



## Volcano Hunters

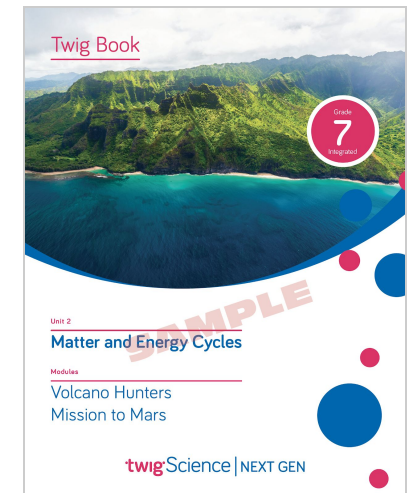
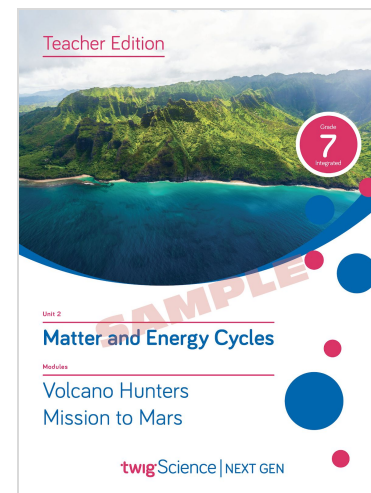
### Assessment Overview

In this module, students take on the role of volcanologists to identify volcanic sites around the globe, analyze real-life data from the Earth's active volcanoes, and devise a plan to protect people from the dangers posed by eruptions.

Students start the module by exploring what features distinguish volcanoes from mountains and other landforms. They use an interactive to identify patterns in volcano locations and begin to collect evidence to help them determine if a landform is a volcano or not. Then, students turn their attention to the rock cycle, exploring the relationship between the rock cycle and the volcanic life cycle by creating 2-D and 3-D models. Students observe the rock samples they were introduced to at the start of the lesson, writing scientific explanations about how rock types can help us determine if a landscape is volcanic or not.

Students continue by investigating the different factors that make a volcano dangerous, starting with the explosivity of volcanic eruptions. Students observe model eruptions and explore different kinds of volcanic eruptions. They examine the case study of Mount St. Helens' 1980 eruption, considering how hazards and threats contributed to the dangers posed by the volcano's eruption. Finally, they are introduced to the module volcano team and study volcano before writing a scientific argument—complete with claim and evidence—which they share with a peer.

In the final part of the module, students turn to the question of volcano monitoring, brainstorming how eruptions could be predicted and collecting and analyzing volcano data. They think about different monitoring techniques, which they discuss, and examine how monitoring devices are used at the module study volcano. Students map timelines of sample volcano data which they use to write scientific arguments. Finally, they analyze a dataset of undermonitored volcanoes and create a monitoring plan, which they present.





## Pre-Exploration (Diagnostic Pre-Assessment)

Key: Lesson (L) Session (S) Teacher Edition (TE) Twig Book (TB)

Reference	Assessment Tool	Description	Type	Misconceptions/Preconceptions identified
L1 (TE p. 6)	Misconceptions Table	Students read 10 statements about volcanoes and volcanic eruptions and state whether they are true or false. They then provide an explanation and reasoning for the false statements.	Constructed response Written (TB pp. 3–4)	<ul style="list-style-type: none"> <li>Students may believe that volcanoes are all dangerous and deadly.</li> <li>Students may not know what fault lines or tectonic plates are. They may know what they are, but not know about hot spots.</li> <li>Students may believe that all volcanoes pose the same amount of risk.</li> <li>For many students their only experience with volcanoes is what they have seen on TV or the internet. The typical volcano shown in TV shows and movies is the stratovolcano, which is shown as very dangerous and explosive. They may not know that there are some volcanoes that erupt lava continually, and are barely noticeable.</li> <li>Students may mistake minerals with types of rocks. They may also believe that each rock is a different type, for example, they may see pumice, granite, and obsidian as completely different and not all belonging to the igneous rock group.</li> <li>Students may not know about the rock cycle. They may believe that certain rock types can only change into one other type of rock.</li> <li>Students may believe that all volcanoes look alike and have different characteristics than mountains.</li> <li>Students may not understand that gas can increase the explosivity of a volcano. They do not generally understand the power of gases.</li> <li>Students may believe that all lava has the same viscosity and that the consistency of lava has nothing to do with the level of danger of a volcano.</li> <li>Students may not know about how to gather data about the status of a volcano. They may think that volcanic activity is mysterious and unpredictable.</li> </ul>



## Formative Assessment (Informal Assessment)

Key: Lesson (L) Session (S) Teacher Edition (TE) Twig Book (TB)

Page	Assessment Tool	Description	Type	What's being assessed?
<b>L1, S1 (TE p. 11)</b>	Exit Ticket Student Answer	Students list the questions they have about volcanoes.	Constructed response Written (TB p. 7)	Teachers use students' questions to prompt and extend student discussion in the next session and throughout the module. They also use this information as a way to predict quality of investigations and address the types of questions that could be asked in an investigation.
<b>L1, S2 (TE p. 19)</b>	Exit Ticket Student Answer	Students describe where volcanoes form.	Constructed response Written (TB p. 19)	Students' ability to summarize information gathered using an interactive and close reading an article.
<b>L1, S3 (TE p. 27)</b>	Exit Ticket Student Answer	Students list the changes that lead to each type of volcano.	Constructed response Written (TB p. 23)	Students' ability to manipulate a model to determine how different physical characteristics affect the structure of a volcano.
<b>L1, S4 (TE p. 33)</b>	Exit Ticket Student Answer	Students describe how a volcano changes over time.	Constructed response Written (TB p. 30)	Students' ability to investigate how a volcano forms by researching the different properties of the Earth's structure and how volcanoes erupt.
<b>L1, S5 (TE p. 41)</b>	Exit Ticket Student Answer	Students explain whether a rock could end up in the same part of the rock cycle where it started.	Constructed response Written (TB p. 34)	Students' ability to understand models of the changes rocks undergo in the rock cycle.



<b>L1, S6 (TE p. 47)</b>	Exit Ticket Student Answer	Students describe how a rock might move from the mantle to a mountain and then to the crust beneath the ocean floor.	Constructed response Written (TB p. 38)	Students' ability to understand models of the rock cycle and explain the different stages.
<b>L1, S7 (TE p. 53)</b>	Exit Ticket Student Answer	Students draw a labeled diagram showing how an extrusive igneous rock found on the surface of a volcano could eventually become metamorphic.	Constructed response Drawn (TB p. 53)	Students' ability to develop 2-D models for rock types and processes.
<b>L1, S8 (TE p. 59)</b>	Exit Ticket Student Answer	Students read a claim and explain why basalt might be found in the ocean.	Constructed response Written (TB p. 58)	Students' ability to use observations and evidence to support a claim.
<b>L1, Extension (TE p. 62)</b>	Exit Ticket Student Answer	Students explain why it is important for volcanologists to use maps when seeking out unknown volcanoes or potential volcanic activity, and give reasoning.	Constructed response Written (TB p. 62)	Students' ability to analyze maps and make observations.
<b>L2, S1 (TE p. 73)</b>	Exit Ticket Student Answer	Students predict what will happen in their investigation into the effects of different properties of a volcano on the impacts of an eruption.	Constructed response Written (TB p. 71)	Students' ability to design an investigation about what makes volcanoes dangerous by observing the effects from an eruption, and then make predictions.



<b>L2, S2 (TE p. 79)</b>	Exit Ticket Student Answer	Students summarize what characteristics make a volcano more or less dangerous, and explain why.	Constructed response Written (TB p. 74)	Students' ability to summarize their findings about the effects of different conditions on the nature of eruptions.
<b>L2, S3 (TE p. 85)</b>	Exit Ticket Student Answer	Students summarize what makes volcanic eruptions explosive.	Constructed response Written (TB p. 78)	Students' ability to design and conduct an investigation on how different viscosity liquids, pressure, and gas affect the explosivity of volcanoes.
<b>L2, S4 (TE p. 92)</b>	Exit Ticket Student Answer	Students observe data about two volcanoes and determine which one is likely to be more dangerous, and explain why.	Constructed response Written (TB p. 88)	Students' ability to collect evidence and determine different factors that make volcanoes dangerous and eruptions explosive.
<b>L2, S5 (TE p. 99)</b>	Exit Ticket Student Answer	Students describe the impacts of an eruption.	Constructed response Written (TB p. 99)	Students' ability to analyze and interpret a case-study of Mount St. Helens to understand the impacts of an eruption.
<b>L2, S6 (TE p. 106)</b>	Exit Ticket Student Answer	Students describe what can make a volcano dangerous.	Constructed response Written (TB p. 102)	Students' ability to ask questions and investigate characteristics that make volcanoes dangerous.
<b>L3, S1 (TE p. 118)</b>	Exit Ticket Student Answer	Students provide examples of how volcanoes can be monitored.	Constructed response Written (TB p. 109)	Students' ability to communicate information about data and volcanic eruptions.
<b>L3, S2 (TE p. 126)</b>	Exit Ticket Student Answer	Students explain whether using multiple techniques to monitor volcanoes could be more or less effective than only using one.	Constructed response Written (TB p. 118)	Students' ability to investigate different monitoring techniques and begin evaluating their use in monitoring volcanoes.





<b>L3, S3 (TE p. 133)</b>	Exit Ticket Student Answer	Students explain how a 3-D thermal map could have been useful in a historic dataset, and what might it have shown.	Constructed response Written (TB p. 123)	Students' ability to communicate information about quantitative models documenting volcanic activity.
<b>L3, S4 (TE p. 140)</b>	Exit Ticket Student Answer	Students explain why it is useful to analyze multiple types of data at the same time, rather than one in isolation.	Constructed response Written (TB p. 130)	Students' ability to analyze data sets from a volcano and evaluating changes in the data over time to determine danger-level.
<b>L3, S5 (TE p. 147)</b>	Exit Ticket Student Answer	Students look at a dataset about volcanoes and name one or two volcanoes that do not require a lot of monitoring.	Constructed response Written (TB p. 135)	Students' ability to design a volcano-monitoring plan for undermonitored volcanoes based on the patterns they identify in data.
<b>L3, S5 (TE p. 153)</b>	Exit Ticket Student Answer	Students describe the changes they would make to their monitoring plan, and explain why.	Constructed response Written (TB p. 145)	Students' ability to reflect on previous learning and summarize the importance of monitoring and understanding volcanoes.



## Formative Assessments (With Rubric)

Key: Lesson (L) Session (S) Teacher Edition (TE) Twig Book (TB)

Page	Assessment Tool	Description	Type	Standards
<b>L1, S7 (TE p. 52)</b>	Different Types of Rocks: Model Rubric	Students create a 3-D model of one rock cycle journey, write and record their journey stages, and discuss how their 3-D model connects to their 2-D landscape model.	Hands-on and Constructed response Written (TB p. 35)	MS-ESS2-1, SEP-2, ESS2.A, CCC-7
<b>L3, S4 (TE p. 139)</b>	Volcano Warning Levels Rubric	Students analyze data sets from a volcano to determine danger-level by evaluating changes in the data over time, and then construct an argument and supporting it with reasoning.	Constructed response Written (TB pp. 129)	MS-ESS3-2, SEP-4, ESS3.B, CCC-1

## Summative Assessments

Key: Lesson (L) Session (S) Teacher Edition (TE) Twig Book (TB)

Page	Assessment Tool	Description	Type	Standards
<b>L1, S8 (TE pp. 54–59)</b>	What Is a Volcano? Answer Key	Students analyze physical evidence and use observations to support a claim about volcanoes and their locations.	Hands-on and written constructed response Written (TB p. 54)	MS-ESS2-1, MS-ESS3-2, SEP-2, SEP-4, ESS2.A, ESS3.B, CCC-1, CCC-7
<b>L2, S6 (TE p. 105)</b>	What Makes a Volcano	Students write a scientific argument in response to the claim: Some volcanoes are more dangerous than others.	Constructed response	MS-ESS3-2, SEP-4, ESS3.B, CCC-1



	Dangerous? Rubric	They use evidence from the previous sessions to support their argument.	Written (TB pp. 101)	
<b>L3, S6 (TE p. 152)</b>	Monitoring Volcanoes Rubric	Students design and present a volcano-monitoring plan for undermonitored volcanoes around the world based on patterns they identify in the data and changes over time.	Hands-on and Constructed response Written (TB pp. 133–135)	MS-ESS3-2, SEP-4, ESS3.B, CCC-1
<b>Multiple Choice Assessment: Part A (online only)</b>	Assessment Answer Key	Students read through a series of statements about volcanoes and volcanic eruptions, and decide which statements are true and which are false.	Multiple choice	MS-ESS2-1, MS-ESS3-2, SEP-2, SEP-3, SEP-4, ESS2.A, ESS3.B, CCC-1, CCC-7
<b>Multiple Choice Assessment: Part B (online only)</b>	Assessment Answer Key	Students answer a series of questions about volcano formation, different types of volcanoes, the rock cycle, and monitoring volcanoes.	Multiple choice	MS-ESS2-1, MS-ESS3-2, SEP-2, SEP-4, ESS2.A, ESS3.B, CCC-1, CCC-7
<b>Benchmark Assessment: (online only)</b>	Volcano Hunters Teacher Rubrics	Students interpret evidence to decide which of two volcanoes poses the biggest threat if they were to erupt. They describe which types of tectonic plates cause volcanoes to form and use materials to draw diagrams to model the rock cycle process. They also analyze data to predict the likelihood of imminent volcanic eruptions.	Written constructed response	MS-ESS2-1, MS-ESS3-2, SEP-2, SEP-4, ESS2.A, ESS3.B, CCC-1, CCC-7