge: to design and build seeds for dispersal by wind. They test and present the results of their design before adding a Seeds Room to the Museum of Leafology.

Students observe the seedlings they planted, as well as plants in nature, and record similarities and differences. They also investigate the clever strategies plants use to get what they need, including defences that some plants use. After observing and discussing existing inventions that were inspired by plants, students tackle their second Engineering Design Challenge:to design, build, and present their own plant-inspired solution to a human problem.

At the end of the module, students invite other classes and their own families to visit the museum in order to demonstrate their learning. The final lesson features a pair of assessment tasks and a reading about edible plants, followed by a celebratory plant parts salad.

The Ultimate Playground Assessment Story

In this module students figure out the Module Phenomenon: How are objects affected by the forces of push and pull? Through a series of investigations, students observe and explain how push and pull forces affect the motion of objects, such as playground equipment, dumbbells, and soccer balls. They plan and carry out investigations to figure out how balanced and unbalanced forces affect objects, how several forces can act upon a stationary object, and work like engineers to test roller coaster cars.

Students develop and use models to collect and analyze data, and identify patterns that help them to predict a swing's motion. They then explore non-contact forces, focussing on magnetic forces.

In the final Performance Task, students design, build, test and refine a Dragon Ride for their Ultimate Playground, using magnets to solve the problem of how the ride will be exciting and fun. Students are assessed on their ability to evaluate multiple design solutions, and ensuring that the final design meets criteria and constraints.

Earthquake Engineering Assessment Story

In this module, students solve the investigative problem: How do we reduce the damage caused by earthquakes. Using an interactive map, students make sense of why earthquakes appear in patterns along plate boundaries and how those patterns help earthquake engineers plan how and where to build. Students are assessed on their ability to analyze data in maps, to identify Earth's features, and identify patterns where earthquakes occur.

Through a series of investigations, students build understanding of how the shape, structure, and properties of materials affect buildings' ability to withstand forces. They use this knowledge to design, build, and test their first earthquake-resistant structures. Students continue to make observations and obtain information from physical models, informational texts, and videos, which informs their design revisions

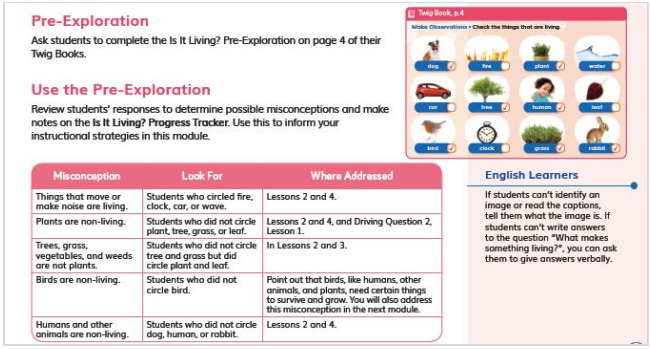
In the final presentation of their engineering designs, students explain how decisions about building characteristics, such as materials' flexibility, shape, and symmetry), address the Module Investigative Problem. Students are assessed on their ability to evaluate multiple design solutions for make buildings more earthquake-resistant, and ensuring the solutions meet the design criteria and constraints.

Designed for the NGSS: Student Progress Rubric
Evidence Chart

Directions

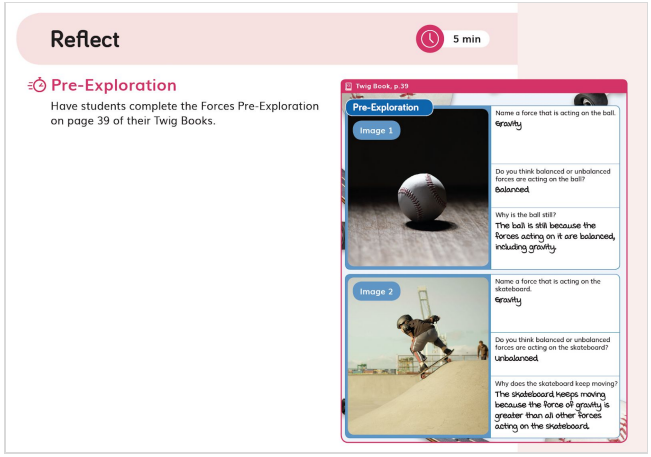
1. Review your assigned materials to identify assessments of and for learning. Complete an evidence chart for each identified assessment.
2. Respond to the prompts or answer the questions in the space provided.
3. Be prepared to represent your responses visually on a public chart.

Pre-Explorations

Assessment Description				
 **Pre-Exploration** Ask students to complete the Is It Living? Pre-Exploration on page 4 of their Twig Books. **Use the Pre-Exploration** Review students' responses to determine possible misconceptions and make notes on the **Is It Living? Progress Tracker**. Use this to inform your instructional strategies in this module. Twig Book, p.4 Make Observations • Check the things that are living. dog, fire, plant, water, car, tree, human, leaf, bird, clock, grass, rabbit **Misconception** / **Look For** / **Where Addressed** Things that move or make noise are living. — Students who circled fire, clock, car, or wave. — Lessons 2 and 4. Plants are non-living. — Students who did not circle plant, tree, grass, or leaf. — Lessons 2 and 4, and Driving Question 2, Lesson 1. Trees, grass, vegetables, and weeds are not plants. — Students who did not circle tree and grass but did circle plant and leaf. — In Lessons 2 and 3. Birds are non-living. — Students who did not circle bird. — Point out that birds, like humans, other animals, and plants, need certain things to survive and grow. You will also address this misconception in the next module. Humans and other animals are non-living. — Students who did not circle dog, human, or rabbit. — Lessons 2 and 4. **English Learners** If students can't identify an image or read the captions, tell them what the image is. If students can't write answers to the question "What makes something living?", you can ask them to give answers verbally. **Grade 1 Module 1 DQ1L1 Reflect TE p.11/DQ1L1 TB p.4**	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs)** Students look at 12 images and check those that show things that are living.	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)** Prior knowledge/ Pre-assessment	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)** Constructed response Multiple choice	**Note evidence of bias or problems with accessibility** No evidence of bias

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students figure out which images show living things.	Students are assessed on their prior knowledge of living and non-living things.

Assessment Description



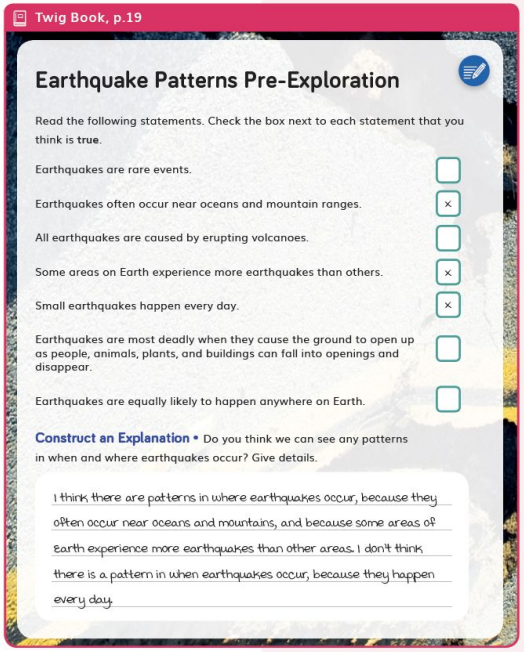
Grade 3 Module 1 DQ2L1 Reflect TE p.119/ DQ2L1 Reflect TB p.39

Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).	Purpose of Assessment (i.e., peer, self, formative, summative, per/post)	Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)	Note evidence of bias or problems with accessibility.
Students observe two images and identify the forces acting on objects, then state whether they are balanced or unbalanced.	Pre-assessment	Images with written response	No evidence of bias

Match among Assessment, Phenomena/Problem, and Three Dimensions

What phenomenon or problem, if any, are students trying to figure out in this assessment?	What is the 2-3 dimensional learning goal assessed in this task?
Students use prior knowledge to work out whether balanced or unbalanced forces are affecting the motion of a skateboarder, and a stationary baseball.	Students are pre-assessed on their knowledge of push and pull forces, and the effects of balanced and unbalanced forces on objects' motion. They apply the concept of cause-and-effect to construct their responses. (PS2.A, PS2.B, CCC-2)

Assessment Description



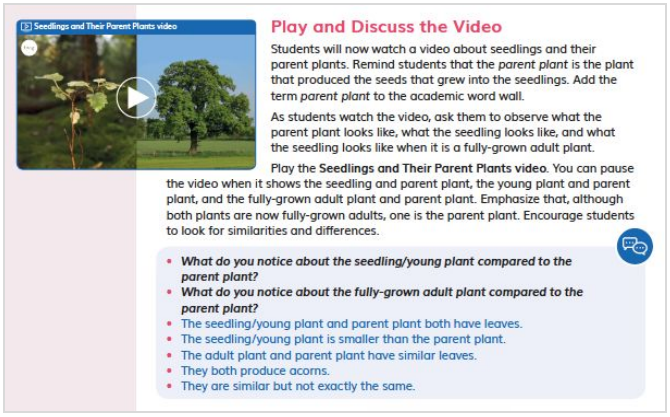
Grade 4 Module 4 DQ1L5 Reflect TE p. 41/DQ1L5 Reflect TB p. 19

Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).	Purpose of Assessment (i.e., peer, self, formative, summative, per/post)	Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)	Note evidence of bias or problems with accessibility.
Students read seven statements about earthquake and decide if they are true or false. Then, answer a question about patterns.	Pre-assessment	Multiple choice and constructed response	No evidence of bias. Text- to-speech function available for students that require language support

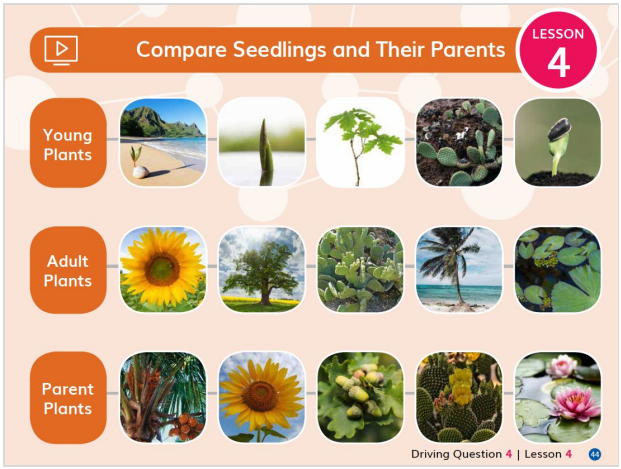
Match among Assessment, Phenomena/Problem, and Three Dimensions

What phenomenon or problem, if any, are students trying to figure out in this assessment?	What is the 2-3 dimensional learning goal assessed in this task?
Students are assessing their prior knowledge/misconceptions of the phenomenon of earthquakes.	There is no learning goal assessed in this pre-assessment. It is assessing prior knowledge of ESS2-B and CCC-1.

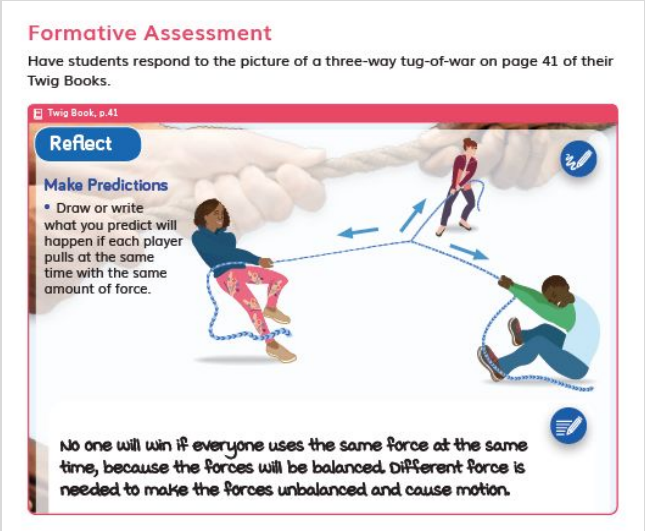
Formative Assessment (Informal Assessment)

Assessment Description				
 Grade 1 Module 1 DQ4L4 Spark TE p. 150	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).** Students watch and video, then have a class discussion.	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)** Formative	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)** Discussion	**Note evidence of bias or problems with accessibility.** No evidence of bias

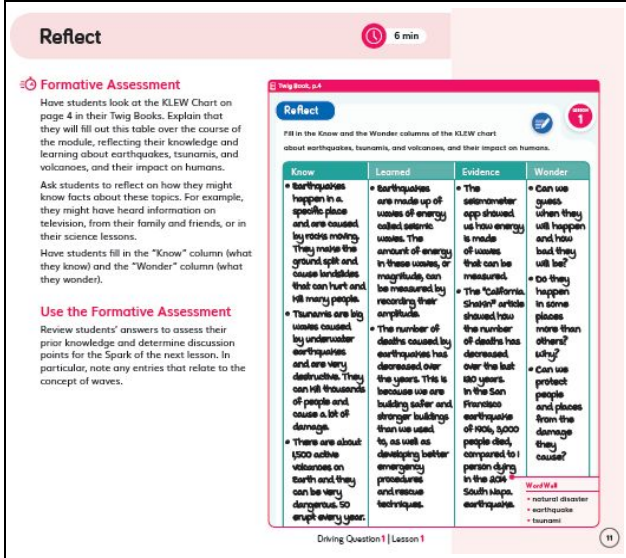
Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students observe seedlings and parent plants, then discuss the module phenomenon—How are plants alike and how are they different?	Students are assessed on their ability to make observations from watching a video, and explain ideas in a class discussion. They should be able to communicate how plant offspring look alike, and look different to their parent plants.

Assessment Description				
 Grade 1 Module 1 DQ4L4 Spark TE p. 150/DQ4L4 TB p. 44	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).**	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)**	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)**	**Note evidence of bias or problems with accessibility.**
	A table of images showing a row of Young Plants, Adult Plants, and Parent Plants. Students connect the Young Plant images to how they will look as Adult Plants, and then to their Parent Plants.	Peer, self	Constructed response, matching/sorting images, discussion	No evidence of bias

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students work with a partner to match young plants to their parent plants, and then discuss the reasons for their answers.	Students are assessed on their ability to recognize and match young plants to their parent plants, and to explain their reasoning to a peer based on evidence of how they are alike and different.

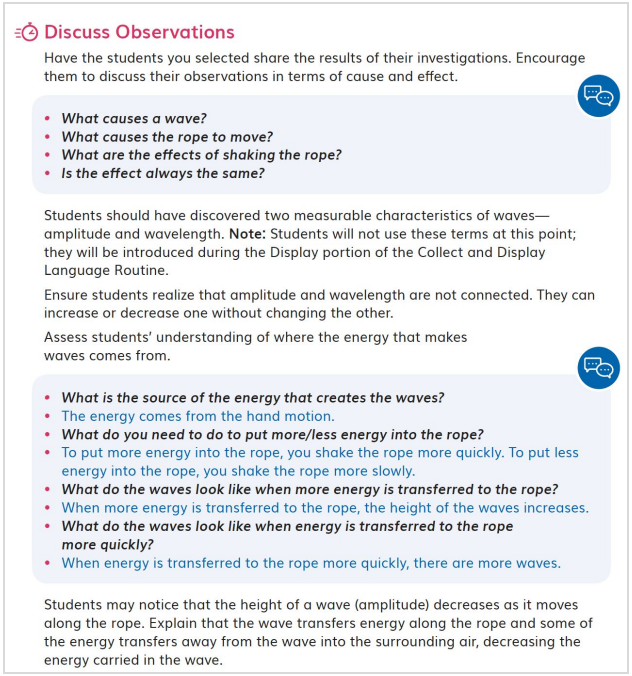
Assessment Description				
 **Grade 3 Module 1 DQ2L2 Reflect TE p. 129/DQ2L2 Reflect TB p. 41**	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).**	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)**	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)**	**Note evidence of bias or problems with accessibility.**
	One prompt asking students to make a prediction about the outcome of a game of tug-of-war. Students annotate a diagram or write what they think will happen.	Formative	Constructed written response	No evidence of bias. Text-to-speech function. The assessment can be completed by either annotating a diagram to show the forces and motion or causes and effects, or by writing a statement

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students are asked to predict the effects balanced forces will have on the motion of a tug-of-war rope.	Students are assessed on their understanding of balanced and unbalanced forces (PS2.A) and the cause-and-effect relationship (CCC-2) between forces and motion. Students demonstrate their understanding by annotating a model (SEP-2) or constructing a statement based on evidence and reasoning (SEP-8).

Assessment Description				
 **Grade 4 Module 4 DQ1L1 Reflect TE p. 11/DQ1L1 Reflect TB p. 4**	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).** Students fill in a KLEW chart (Know, Learned, Evidence, Wonder) to reflect on what they already know about natural disasters and what they wonder about.	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)** Self	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)** Constructed written response	**Note evidence of bias or problems with accessibility.** No evidence of bias. All students able to self-reflect. Text-to-speech function available for students that require language support

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students are assessing their prior knowledge of earthquakes, tsunamis, and volcanoes, and the problem of their impact on humans.	Students are defining the problem (SEP-1) of natural hazards (ESS3B) and how earthquakes can change landscapes (CCC-7).

Assessment Description



Discuss Observations

Have the students you selected share the results of their investigations. Encourage them to discuss their observations in terms of cause and effect.

- *What causes a wave?*
- *What causes the rope to move?*
- *What are the effects of shaking the rope?*
- *Is the effect always the same?*

Students should have discovered two measurable characteristics of waves—amplitude and wavelength. **Note:** Students will not use these terms at this point; they will be introduced during the Display portion of the Collect and Display Language Routine.

Ensure students realize that amplitude and wavelength are not connected. They can increase or decrease one without changing the other.

Assess students' understanding of where the energy that makes waves comes from.

- *What is the source of the energy that creates the waves?*
- The energy comes from the hand motion.
- *What do you need to do to put more/less energy into the rope?*
- To put more energy into the rope, you shake the rope more quickly. To put less energy into the rope, you shake the rope more slowly.
- *What do the waves look like when more energy is transferred to the rope?*
- When more energy is transferred to the rope, the height of the waves increases.
- *What do the waves look like when energy is transferred to the rope more quickly?*
- When energy is transferred to the rope more quickly, there are more waves.

Students may notice that the height of a wave (amplitude) decreases as it moves along the rope. Explain that the wave transfers energy along the rope and some of the energy transfers away from the wave into the surrounding air, decreasing the energy carried in the wave.

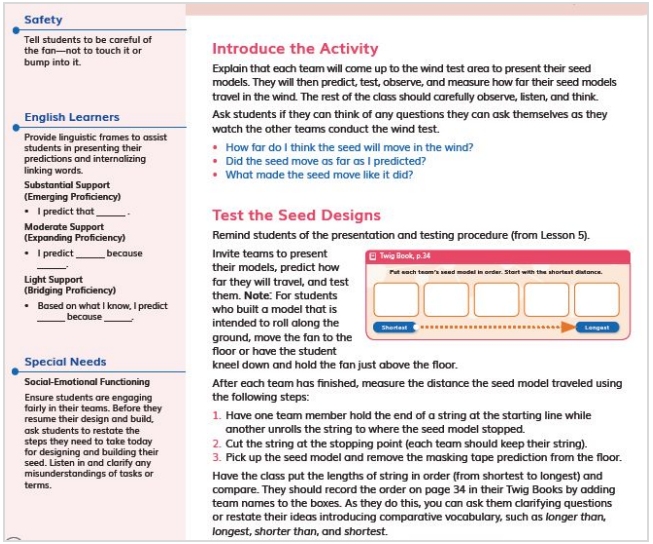
Grade 4 Module 4 DQ1L3 Report TE p. 25

Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).	Purpose of Assessment (i.e., peer, self, formative, summative, per/post)	Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)	Note evidence of bias or problems with accessibility.
As a whole class, students discuss their observations from the investigation in terms of the cause and effect of waves.	Self and peer	Discussion	No evidence of bias. All students able to offer up their observations.

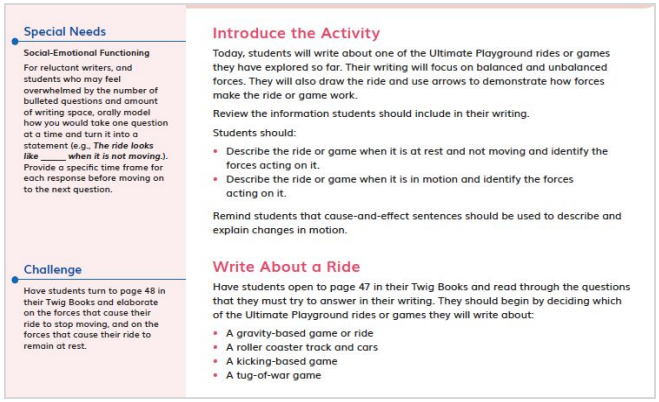
Match among Assessment, Phenomena/Problem, and Three Dimensions

What phenomenon or problem, if any, are students trying to figure out in this assessment?	What is the 2-3 dimensional learning goal assessed in this task?
Students are figuring out where the energy comes from that makes waves in the ropes, and how and why the size and frequency of waves change.	Students carry out an investigation (SEP-3), using CCC-1 and CCC-2, to understand the properties of waves—amplitude and wavelength (PS4.A).

Summative Performance Tasks

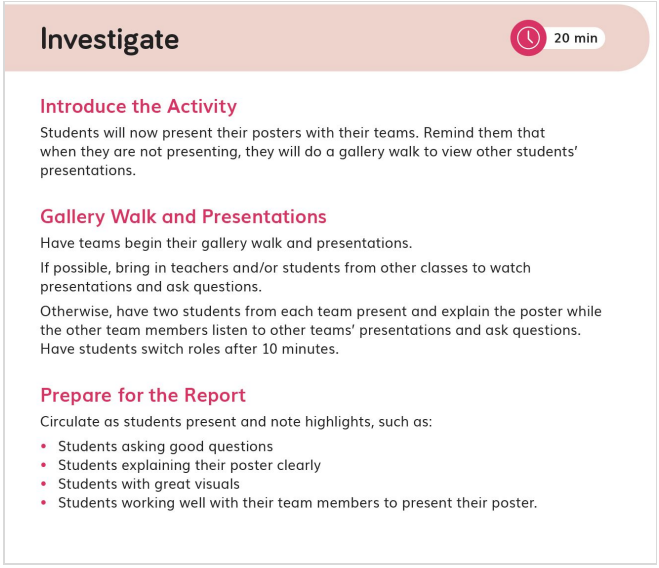
Assessment Description				
 **Safety** Tell students to be careful of the fan—not to touch it or bump into it. **English Learners** Provide linguistic frames to assist students in presenting their predictions and internalizing linking words. **Substantial Support (Emerging Proficiency)** • I predict that _____. **Moderate Support (Expanding Proficiency)** • I predict _____ because _____. **Light Support (Bridging Proficiency)** • Based on what I know, I predict _____ because _____. **Special Needs** **Social-Emotional Functioning** Ensure students are engaging fairly in their teams. Before they resume their design and build, ask students to restate the steps they need to take today for designing and building their seed. Listen in and clarify any misunderstandings of tasks or terms. **Introduce the Activity** Explain that each team will come up to the wind test area to present their seed models. They will then predict, test, observe, and measure how far their seed models travel in the wind. The rest of the class should carefully observe, listen, and think. Ask students if they can think of any questions they can ask themselves as they watch the other teams conduct the wind test. • How far do I think the seed will move in the wind? • Did the seed move as far as I predicted? • What made the seed move like it did? **Test the Seed Designs** Remind students of the presentation and testing procedure (from Lesson 5). Invite teams to present their models, predict how far they will travel, and test them. **Note:** For students who built a model that is intended to roll along the ground, move the fan to the floor or have the student kneel down and hold the fan just above the floor. Twig Book, p. 34 Put each team's seed model in order. Start with the shortest distance. Shortest Longest After each team has finished, measure the distance the seed model traveled using the following steps: 1. Have one team member hold the end of a string at the starting line while another unrolls the string to where the seed model stopped. 2. Cut the string at the stopping point (each team should keep their string). 3. Pick up the seed model and remove the masking tape prediction from the floor. Have the class put the lengths of string in order (from shortest to longest) and compare. They should record the order on page 34 in their Twig Books by adding team names to the boxes. As they do this, you can ask them clarifying questions or restate their ideas introducing comparative vocabulary, such as *longer than, longest, shorter than,* and *shortest.* **Grade 1 Module 1 DQ3L6 TE p. 114/DQ3L6 TB p. 34**	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).** In DQ3L1, DQ3L2, DQ3L4, DQ3L5 and DQ3L6 students work toward the Performance Task: • L1—students compare different seeds • L2—students gather information of how seeds disperse • L4—students design a seed model that can be dispersed as far as possible by wind • L5—students make a model seed • L6—students test their seed models	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)** Summative	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)** Performance Task, hands-on	**Note evidence of bias or problems with accessibility.** No evidence of bias. Suggestions are made as to how the teacher can modify the task for students with special needs and English Learners.

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students are figuring out the phenomena of how the plants have different external parts that help them to survive and how parent plants have offspring, and are solving a design problem.	Students are assessed on how they gather information, and their ability to apply knowledge of seeds and seed dispersal to make and test a model seed.

Assessment Description				
 **Special Needs** **Social-Emotional Functioning** For reluctant writers, and students who may feel overwhelmed by the number of bulleted questions and amount of writing space, orally model how you would take one question at a time and turn it into a statement (e.g., *The ride looks like _____ when it is not moving.*). Provide a specific time frame for each response before moving on to the next question. **Challenge** Have students turn to page 48 in their Twig Books and elaborate on the forces that cause their ride to stop moving, and on the forces that cause their ride to remain at rest. **Introduce the Activity** Today, students will write about one of the Ultimate Playground rides or games they have explored so far. Their writing will focus on balanced and unbalanced forces. They will also draw the ride and use arrows to demonstrate how forces make the ride or game work. Review the information students should include in their writing. Students should: • Describe the ride or game when it is at rest and not moving and identify the forces acting on it. • Describe the ride or game when it is in motion and identify the forces acting on it. Remind students that cause-and-effect sentences should be used to describe and explain changes in motion. **Write About a Ride** Have students open to page 47 in their Twig Books and read through the questions that they must try to answer in their writing. They should begin by deciding which of the Ultimate Playground rides or games they will write about: • A gravity-based game or ride • A roller coaster track and cars • A kicking-based game • A tug-of-war game **Grade 3 Module 1 DQ5L7 Investigate TE p. 278/DQ5L7 Investigate TB p. 89**	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).** Students develop model rides using a criteria and design.	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)** Summative	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)** Performance Task, hands-on	**Note evidence of bias or problems with accessibility.** No evidence of bias

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Over the course of three lessons, students research, design, build, and test a magnetic ride. They figure out how magnetic interactions can create an amusement park ride that moves in fun and exciting ways.	Students are assessed on their ability to research, design, and build a dragon ride to test. They define criteria and constraints, and measure their success according to a rubric. They apply knowledge of forces and motion, non-contact forces, and generate solutions to an engineering problem (PS2.A, PS2.B, ETS1.B, ETS1.C, CCC-1, CCC-2, SEP-2, SEP-3, SEP-6).

Assessment Description



Investigate — 20 min

Introduce the Activity

Students will now present their posters with their teams. Remind them that when they are not presenting, they will do a gallery walk to view other students' presentations.

Gallery Walk and Presentations

Have teams begin their gallery walk and presentations.

If possible, bring in teachers and/or students from other classes to watch presentations and ask questions.

Otherwise, have two students from each team present and explain the poster while the other team members listen to other teams' presentations and ask questions. Have students switch roles after 10 minutes.

Prepare for the Report

Circulate as students present and note highlights, such as:

- Students asking good questions
- Students explaining their poster clearly
- Students with great visuals
- Students working well with their team members to present their poster.

Grade 4 Module 4 DQ6L5 TE p. 204/DQ6L5 TB pp. 100–101

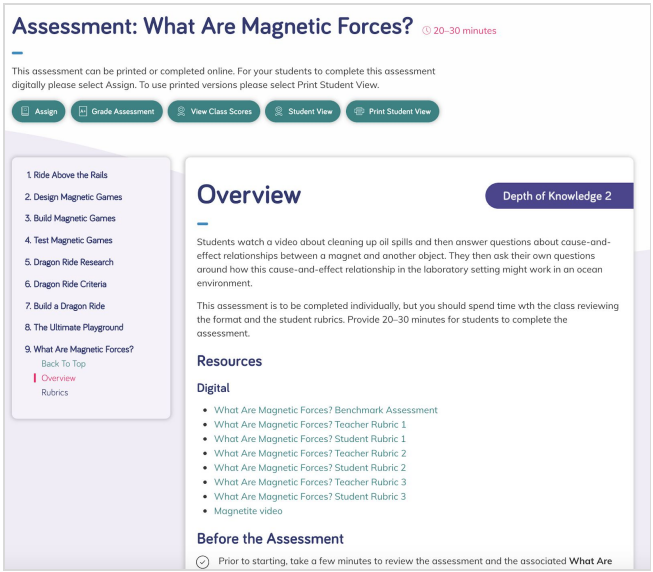
Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).	Purpose of Assessment (i.e., peer, self, formative, summative, per/post)	Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)	Note evidence of bias or problems with accessibility.
Students complete the final stage of the Performance Task as they communicate information about the engineering process in visual and oral presentations.	Self and summative	Performance Task, hands-on	Free from bias. All students able to table part in this Performance Task.

Match among Assessment, Phenomena/Problem, and Three Dimensions

What phenomenon or problem, if any, are students trying to figure out in this assessment?	What is the 2-3 dimensional learning goal assessed in this task?
Students have followed the engineering design process to investigate and solve the problem of how to reduce the damage caused by earthquakes. They have designed and built their own earthquake-resistant structure and tested it using a shake table. After analyzing the tests, they redesigned their structures and implemented improvements. Here, they communicate their designs in poster and presentation form. They use a rubric to self-assess their designs and posters, and their peers'.	To define a problem that includes specified criteria for success and constraints (3–5 ETS1-1), to generate and compare multiple solutions (3–5 ETS1-2), and then carry out tests to identify aspects of the design that can be improved (3–5 ETS1-3).

Summative Benchmark Assessment

Assessment Description



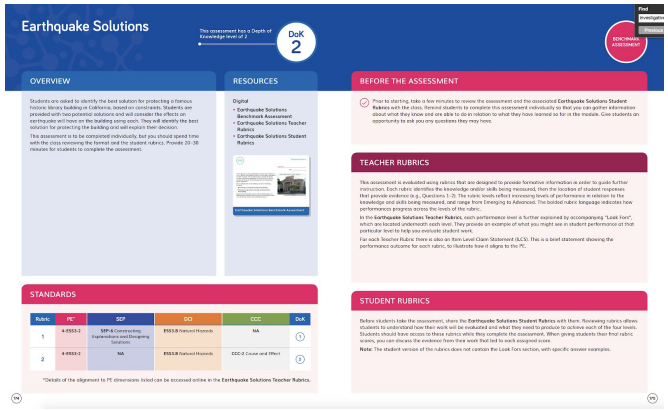
Grade 3 Module 1 DQ5 What Are Magnetic Forces? Benchmark Assessment TE pp. 288–292

Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).	Purpose of Assessment (i.e., peer, self, formative, summative, per/post)	Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)	Note evidence of bias or problems with accessibility.
Students watch a video about cleaning up oil spills, and then answer questions about cause-and-effect relationships between a magnet and another object. They then ask their own questions around how this cause-and-effect relationship in the laboratory setting might work in an ocean environment.	Summative	Constructed response, written and drawn	No evidence of bias. Text-to-speech function available.

Match among Assessment, Phenomena/Problem, and Three Dimensions

What phenomenon or problem, if any, are students trying to figure out in this assessment?	What is the 2-3 dimensional learning goal assessed in this task?
Students are figuring out how non-contact forces, such as magnetism, can be used to solve engineering problems, such as cleaning up an oil spill.	Students are assessed on their ability to use what they have learned throughout the module to solve a real-world problem—cleaning up oil spills (PS2.B, SEP-2, SEP-6, CCC-2, ETS1.B).

Assessment Description



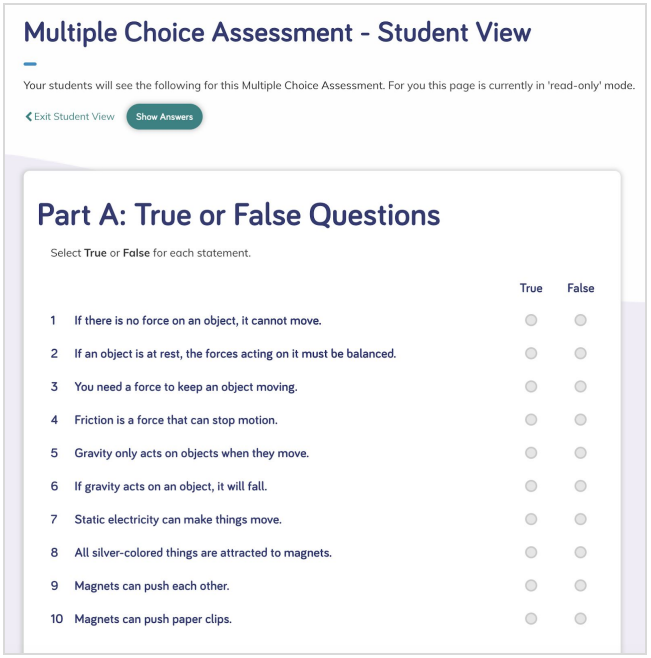
Grade 4 Module 4 DQ2 Analyzing Maps Benchmark Assessment TE pp.88–91

Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).	Purpose of Assessment (i.e., peer, self, formative, summative, per/post)	Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)	Note evidence of bias or problems with accessibility.
Students analyze the data in a series of maps of California, showing the occurrence and magnitude of earthquakes. They complete a series of scaffolded questions.	Summative	Performance Task, constructed response	No Bias. Text-to-speech function available for students that require language support. Questions are scaffolded so all students will be able to demonstrate their understanding. Rubrics support teachers to assess all levels of ability.

Match among Assessment, Phenomena/Problem, and Three Dimensions

What phenomenon or problem, if any, are students trying to figure out in this assessment?	What is the 2-3 dimensional learning goal assessed in this task?
Students take on the role of engineers to analyze earthquake data in maps to solve the problem of choosing the safest location to build a theme park in.	4-ESS2-2 is assessed in this task. Students analyze data from maps to identify the locations and types of Earth's features on a map, and interpret data maps to identify patterns where earthquakes occur.

Summative 3-D Multiple Choice Assessment

Assessment Description				
 **Grade 3 Module 1** Multiple Choice Assessment	**Describe the assessment (e.g., how many questions, presence of tables/charts, graphs).** Part A: 10 True or False questions Part B: 17 Multiple Choice questions Part C: 5 Extended questions Suggested pacing: 20–30 minutes	**Purpose of Assessment (i.e., peer, self, formative, summative, per/post)** Summative	**Type of Measure (e.g., performance task, discussion, multiple choice. constructed response)** Multiple choice	**Note evidence of bias or problems with accessibility.** No evidence of bias. A good mix of image-based and text questions, with text-to-speech function available. Extended questions in Part C for GATE students.

Match among Assessment, Phenomena/Problem, and Three Dimensions	
What phenomenon or problem, if any, are students trying to figure out in this assessment?	**What is the 2-3 dimensional learning goal assessed in this task?**
Students figure out the Module Phenomenon—How are objects affected by the forces of push and pull?—using a number of question types, and answering the DQs covered in the module.	Students are assessed on their ability to answer questions applying the SEPs, CCCs, DCIs, and engineering skills covered across the module.

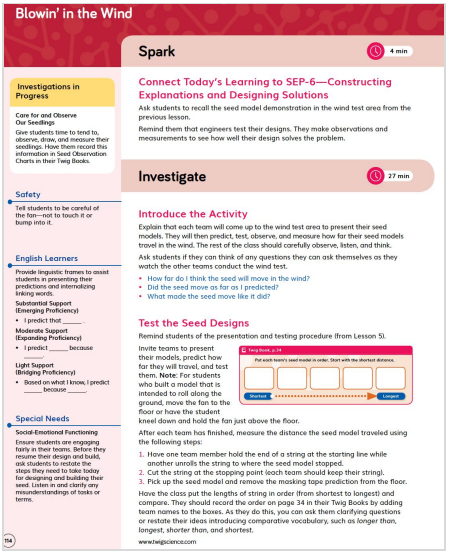
Designed for the NGSS: Foundations	High Quality 5	Medium Quality 3	Low Quality 1
SP1: Three-dimensional Performances. Materials include assessments designed to: ● match the targeted learning goals, and, ● elicit observable evidence of students' use of grade-appropriate elements of the three dimensions to make sense of phenomena and/or to design solutions to problems.	Materials include assessments that are consistently designed to connect to learning goals and require students to apply appropriate elements of the three dimensions to make sense of the phenomenon/ solve the problem.	Materials include assessments that are sometimes designed to connect to learning goals and require students to apply appropriate elements of the three dimensions to make sense of the phenomenon/solve the problem.	Materials include assessments that are designed such that they have limited connection to learning goals and/or they require students to apply elements of only one dimension to demonstrate their understanding of the phenomenon/solve the problem.
SP2: Variety of Measures. Assessments within a unit of instruction are matched to the targeted learning goals and elicit a full range of student thinking through: ● use of a variety of measures (e.g., performance tasks, discussion questions, constructed response questions, project- or problem- based tasks, portfolios, justified multiple choice); and ● multiple assessment opportunities so that students can demonstrate their understanding of the same learning goals in a variety of ways.	Materials include assessments that include a wide variety of formats with clear expectations that allow students to demonstrate their understanding of the learning goals in multiple ways.	Materials include assessments that include some variety of formats with clear expectations that allow students to demonstrate their understanding of the learning goals in multiple ways.	Materials include assessments that use just one format and/or the expectations for students to demonstrate their knowledge are absent or unclear.
SP3: Student Progress Over Time. The unit of instruction includes assessments that serve a variety of purposes (e.g., pre/post; formative, summative, peer, self) to measure students' progress over time. The assessments: ● provide opportunities to see growth and development in the use of the dimensions over time; and, ● allow students to reflect on and monitor their sense-making/ problem-solving over time.	Materials include assessments that offer multiple opportunities, using more than one type of measure, to demonstrate learning and these measures are strongly connected to show student progress both in and across the three dimensions.	Materials include assessments that offer multiple opportunities, using more than one type of measure, to demonstrate learning and these measures are somewhat connected to show student progress in or across the three dimensions.	Materials include assessments that offer limited opportunities for students to demonstrate progress on the three dimensions.
SP4: Equitable Access. Assessments within the unit of instruction are designed to: ● be free from bias (e.g., gender, racial, socioeconomic status, cultural, etc.); and, ● be accessible to all students (e.g., reading level, accommodations).	Most assessments in the materials are free from bias and are accessible.	Some assessments in the materials are free from bias and are accessible.	Few assessments in the materials are free from bias and are accessible.

Designed for the NGSS: Student Progress Rubric
Analyze Evidence

Directions

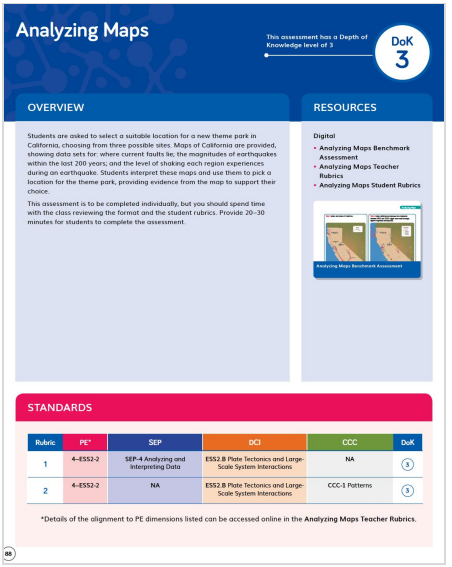
1. Review the Designed for the NGSS: Student Progress Rubric.
2. Reflect on the evidence (or lack of evidence) that you and your team gathered.
3. Record strengths and limitations for each criterion based on your observations. Cite specific examples.

Strengths
SP1: Three-Dimensional Performances
The materials are High Quality 5 in regards to SP1 The Twig Science assessments are consistently designed to connect to learning goals and require students to apply appropriate elements of the three dimensions to make sense of the phenomenon/ solve the problem.
Evidence All the assessments in Twig Science have been carefully designed to be multi-dimensional. Students use the three dimensions to make sense of phenomena and solve problems. They articulate their reasoning and explanations through written and drawn explanations, discussions, and presentations. Of particular note are the Summative Performance Tasks, which are present in all modules and wrap up instructional blocks, requiring students to demonstrate their ability to meet specific PEs. For example, in **Grade 1 Module 1 (DQ3L6 Investigate TE p. 114)**, students meet the PEs 1-LS1-1, K–2-ETS1-2, and K–2-ETS1-3. They do this by comparing different seeds, gathering information of how seeds disperse, and solving the engineering design problem by designing, building, and testing their own a seed model that can be dispersed by the wind. Every Module in Grades 3–6 also contains Benchmark Assessments, developed in partnership with the Stanford Center for Assessment, Learning, and Equity. Students are challenged to apply the skills and knowledge acquired in the module to new contexts.



Grade 1 Module 1 DQ3L6 Investigate TE p. 114

For example, in Grade 4 Module 4, students meet the PE ESS2-2. The **Analyzing Maps Benchmark Assessment (DQ2 TE pp. 89–91, and online)** requires students to take on the role of engineers to analyze earthquake data in maps and look for patterns helping them solve the problem of where to build a theme park that is at a low risk of damage from earthquakes.



Grade 4 Module 4 DQ2 Analyzing Maps Benchmark Assessment TE p. 89

SP2: Variety of Measures

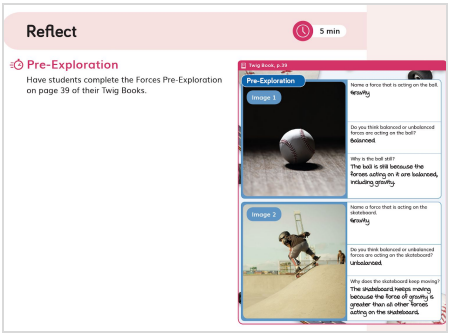
The materials are High Quality in regards to SP2

All modules include assessments in a wide variety of formats with clear expectations that allow students to demonstrate their understanding of the learning goals in multiple ways.

Evidence

Pre-Explorations (Diagnostic Pre-Assessments)

These pre-assessments include multiple choice and constructed responses (both written and drawn). For example, in **Grade 3 Module 1 (DQ2L1 Reflect TE p. 119 / DQ2L1 Reflect TB p. 39)**.



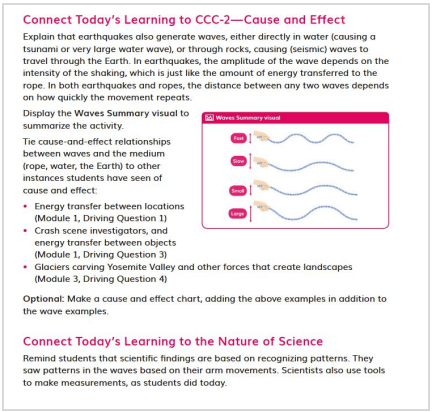
Grade 3 Module 1 DQ2L1 Reflect TB p. 39

Formative Assessment (Informal Assessment)

Quick and easy informal assessments are embedded into all lessons. They are often found in the Reflect section of the lesson, and include a wide variety of formats. For example, in Grade 4 Module 4 Earthquake Engineering, following an investigation about waves in the ropes, students have a class discussion about where the energy comes from that makes the waves, and how and why the size and frequency of waves change **(DQ1L3 Report TE p. 25)**.

Summative Performance Tasks

These highly engaging assessment tasks include written reports, posters, oral presentations, and collaborative engineering projects. For example, in Grade 4 Module 4, students have followed the engineering design process to solve the problem of how to reduce the damage caused by earthquakes. They have designed and built their own earthquake-resistant structures and tested them using a shake table. After analyzing the tests, they redesigned their structure with improvements. Here they communicate their designs in a poster and presentation. They use a rubric to self-assess their design and poster, as well as their peers'.



Connect Today's Learning to CCC-2—Cause and Effect

Explain that earthquakes also generate waves, either directly in water (causing a tsunami or very large water wave), or through rocks, causing (seismic) waves to travel through the Earth. In earthquakes, the amplitude of the wave depends on the intensity of the shaking, which is just like the amount of energy transferred to the rope. In both earthquakes and ropes, the distance between any two waves depends on how quickly the movement repeats.

Display the **Waves Summary visual** to summarize the activity.

Tie cause-and-effect relationships between waves and the medium (rope, water, the Earth) to other instances students have seen of cause and effect:

- Energy transfer between locations (Module 1, Driving Question 1)
- Crash scene investigators, and energy transfer between objects (Module 1, Driving Question 3)
- Glaciers carving Yosemite Valley and other forces that create landscapes (Module 3, Driving Question 4)

Optional: Make a cause and effect chart, adding the above examples in addition to the wave examples.

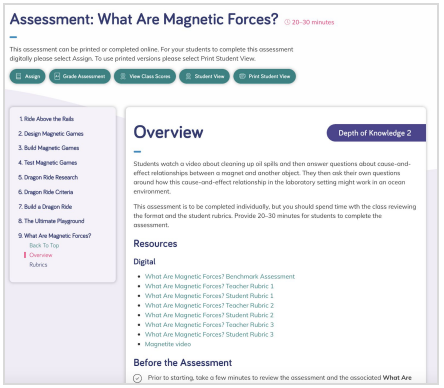
Connect Today's Learning to the Nature of Science

Remind students that scientific findings are based on recognizing patterns. They saw patterns in the waves based on their arm movements. Scientists also use tools to make measurements, as students did today.

DQ1L3 Report TE p. 25

Benchmark Assessments

Designed to assess students' ability to apply the three dimensions in a new context, the Benchmark Assessments include video and data analysis, hands-on activities, as well as design problems to solve. For example, in the Grade 3 Module 1 **What Are Magnetic Forces? Benchmark Assessment**, students are assessed on their ability to use what they have learned throughout the module about magnetism to solve a real-world problem. After watching a video about how magnets can clear up an oil spill in a small laboratory tank, they have to figure out how this cause-and-effect relationship in the laboratory setting might work in an ocean environment.



Assessment: What Are Magnetic Forces? 20–30 minutes

This assessment can be printed or completed online. For your students to complete this assessment digitally please select Assign. To use printed versions please select Print Student View.

Assign | Grade Assessment | View Class Scores | Student View | Print Student View

1. Ride Above the Rails
2. Design Magnetic Games
3. Build Magnetic Games
4. Test Magnetic Games
5. Dragon Ride Research
6. Dragon Ride Criteria
7. Build a Dragon Ride
8. The Ultimate Playground
9. What Are Magnetic Forces?
   - Back To Top
   - Overview
   - Rubrics

Overview — Depth of Knowledge 2

Students watch a video about cleaning up oil spills and then answer questions about cause-and-effect relationships between a magnet and another object. They then ask their own questions around how this cause-and-effect relationship in the laboratory setting might work in an ocean environment.

This assessment is to be completed individually, but you should spend time with the class reviewing the format and the student rubrics. Provide 20–30 minutes for students to complete the assessment.

Resources

Digital

- What Are Magnetic Forces? Benchmark Assessment
- What Are Magnetic Forces? Teacher Rubric 1
- What Are Magnetic Forces? Student Rubric 1
- What Are Magnetic Forces? Teacher Rubric 2
- What Are Magnetic Forces? Student Rubric 2
- What Are Magnetic Forces? Teacher Rubric 3
- What Are Magnetic Forces? Student Rubric 3
- Magnetite video

Before the Assessment

Prior to starting, take a few minutes to review the assessment and the associated What Are

What Are Magnetic Forces? Benchmark Assessment

SP3: Student Progress Over Time

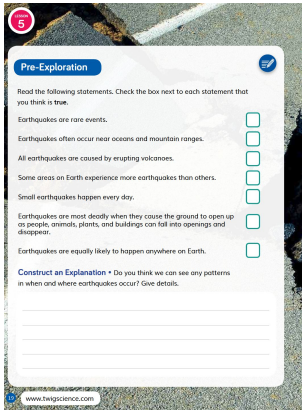
The materials are High Quality 5 in regards to SP3

All Twig modules include assessments that offer multiple opportunities—using more than one type of measure—to demonstrate learning, and these measures are strongly connected to show student progress both in and across the three dimensions.

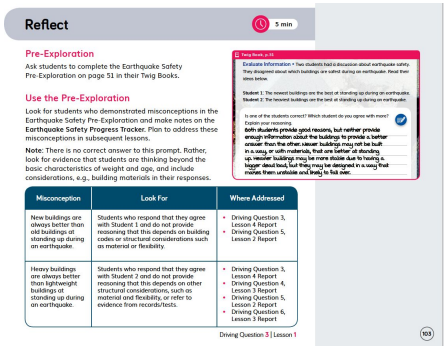
Evidence

All modules contain diagnostic pre-assessments called Pre-Explorations at strategic points in the module that assess prior knowledge and enable teachers to identify misconceptions. Notes in the Teacher Edition and the Progress Tracker support teachers to track students' mastery of their misconceptions and the three dimensions throughout the module. Guidance is also given for how to tailor instruction for students whose misconceptions persist. For example, in Grade 4 Module 4, students complete a Pre-Exploration in **DQ1L1 Reflect TB p. 19 and DQ3L1 Reflect TE p. 103**.

A version of the Twig Book with sample answers is provided to support teachers to know what success looks like. A redux of this is also included at point of use in the Teacher Editions.

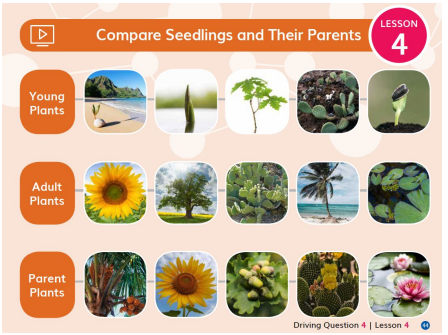


Grade 4 Module 4 DQ1L1 Reflect TB p. 19



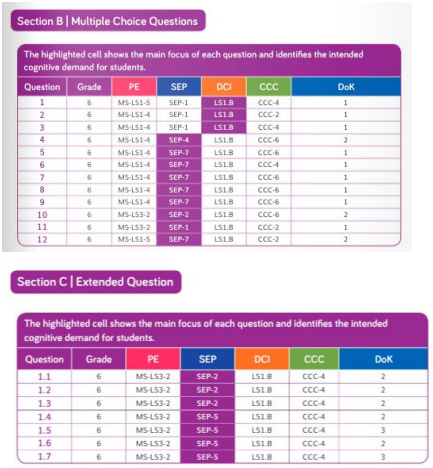
Grade 4 Module 4 DQ3L1 Reflect TE p. 103

Ongoing Formative Assessments are embedded in each module and provide frequent informal opportunities to quickly assess how students are progressing, using a variety of means. For example, in **Grade 1 Module 1 (DQ4L4 TB p. 44)**, students connect images of young plants to images of how they will look as adult plants, and then to images of their parent plants.



Grade 1 Module 1 DQ4L4 TB p. 44

Performance Tasks, Benchmark Assessments, and Multiple Choice Assessments are tied to specific PEs. Data from these assessment items allow teachers to track student mastery of these PEs and their three dimension across the module and across the grade.



Section B | Multiple Choice Questions

The highlighted cell shows the main focus of each question and identifies the intended cognitive demand for students.

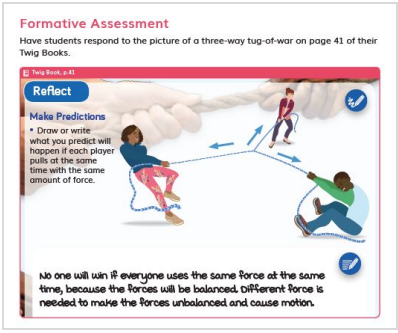
Question	Grade	PE	SEP	DCI	CCC	DoK
1	6	MS-LS1-5	SEP-1	LS1.B	CCC-4	1
2	6	MS-LS1-4	SEP-1	LS1.B	CCC-2	1
3	6	MS-LS1-4	SEP-1	LS1.B	CCC-4	1
4	6	MS-LS1-4	SEP-4	LS1.B	CCC-6	2
5	6	MS-LS1-4	SEP-7	LS1.B	CCC-6	1
6	6	MS-LS1-4	SEP-7	LS1.B	CCC-4	1
7	6	MS-LS1-4	SEP-7	LS1.B	CCC-6	1
8	6	MS-LS1-4	SEP-7	LS1.B	CCC-6	1
9	6	MS-LS1-4	SEP-7	LS1.B	CCC-6	1
10	6	MS-LS3-2	SEP-2	LS1.B	CCC-6	2
11	6	MS-LS3-2	SEP-1	LS1.B	CCC-2	1
12	6	MS-LS1-5	SEP-7	LS1.B	CCC-2	2

Section C | Extended Question

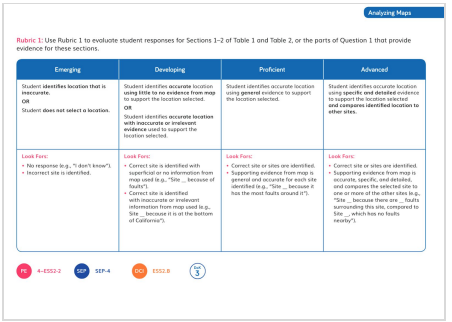
The highlighted cell shows the main focus of each question and identifies the intended cognitive demand for students.

Question	Grade	PE	SEP	DCI	CCC	DoK
1.1	6	MS-LS3-2	SEP-2	LS1.B	CCC-4	2
1.2	6	MS-LS3-2	SEP-2	LS1.B	CCC-4	2
1.3	6	MS-LS3-2	SEP-2	LS1.B	CCC-4	2
1.4	6	MS-LS3-2	SEP-5	LS1.B	CCC-4	2
1.5	6	MS-LS3-2	SEP-5	LS1.B	CCC-4	3
1.6	6	MS-LS3-2	SEP-5	LS1.B	CCC-4	2
1.7	6	MS-LS3-2	SEP-5	LS1.B	CCC-4	3

Grade 6 Multiple Choice Assessment Section B and Data Alignment

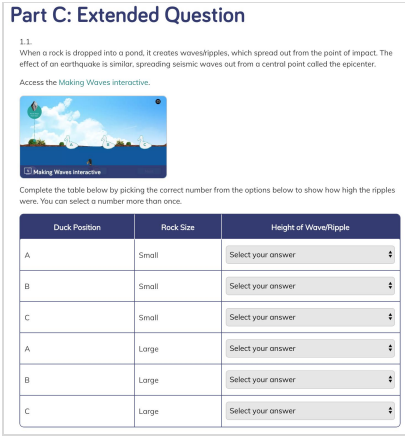
SP4: Equitable Access	
The materials are High Quality in regards to SP4 Assessments in all modules of Twig Science are free of bias and are accessible to all.	
Evidence The Twig Science **Digital Twig Books** and digital assessment items (Benchmark Assessments, Multiple Choice Assessments, and Student Rubrics) have a text-to-speech function, which allows students of all reading levels to access the assessments.	 **Digital Twig Books**
Across all modules, **assessments** of the three dimensions are multimodal and include multiple choice, writing, drawing, physical models, posters, and oral presentations. This allows all students to access a range of assessment types to suit their learning style and/or reading level.	 **Constructed Response in Grade 3**

Rubrics for the upper grade Performance Tasks and all Benchmark Assessments have four levels: Emerging, Developing, Proficient, and Advanced. This allows all students to demonstrate their current level of attainment.



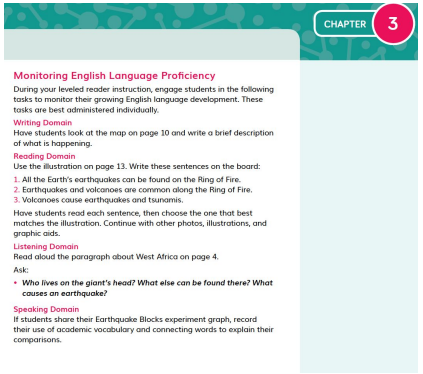
Leveled Rubric in Grade 4

The summative Benchmark and **Multiple Choice Assessment** targeting different DOK levels. Multiple Choice assessments contain an extended Part C to further challenge GATE students.



Multiple Choice Assessment

Writing, Reading, Listening, and Speaking Domain tasks are dedicated to assessing science-relevant English language development, and are integrated into the core instructional resources and the Leveled Reader lessons in Chapter 3 Second Read.



Writing, Reading, Listening and Speaking Domain tasks in Grade 4