HMH SCIENCE DIMENSIONS™
ENGINEERED for the NEXT GENERATION

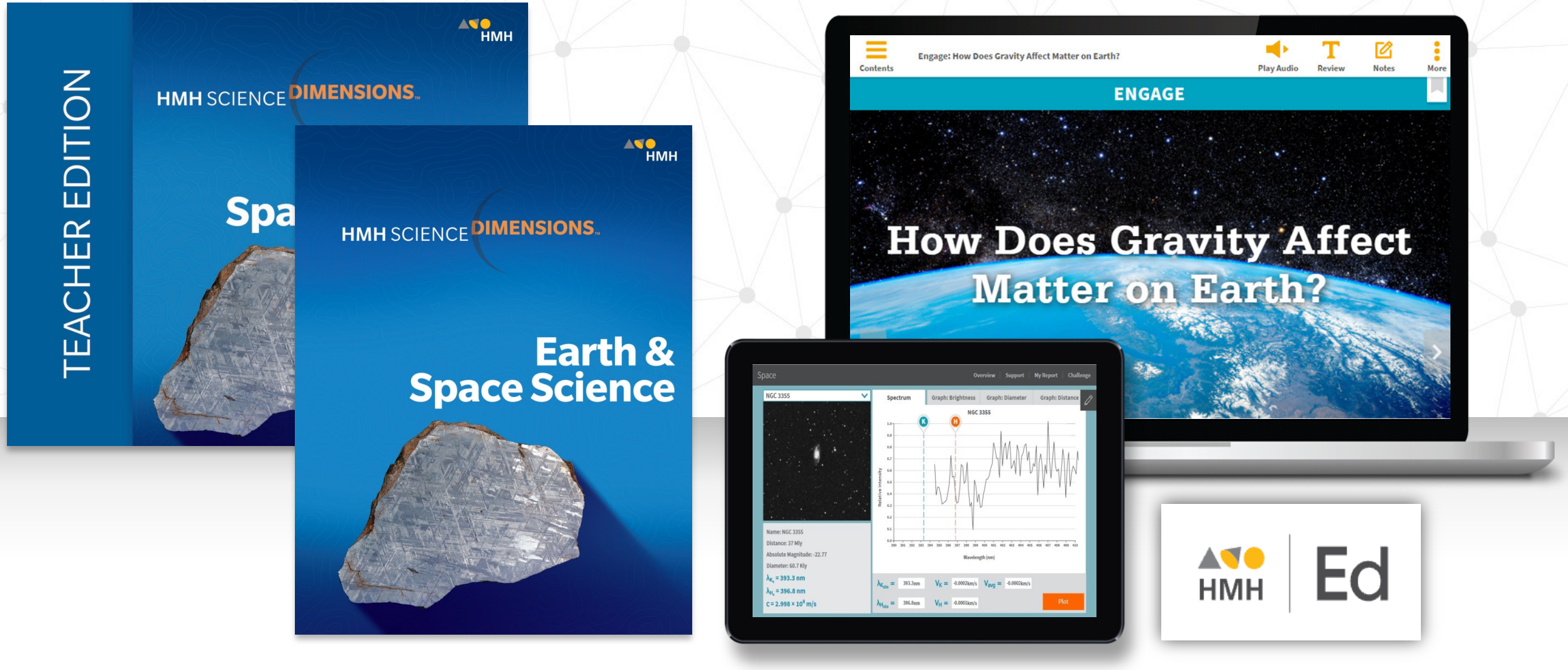
Earth & Space Science







HMH Science Dimensions®



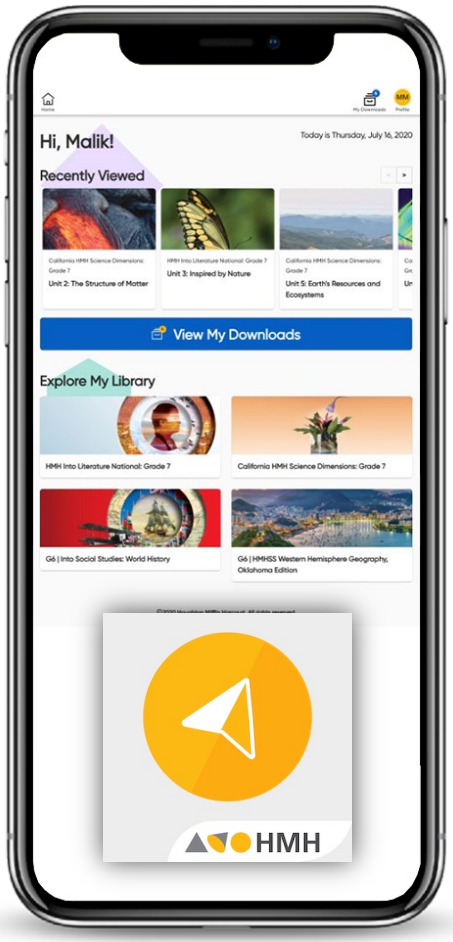
HMH | Ed

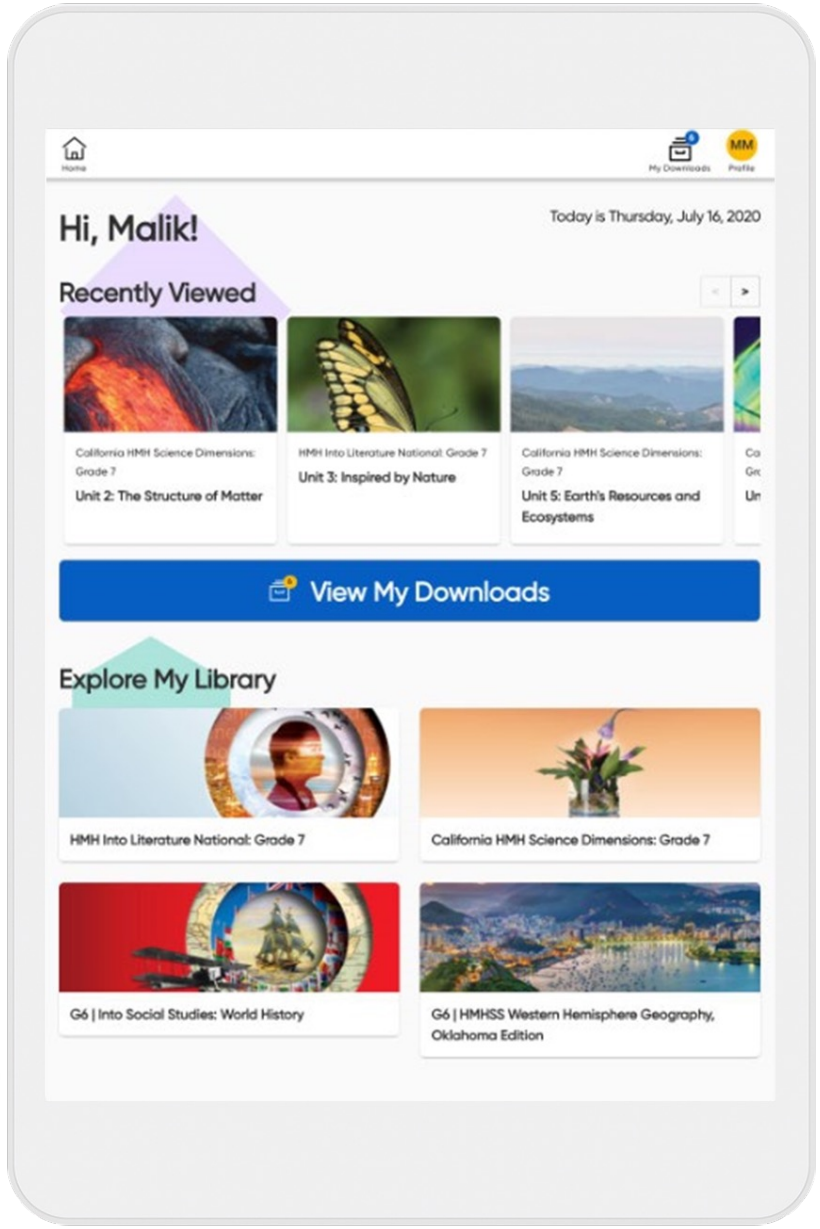
ED Integration with Learning Management Systems



HMH | Ed

S.S.O.





HMH GO App

Extend learning with offline support through



Anchor Phenomena

These anchoring phenomena inspire students to ask questions [SEP-1] …



CAN YOU EXPLAIN IT?



A pair of galaxies collides approximately 134 million light-years away in the constellation Ursa Major.

What tools and techniques do you think scientists use to study galaxies and other objects across the vast distances of space?

Start Typing...

HMH Science Dimensions focuses on

- **Motivating more detailed investigations**
- **Reflecting on learning**
- **Revisiting central ideas throughout instruction**
- **Applying new student learning**

DRIVING QUESTIONS

As you move through the unit, gather evidence to help you answer the following questions. In your Evidence Notebook, record what you already know about these topics and any questions you have about them.

1. How do scientists study objects in space that are at vast distances from Earth?
2. What types of evidence enable scientists to make inferences about the masses, sizes, temperatures, and distances of stars?
3. How are scientific inquiry and engineering design interrelated in the field of astronomy? How might new instruments and tools help astronomers expand their knowledge of the universe?
4. How do astronomers interpret lines of evidence to support a theory that explains the formation and history of the universe?

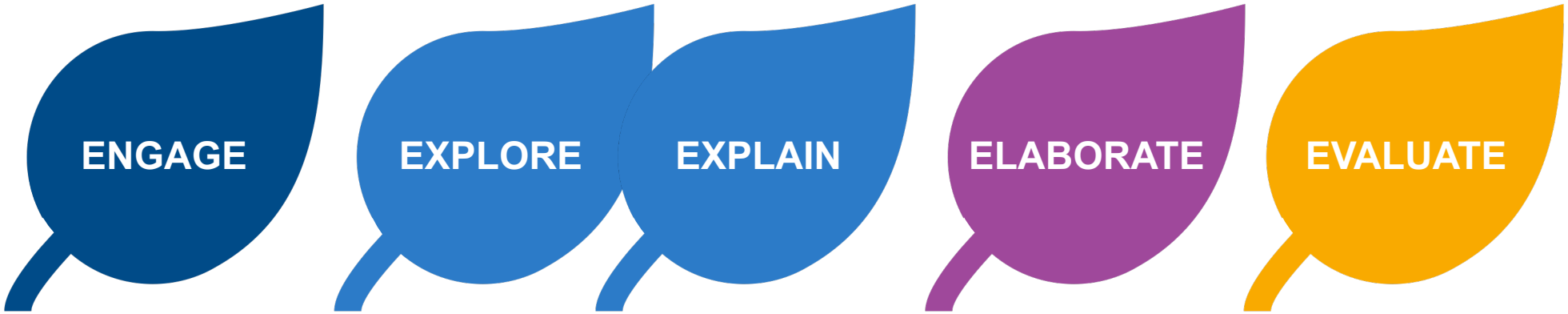
HMH Science Dimensions focuses on

- **Motivating more detailed investigations**
- **Reflecting on learning**
- **Revisiting central ideas throughout instruction**
- **Applying new student learning**

Three Dimensions of Learning



5Es



Phenomena → Gather Evidence → More Evidence & Extend → Apply Reasoning

Engage with Meaningful Technology

HMH Science Dimensions is a truly digital-first program. The curriculum leverages the advantages of technology while prioritizing a **student-centered learning model.** Students can view videos and animations, interact with instructional images and text, enter responses, pursue their intellectual interests by choosing lesson paths, and enjoy simulation-based learning. All of these features help you maintain an **integrated three-dimensional approach** to learning science.





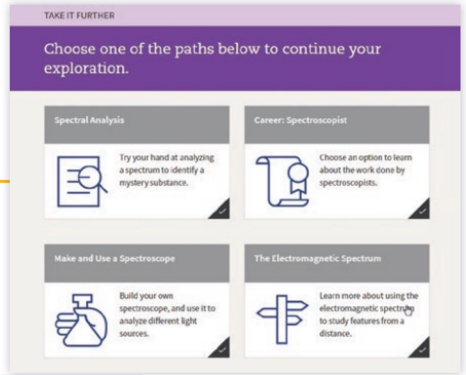
Online Student Edition

Immersive Digital Curriculum

Online lessons are enriched above and beyond the print lessons with educational videos, learning interactivities, and places to save student work as **typewritten responses** and **technology-enhanced item choices**. Vocabulary is highlighted and clickable, with point-of-use pop-up definitions.

Maximize Student Choice

The **Continue Your Exploration** feature at the end of each lesson maximizes the opportunity for students to elaborate on what they have learned so far. By leveraging the power of technology, students can go in depth on **topics of their choice** to learn more and create stronger, more personal links to their learning.

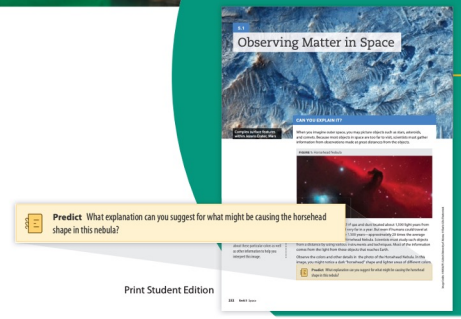


Online Student Edition



Build Student Confidence with Authentic Investigations

Students are more engaged and learn more meaningfully through investigative inquiry. ***HMH Science Dimensions*** is built on this approach. Your students will learn to conduct hands-on investigations, define questions and objectives, make claims, and identify evidence—in short, to **take charge** and **fully engage** in their learning!



Print Student Edition

Every Lesson Is an Activity

- Each lesson begins with **Can You Explain It?**— a **problem to solve** or **discrepant event to explain.** Unusual and surprising phenomena spark curiosity and motivate students to explore the subsequent learning activities. At lesson's end, students explain the how and why of the phenomenon.
- The goal is **active learning.** Rather than receiving facts passively, students **solve problems** or explain phenomena by stating **claims**, gathering **evidence**, and supporting them with **reasoning.**

NGSS and *HMH Science Dimensions Earth & Space Science*

HS-ESS1 Earth's Place in the Universe		Print and Digital Resources	
		Supporting Learning Experiences	Assessment and Performance
Performance Expectation **HS-ESS1-1** **Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.**		Unit 5 Lesson 1 and **Hands-On Lab** Lesson 2 and **Hands-On Lab**	Unit 5 Unit Project You Solve It (digital only) **Unit Performance Task** Assessment Guide and Online Lesson Quizzes Unit Test **Performance-Based Assessment** Middle-of-Year Test
Disciplinary Core Idea	**ESS1.A The Universe and Its Stars** The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years.		
	PS3.D Energy in Chemical Processes and Everyday Life Nuclear fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.		
Science and Engineering Practice	**Developing and Using Models** Develop a model based on evidence to illustrate the relationships between systems or between components of a system.		
Crosscutting Concept	**Scale, Proportion, and Quantity** The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.		

Pacing Guide

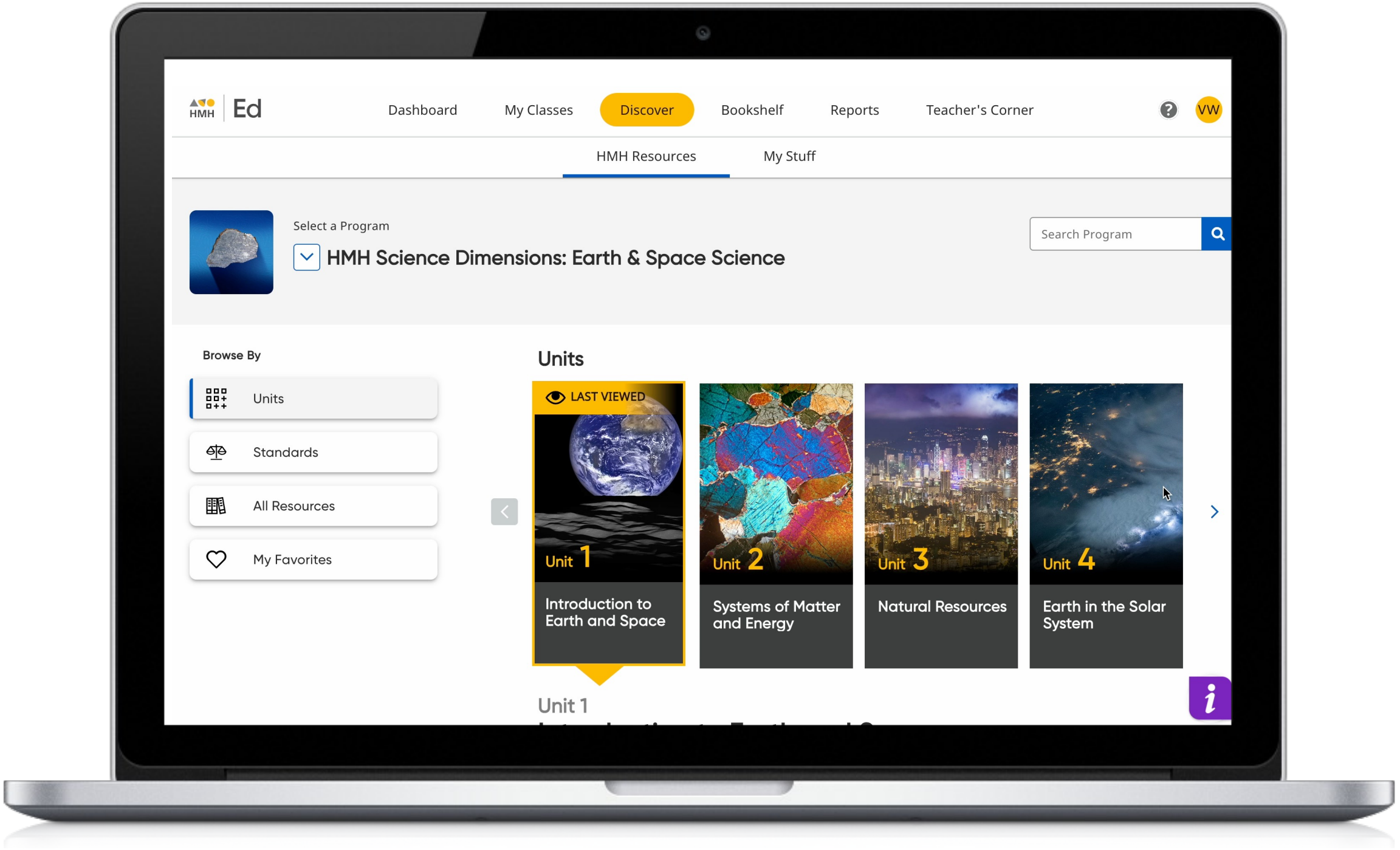
This Pacing Guide recommends durations for the instructional elements of each unit. The comprehensive path includes all available instructional and assessment materials. The core path includes selected instructional and assessment materials. You may also customize based on your classroom needs.

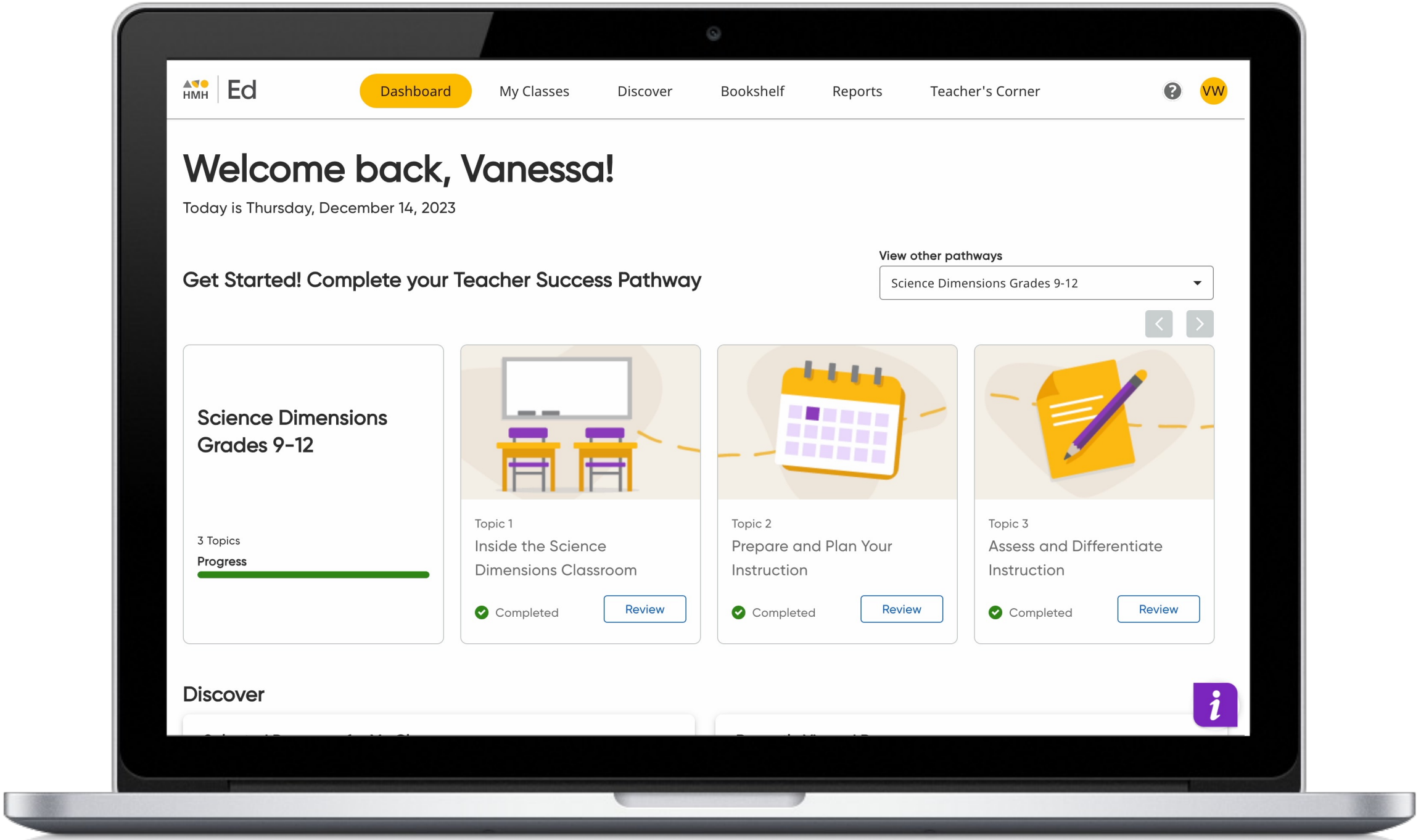
Unit 1 Introduction to Earth and Space	Comprehensive 1 = 45 min	Core 1 = 45 mi
Unit Project	4	
Lesson 1 Studying Earth	4	3
Lesson 2 Earth's Systems	4	3
Unit 1 Review and Unit 1 Test	2	1
Unit 1 Performance Task	2	
Performance-Based Assessment (as applicable)	2	
*Total Days for Unit 1	12	7

Unit 2 Systems of Matter and Energy	Comprehensive 1 = 45 min	Core 1 = 45 mi
Unit Project	4	
Lesson 1 Earth's Energy	3	3
Lesson 2 Minerals	3	2
Lesson 3 The Rock Cycle	3	2
Lesson 4 Cycles and Cycle Models	4	3
You Solve It	1	
Unit 2 Review and Unit 2 Test	2	1
Unit 2 Performance Task	2	
Performance-Based Assessment (as applicable)	2	
*Total Days for Unit 2	18	11

Unit 3 Natural Resources	Comprehensive 1 = 45 min	Core 1 = 45 min	Customize Your Pacing Guide
Unit Project	5		
Lesson 1 Designing Solutions to Resource Problems	4	3	
Lesson 2 Rock and Mineral Resources	3	3	
Lesson 3 Energy Resources	3	2	
Unit 3 Review and Unit 3 Test	2	1	
Unit 3 Performance Task	2		
Performance-Based Assessment (as applicable)	2		
*Total Days for Unit 3	14	9	

Unit 4 Earth in the Solar System	Comprehensive 1 = 45 min	Core 1 = 45 min	Customize Your Pacing Guide
Unit Project	4		
Lesson 1 Solar System Formation	3	3	
Lesson 2 Gravity and Orbits	3	2	
Lesson 3 Earth and the Sun	3	2	
Unit 4 Review and Unit 4 Test	2	1	
Unit 4 Performance Task	2		
Performance-Based Assessment (as applicable)	2		
*Total Days for Unit 4	13	8	


HMH Ed
Dashboard
My Classes
Discover
Bookshelf
Reports
Teacher's Corner
VW
HMH Resources
My Stuff
Select a Program
HMH Science Dimensions: Earth & Space Science
Search Program
Browse By
Units
Standards
All Resources
My Favorites
Units
LAST VIEWED
Unit 1
Introduction to Earth and Space
Unit 2
Systems of Matter and Energy
Unit 3
Natural Resources
Unit 4
Earth in the Solar System
Unit 1


HMH Ed
Dashboard
My Classes
Discover
Bookshelf
Reports
Teacher's Corner
VW
Welcome back, Vanessa!
Today is Thursday, December 14, 2023
Get Started! Complete your Teacher Success Pathway
View other pathways
Science Dimensions Grades 9-12
Science Dimensions Grades 9-12
3 Topics
Progress
Topic 1
Inside the Science Dimensions Classroom
Completed
Review
Topic 2
Prepare and Plan Your Instruction
Completed
Review
Topic 3
Assess and Differentiate Instruction
Completed
Review
Discover

UNIT 1

Introduction to Earth and Space

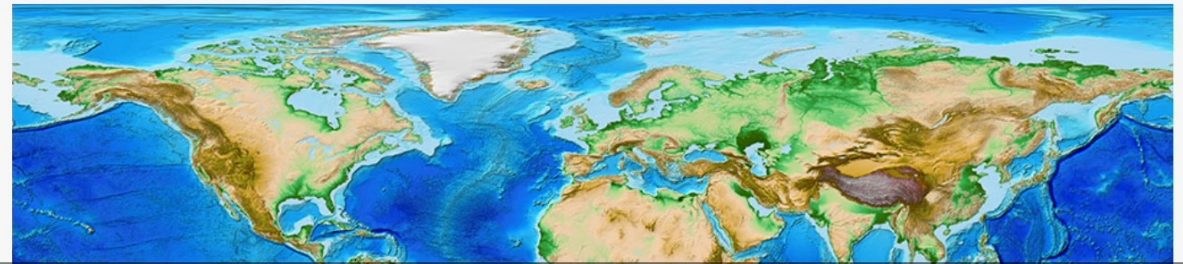


Earth and the surface of the moon, as seen from the Lunar Reconnaissance Orbiter in 2015

UNIT 1

Introduction to Earth and Space

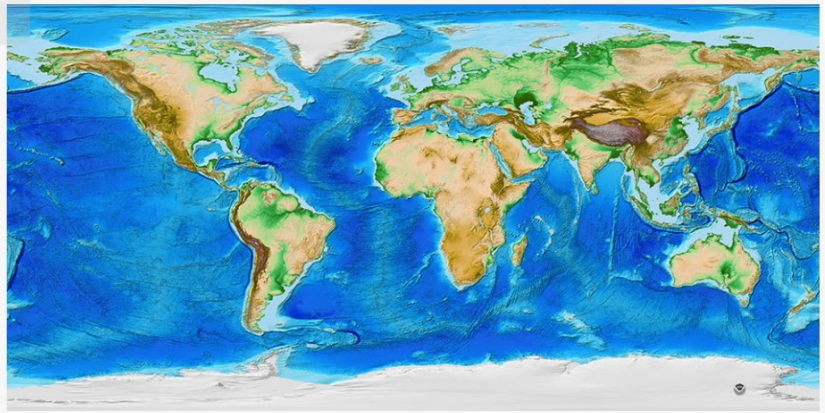
Earth and the surface of the moon, as seen from the Lunar Reconnaissance Orbiter in 2015



UNIT 1

Introduction to Earth and Space

Earth and the surface of the moon, as seen from the Lunar Reconnaissance Orbiter in 2015



A global relief map of Earth

A map is a type of model—it represents some, but not all, aspects of the real object. Like other models, a map is



Overview

1.1

Studying Earth

Land, oceans, and clouds are visible from satellites orbiting Earth.

CAN YOU EXPLAIN IT?

Data Analysis

Population Size

A scientist sampled a small cross section of a grassland ecosystem. Her data for each trophic level are shown in the table.

Trophic Level	Producers	Primary Consumers	Secondary Consumers	Tertiary Consumers
Population Count	6,025,682	723,082	98,541	4

Analyze Answer the following questions in your Evidence Notebook:

1. How does the population size change at each trophic level in this sample?
2. What is the relationship between trophic level and population size?
3. Predict what would happen if a quaternary consumer were added to this ecosystem.

Cause and Effect

FIGURE 6: Discarded plastics pollute Bicaz Lake in Romania.



Analyzing Human Impacts

Human activities impact ecosystems, sometimes in severe ways. We produce wastes, such as plastics, that are a major source of pollution. Humans destroy habitats to build cities, grow crops, and mine resources. Most of these activities impair the air, water, soil, and biodiversity in ecosystems. How do you impact your ecosystem?

Hands-on Activity

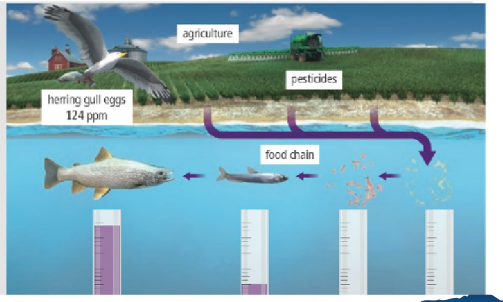
Biomagnification

MATERIALS

- beads, large (16)
- beaker, 500 mL
- marker
- tape, masking
- paper cups (4 small, 2 medium, 1 large)
- pencil, sharpened
- salt

Harmful chemicals enter aquatic ecosystems from the runoff of silt, pesticides, and fertilizers. These chemicals enter the food chain and build up in the bodies of organisms through a process known as biomagnification. Scientists study this process by measuring the amount of chemicals in each trophic level in parts per million.

FIGURE 21: Biomagnification in an aquatic ecosystem.



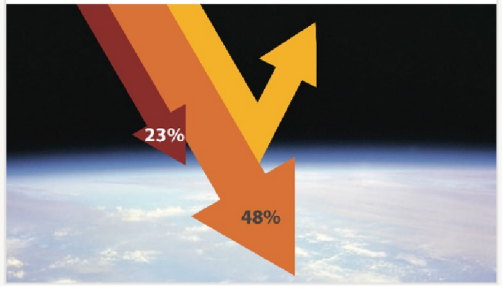
Math Connection

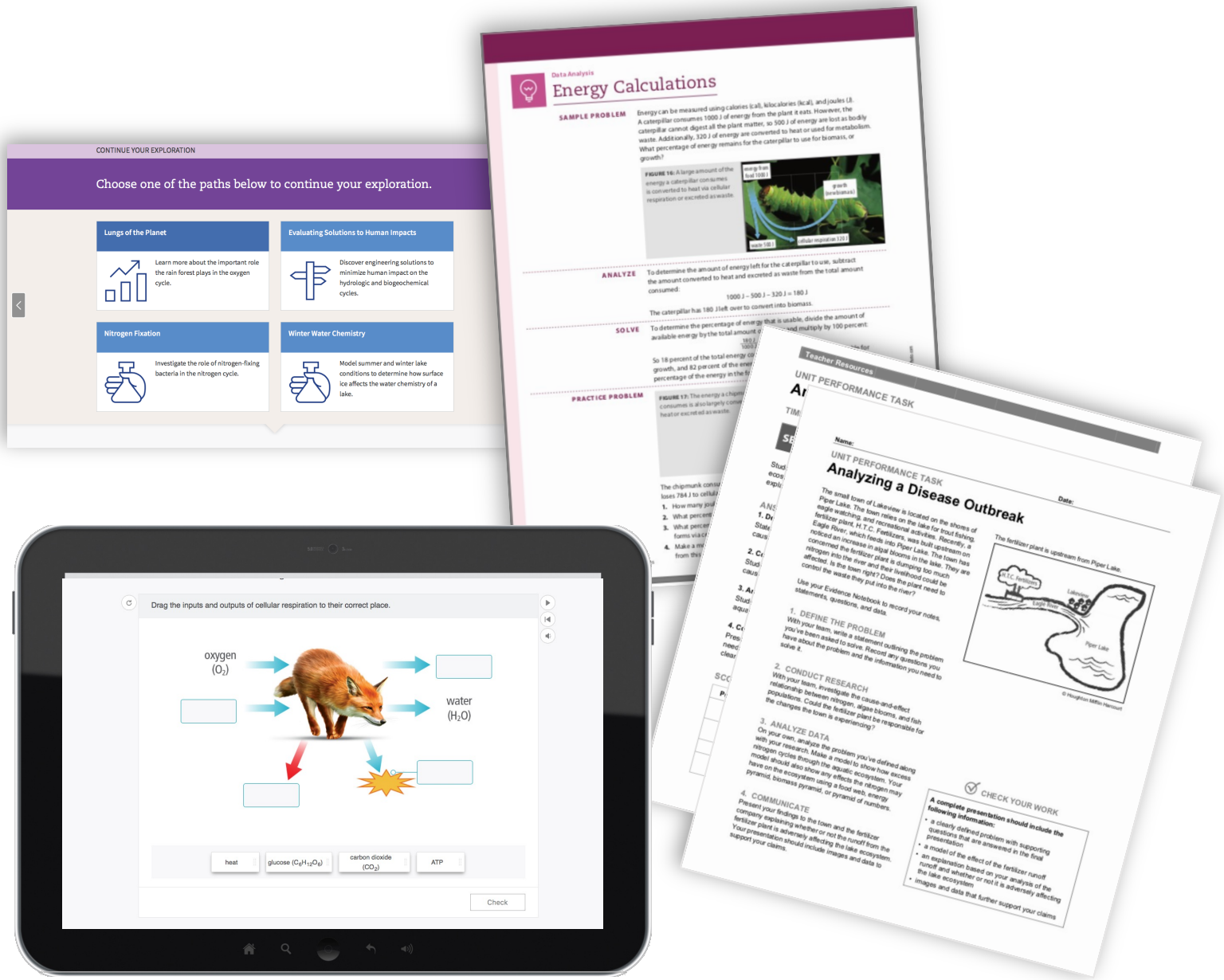
Solar Radiation

When solar radiation enters Earth's atmosphere, about 23 percent is absorbed in the atmosphere and about 48 percent is absorbed at the surface.

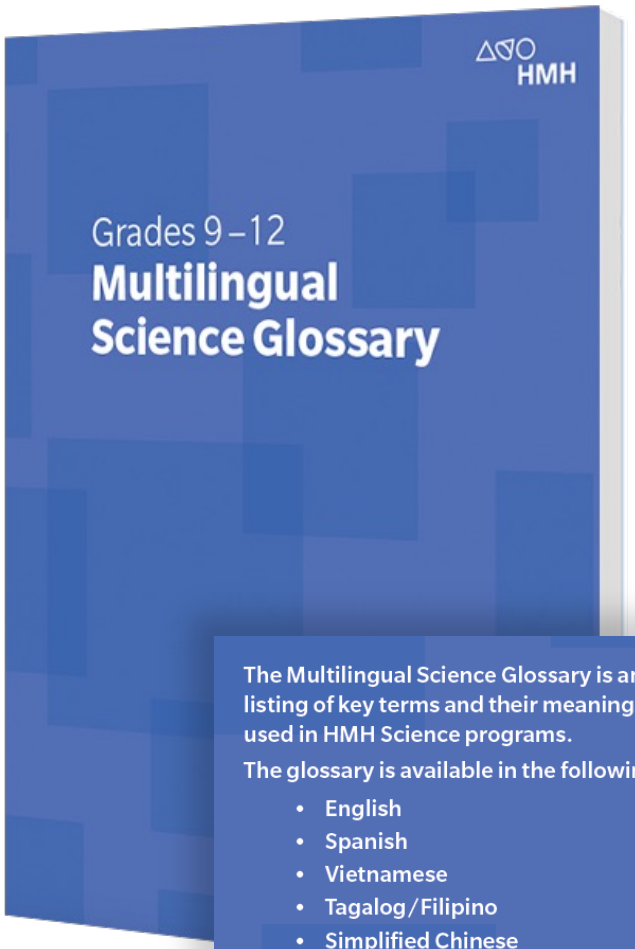
Collaborate With a partner discuss these questions: If energy is conserved, what percent of the solar energy should be reflected back into space? How do you think Earth's ecosystems would be different if more or less solar radiation was reflected by the atmosphere?

FIGURE 2: Earth's atmosphere absorbs and reflects energy.





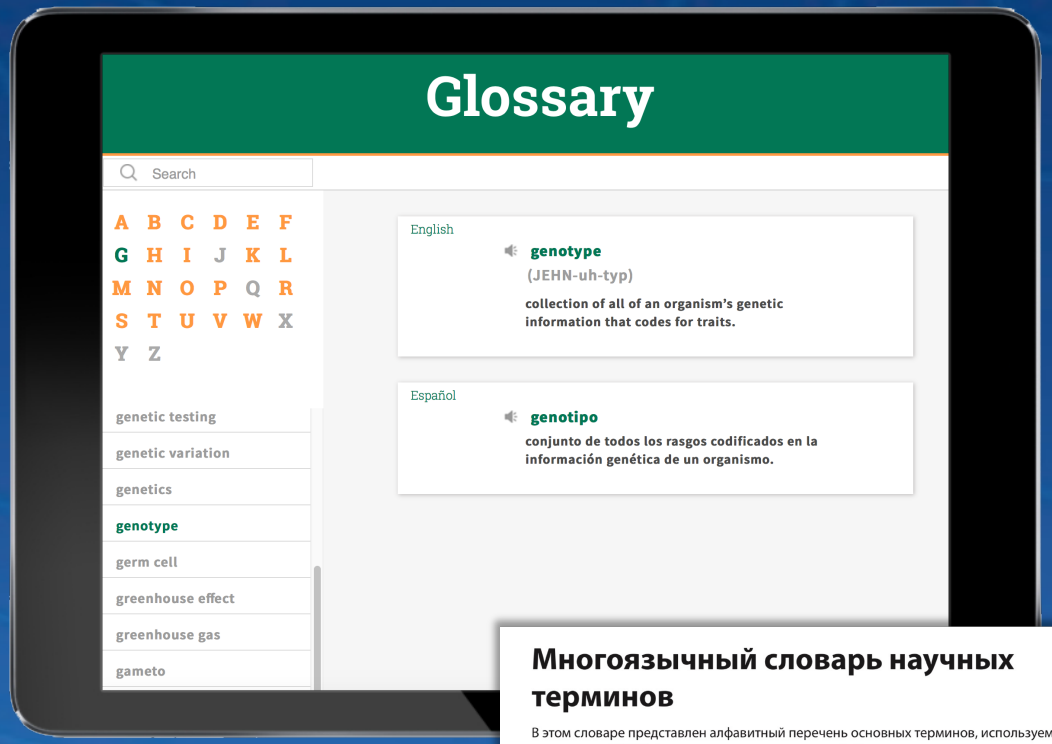
- Engineering Opportunities
- Interactive eBooks
- Hands-On Activities
- Unit Tasks
- Data Analysis
- Continue Your Exploration
- Performance-Based Assessments
- Can You Solve It?
- Can You Explain It?
- Unit Projects
- You Solve It!
- Evidence Notebooks
- Make Your Own Study Guide



The Multilingual Science Glossary is an English-alphabetical listing of key terms and their meanings for grades 9–12, as used in HMH Science programs.

The glossary is available in the following languages:

- English
- Spanish
- Vietnamese
- Tagalog/Filipino
- Simplified Chinese
  (for speakers of Mandarin and Cantonese)
- Arabic
- Hmong
- Korean
- Punjabi
- Russian
- Haitian Creole
- Brazilian Portuguese





HMH Science Dimensions®

Select a g
begin

Overview

Astronomers have obtained images and spectra for 17 galaxies. The distance to each galaxy, the galaxy's brightness, and the galaxy's diameter have already been determined.

Your team will determine the Doppler shift of the calcium H and K lines in the spectra of the galaxies. You will reposition the H and K sliders to measure the shift in each galaxy's absorption wavelengths. The velocity of each galaxy relative to Earth will be calculated and displayed automatically.



Get Started

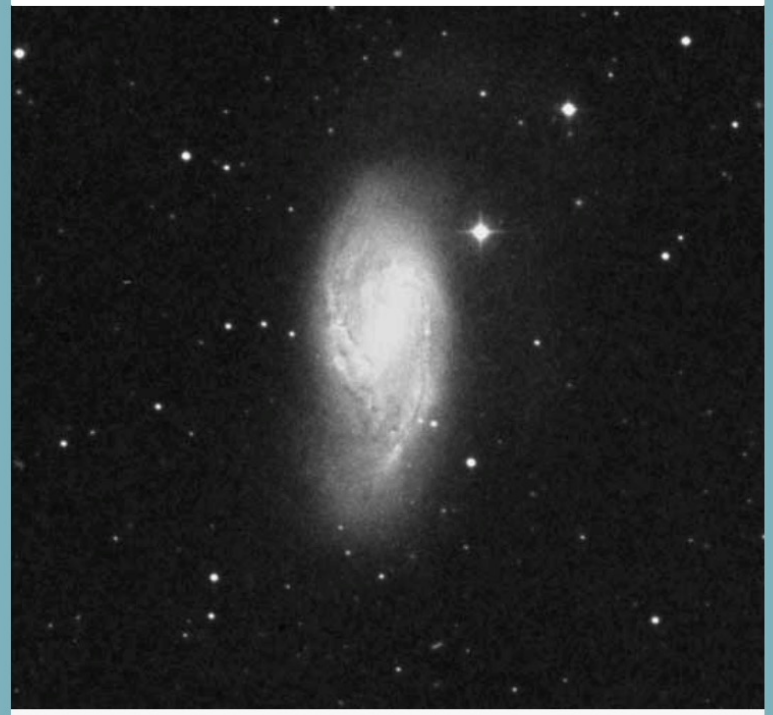
643A

NGC

3321

NGC 2337A | NGC 1879 | NGC 1832B | NGC 1337 | NGC 1311 | NGC 0360

NGC 7689



Name: NGC 7689

Distance: 26 Mly

Absolute Magnitude: –22.21

Diameter: 92.8 Kly

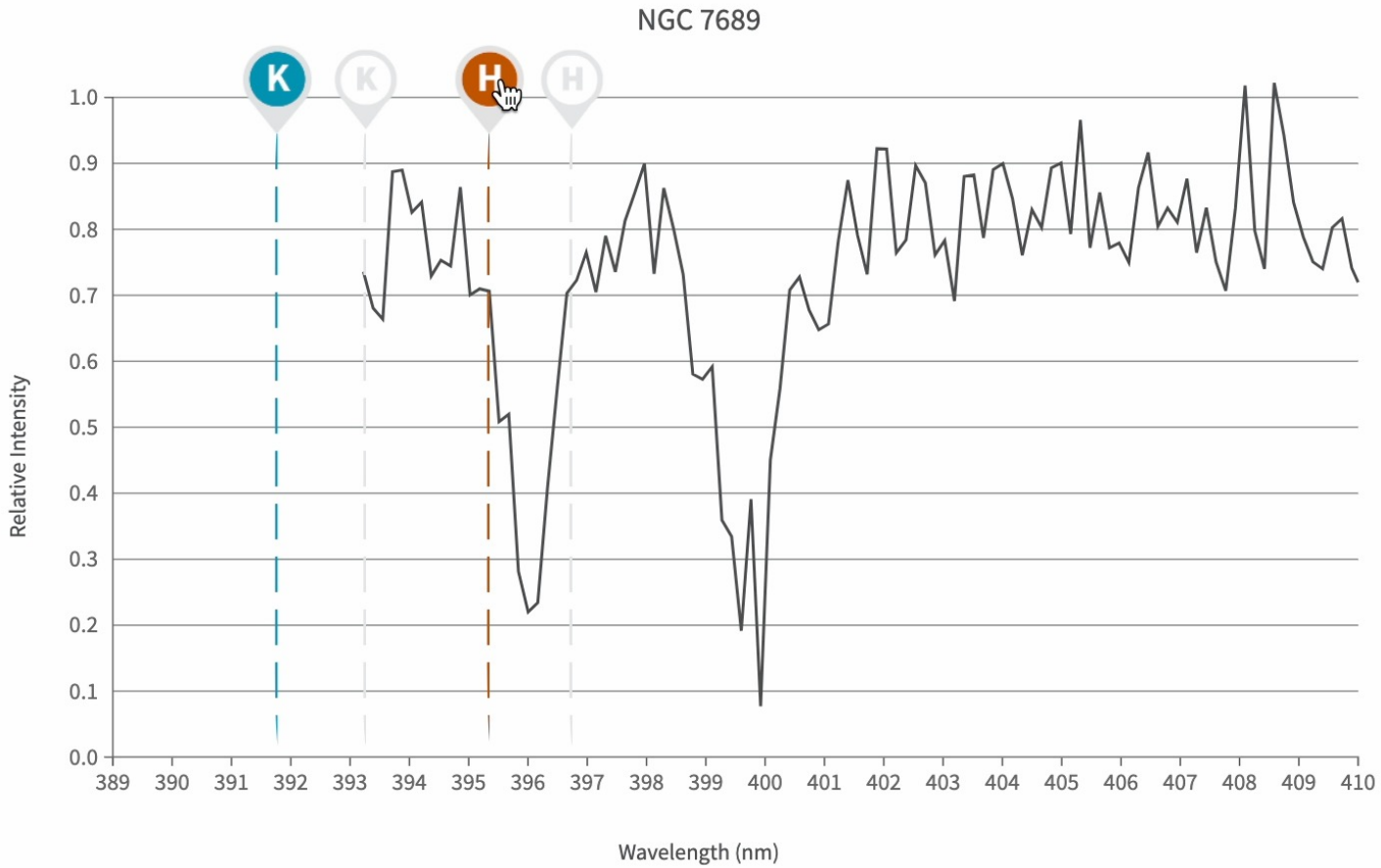
$\lambda_{K_{em}}$ = 393.37 nm

$\lambda_{H_{em}}$ = 396.85 nm

c = 2.998 × 10^5 km/s

The precision of V_{avg} is typically 2 significant figures.

Spectrum | Graph of Brightness | Graph of Diameter | Graph of Distance



$\lambda_{K_{obs}}$ = 391.8 nm

V_K = –1.197e+3 km/s

V_{avg} = –1.146e+3 km/s

$\lambda_{H_{obs}}$ = 395.4 nm

V_H = –1.095e+3 km/s

Plot

Save To Notes

You Solve It 20–45 minutes

How Can We Determine How Rapidly Galaxies Are Moving?

3D Learning Objective
Students use models of galaxies to analyze the galaxies' absorption wavelengths and to calculate the velocity of each galaxy relative to Earth.

Overview of You Solve It
Students use simulations to explore Doppler shifts of galaxies by analyzing the spectra of several galaxies. Students compare the wavelength shift and velocity data for galaxies of known distances in order to discover the relationships between wavelength shift, velocity, and distance. Students make a claim about the relationship between the velocity (Doppler shift) of a galaxy and the galaxy's distance from the observer, its magnitude, or its diameter. Students support their claims with evidence gathered from the investigation.

Working with the You Solve It
Students can toggle among 17 galaxy models. When students select a galaxy, they are provided with information, including the galaxy's name, size, and distance.

The light spectrum for the galaxy is displayed with graphs showing brightness, diameter, and distance.

STANDARDS

PE HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

DCI PS4.B Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.

DCI ESS1.A The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth.

CCC Scale, Proportion, and Quantity

SEP Asking Questions and Defining Problems

SEP Constructing Explanations and Designing Solutions

Differentiating the Activity

Students might have trouble getting started, and they might ask specific questions about what they should do as they look at the selection of galaxies they can choose from. Instead of answering student questions by telling them what to do next, try using these guiding questions and suggestions. This will help students focus their thinking while still allowing them to figure out the activity themselves. Choose the questions that would best help each student, depending on what he or she is asking about. The nested questions are designed so that the main question can be used first, and if that does not help the student progress with the activity, the focused questions can be used.

What can you tell me about the light spectrum?

- What do peaks (or valleys) in a galaxy's spectrum represent?

Original content copyright © Houghton Mifflin Harcourt. Alterations to the original content are the responsibility of the instructor.

What can you tell me about Doppler shift?

- How does the direction of the shift relate to the direction of a moving galaxy?

What is the relationship between Doppler shift and the calcium K and H lines?

How can you identify the position of the calcium K and H lines on a spectrum graph?

Student Report
The You Solv
and there is a
reasons, no si
students coul

Claims
Students can

- There
a gala
- There
betwe

The student m
velocity and ir
diameter and
that the relatic
points on the

Depending on
graphs preser
graphs will ap

the galaxy increases, the
plain that galaxies with
negative velocities on the graph are moving toward Earth, rather than away from it. Students might be able to explain that for galaxies moving away from Earth, the distance increases with time, and faster-moving galaxies have the potential to be located farther from Earth because

Original content copyright © Houghton Mifflin Harcourt. Alterations to the original content are the responsibility of the instructor.

You Solve It Rubric

How Can We Determine How Rapidly Galaxies Are Moving?

Criteria	3	2	1	0
Claim	The claim is clearly stated and fully scientifically accurate. AND The claim is well supported by the evidence gathered from the galaxy observations.	The claim is clearly stated and mostly scientifically accurate. AND The claim is supported by the evidence gathered from the galaxy observations.	The claim is minimal. AND/OR The claim is partially supported using the evidence gathered from the galaxy observations.	The claim is missing. OR The claim is not supported using the evidence gathered from the galaxy observations.
Evidence	The data are complete, accurate, and support the claim.	The data are partially complete and provide partial support for the claim.	The data provided are incomplete or do not support the claim.	No data are provided.
	The reasoning mostly explains how the claim is supported by the evidence gathered on the relationship between a galaxy's velocity and its brightness, diameter, or distance from Earth.	The reasoning minimally explains how the claim is supported by the evidence gathered on the relationship between a galaxy's velocity and its brightness, diameter, or distance from Earth.	The reasoning is missing an explanation of how the evidence supports the claim. OR The reasoning gives an inaccurate explanation of how the evidence supports the claim.
	The report is organized and is mostly clear and complete. The data and explanations are mostly presented in a logical way. AND The report does not have many errors in grammar, spelling, or data.	The report is somewhat organized but it is not clear or complete, or the data and explanations are not presented in a logical order. AND/OR The report has many errors in grammar, spelling, or data.	The report is not well organized. It lacks details and has missing data and incomplete descriptions.

CONTINUE YOUR EXPLORATION

Choose one of the paths below to continue your exploration.

Oceanographer



Explore the work done by oceanographers.

Using the Present to Understand the Past

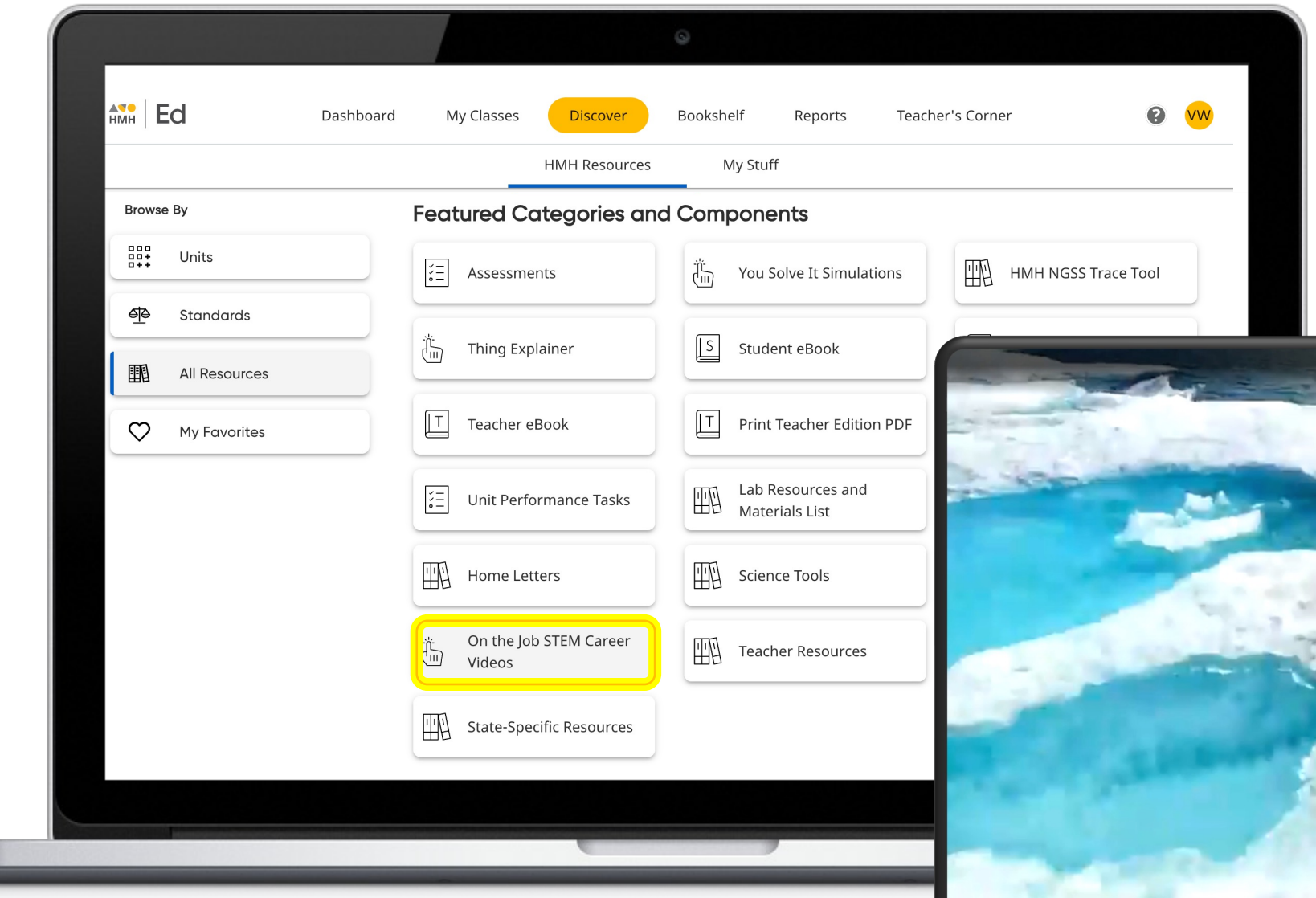


Research modern corals and compare them with ancient coral reefs.

Classifying Events in Earth Systems

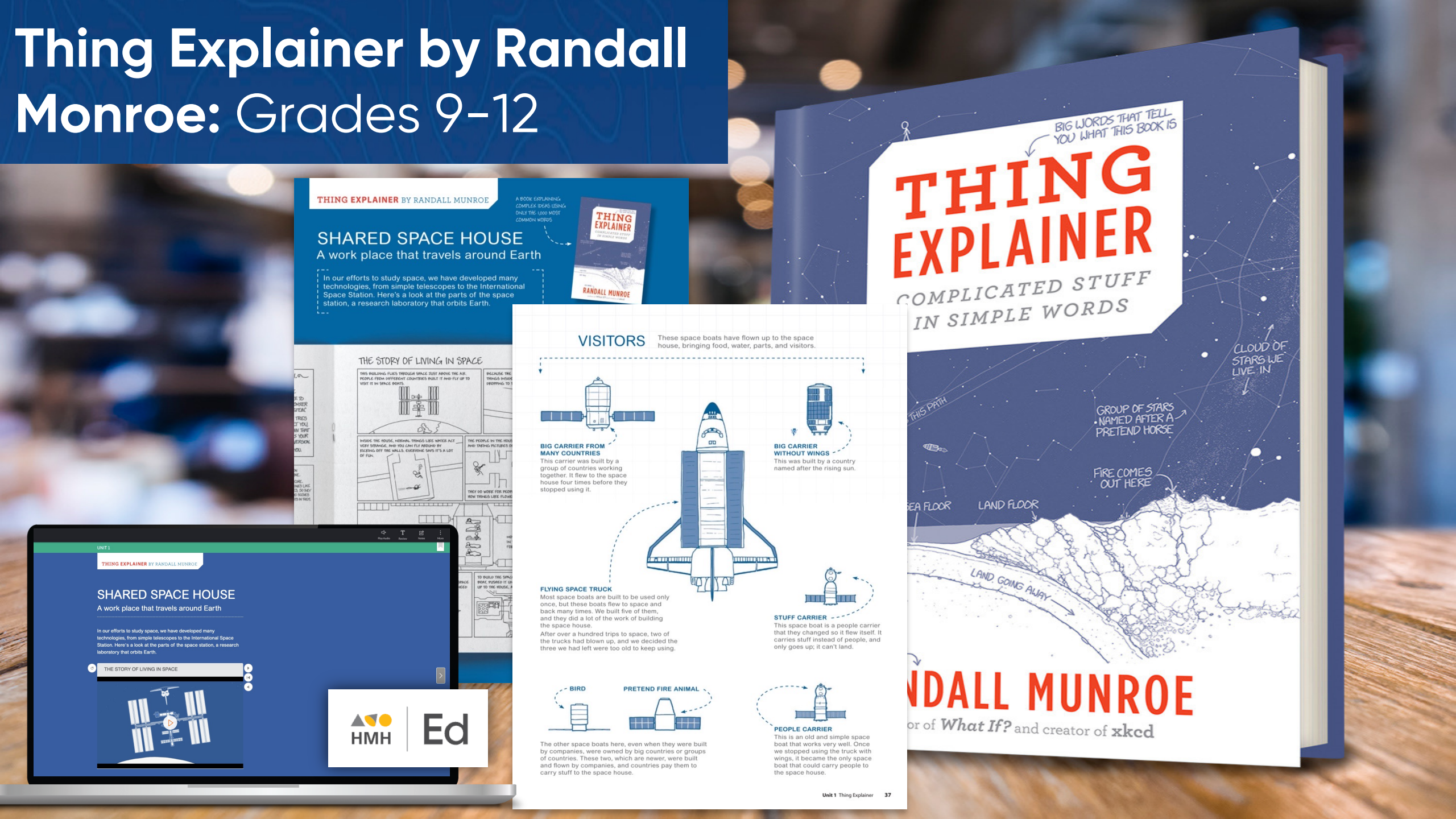


Learn how to classify events in Earth Systems.


HMH Ed
Dashboard
My Classes
Discover
Bookshelf
Reports
Teacher's Corner
VW
HMH Resources
My Stuff
Browse By
Units
Standards
All Resources
My Favorites
Featured Categories and Components
Assessments
You Solve It Simulations
HMH NGSS Trace Tool
Thing Explainer
Student eBook
Teacher eBook
Print Teacher Edition PDF
Unit Performance Tasks
Lab Resources and Materials List
Home Letters
Science Tools
On the Job STEM Career Videos
Teacher Resources
State-Specific Resources


On the Job
The CliffsNotes Version
Planetary Scientist

Thing Explainer by Randall Monroe: Grades 9–12



LESSON SELF-CHECK

Use the resources to review and study the lesson.

CAN YOU EXPLAIN IT?

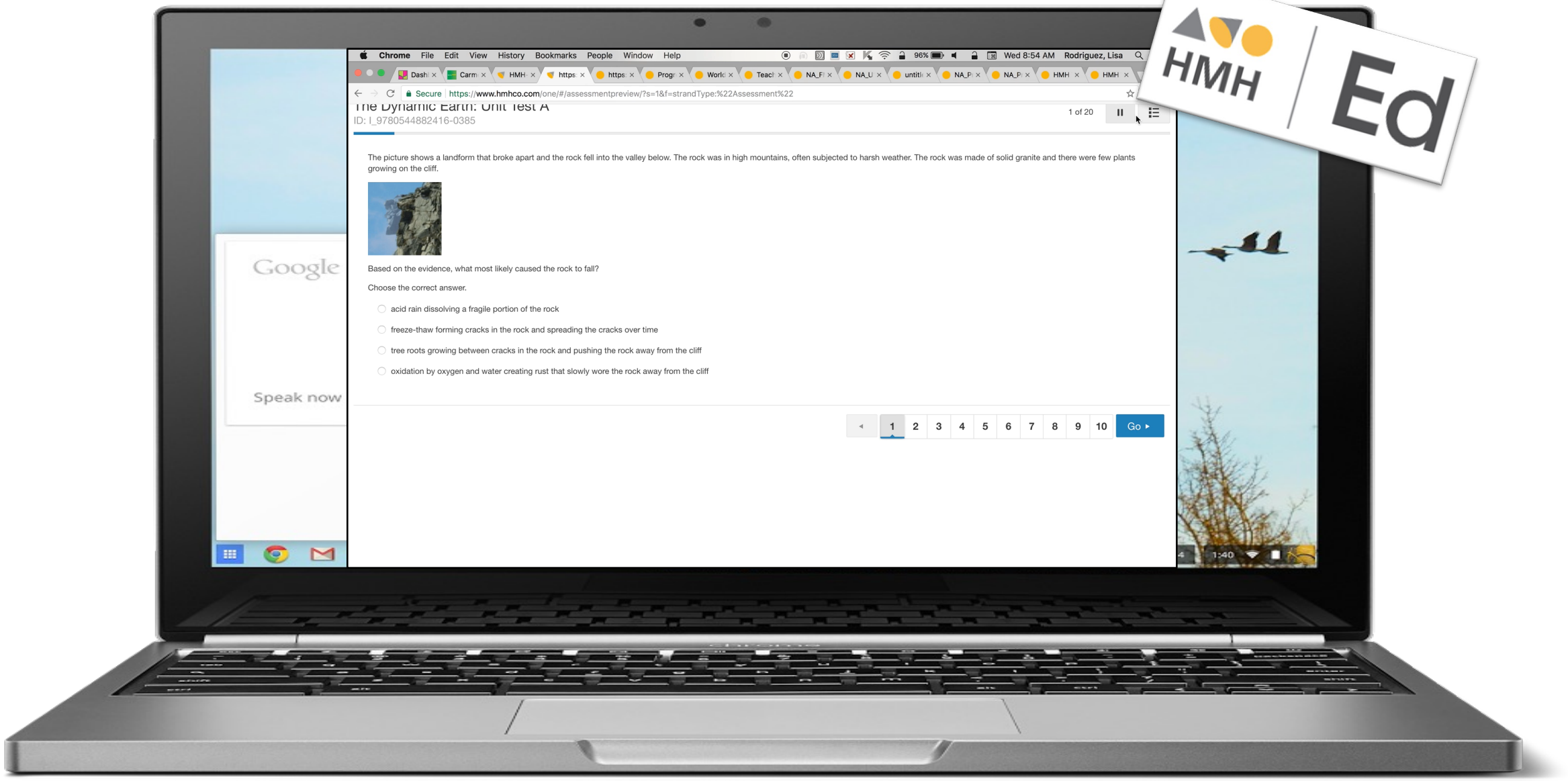
CHECKPOINTS

MAKE YOUR OWN STUDY GUIDE

CAN YOU EXPLAIN IT?

Lesson Quiz

Assessments both Digital or Print Format (both customizable)



Assessment Guides

Unit 2 Unit Test B

Item Analysis	
Item #	
1	HS-ESS2-4, DCI.HS-ESS1.B.2
2	HS-ESS2-5
3	HS-ESS2-5
4	HS-ESS2-5
5	HS-ESS2-5
6	HS-ESS2-5
7	HS-ESS2-5
8	HS-ESS2-4, DCI.HS-ESS1.B.2
9	HS-ESS2-3, DCI.HS-ESS2.B.1,
	HS-ESS2-5, DCI.HS-ESS2.C.1,
	HS-ESS2-5, DCI.HS-ESS2.C.1,
	DCI.HS-ESS2.D.1
	DCI.HS-ESS2.C.1,
	DCI.HS-ESS2.A.2,
	DCI.HS-ESS2.B.1
	DCI.HS-ESS1.C.1
	DCI.HS-ESS1.B.2,
	DCI.HS-ESS2.C.1,
	DCI.HS-ESS2.D.3,
	DCI.HS-ESS2.A.1,
	DCI.HS-ESS2.A.1,
	DCI.HS-ESS2.A.1,
	DCI.HS-ESS2.A.1,
	DCI.HS-ESS2.D.2,

Unit 1 Lesson 1 Quiz

8.

9.

10

Mastery	make our lives more comfortable. Earth science helps save lives by providing explanations for natural events, such as earthquakes and volcanic eruptions, and by allowing scientists to forecast such events.

Assessment Tools

Portfolio Assessment

Guidelines for Student Evaluation through Portfolio Assessment

A portfolio is a showcase for student work, a place where many types of assignments, projects, reports, and data sheets can be collected. The work samples in the collection provide snapshots of the student's efforts over time, and taken together they reveal the student's growth, attitudes, and understanding. Portfolio assessment involves meeting with each student to discuss the work and to set goals for future performance. In contrast with formal assessments, portfolio assessments have these advantages:

1. They give students a voice in the assessment process.
2. They foster reflection, self-monitoring, and self-evaluation.
3. They provide a comprehensive picture of a student's progress.

Tips for Portfolio Assessment

- Make a basic plan. Decide how many work samples will be included in the portfolios and what period of time they represent.
- Explain the portfolio and its use. Describe the portfolio an artist might put together, showing his or her best or most representative work, as part of an application for school or a job. The student's portfolio is based on this model.
- Together with your class decide on the required work samples that everyone's portfolio will contain.
- Explain that the students will choose additional samples of their work to include. Have students remember how their skills and understanding have grown over the period covered by the portfolio, and review their work with this in mind. The best pieces to choose may not be the longest or neatest.
- Have students record their reasoning as they make their selections and assemble their portfolios.
- Explain to students how you will evaluate the contents of their portfolios.
- Use the portfolios for conferences, grading, and planning. Give students the option of taking their portfolios home to share.

My Science Portfolio

What Is in My Portfolio	Why I Chose It
1.	
2.	
3.	
4.	
5.	
6.	
7.	

I organized my Science Portfolio this way because _____

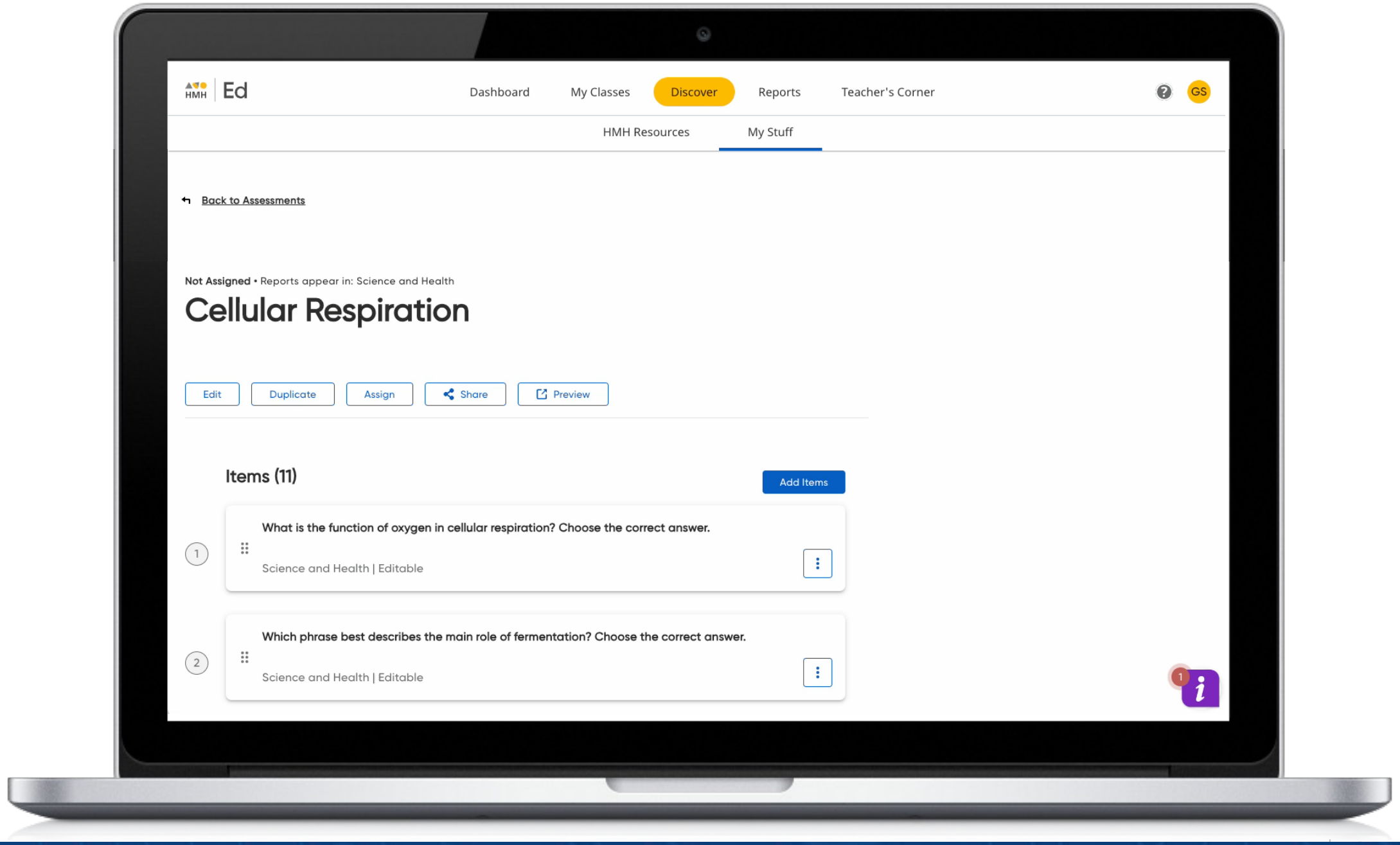
_____

_____

_____

_____

_____


HMH | Ed
Dashboard
My Classes
Discover
Reports
Teacher's Corner
GS
HMH Resources
My Stuff
Back to Assessments
Not Assigned • Reports appear in: Science and Health
Cellular Respiration
Edit
Duplicate
Assign
Share
Preview
Items (11)
Add Items
1
What is the function of oxygen in cellular respiration? Choose the correct answer.
Science and Health | Editable
2
Which phrase best describes the main role of fermentation? Choose the correct answer.
Science and Health | Editable
1

Active Assessments Based on Performance Expectations

Performance-Based Assessment

Teacher Resources

Geoscience

Task 1: Carbon

Students will develop
the movement of carb

Performance E

PE.HS-ESS2-2 Analy
to Earth's surface can
systems.

PE.HS-ESS2-6 Devel
carbon among the hyd
Additional:
CCC.HS.E.1 Conse

Safety:

- Instruct students to
- Instruct students to

Tip **Preparation Q**

- Organize and group
between the end of
- Ask students to dor
- Provide research m
help.

Options for Project-E

- Students can resear
their lessons on ene
- Students can select
between the atmosp
hydrosphere (ocean
- Students can select
providing materials

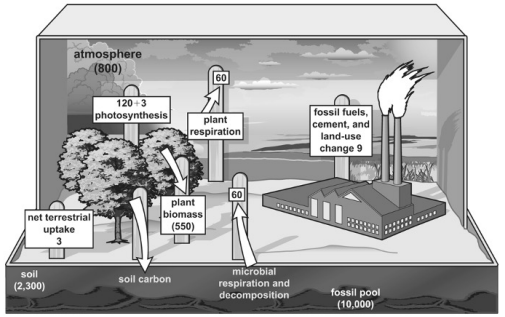
Performance-Based Assessment

Teacher Resources

Task 1 – Model Requirements:

- Name of student
- Available materials are used to represent the atmosphere, land and/or ocean, and carbon dioxide cycling.
- Each component in the carbon dioxide cycling model is labeled.
- Each model should have quantitative figures for each of the following:
  - Carbon stores/sinks
  - Natural sources of carbon emissions
  - Human sources of carbon emissions

Sample Model



Task 1 – Procedure Answers:

1. Table entries will vary but should be similar to the sample table below.

Factors	Chemical reaction	Natural source, human source, stored?	To/from the atmosphere?	Amount (billions of tons of carbon per year)
Plant and animal	respiration	natural source	to the atmosphere	120
Burning of fossil fuels	combustion	human activity	to the atmosphere	7
Soil	n/a	stored	n/a	2,300
Plant photosynthesis	photosynthesis	natural source	from the atmosphere	120
Atmosphere	n/a	stored	n/a	800
Ocean	n/a	stored	n/a	38,000
Phytoplankton photosynthesis	photosynthesis	natural source	to/from the atmosphere	90
Plant biomass	respiration	stored	n/a	550
Raising livestock	respiration	human activity	to the atmosphere	2

UNIT 1 Introduction to Earth and Space

Unit Project

Overview and Planning

Map Your School

3D Learning Objective

Students make maps of their school or school grounds, highlighting different features in different ways and relating these to Earth's spheres.

Students construct different types of maps or other models of the same physical space, such as the school grounds or a classroom. Students brainstorm different ways to map the same space. For example: map of streets or passages/hallways; map of surface materials (concrete, asphalt, grass, carpet, tile, map of room or building types (e.g., classroom, office, closet); map of air temperature. Each student chooses a scale that is appropriate for the map. Students analyze theirs and others' maps to identify the systems that are modeled and interactions between various systems. This can potentially all be delivered as a poster—an assemblage of maps with short descriptions and callouts. Map could also be layered .



NGSS Focus	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
This project supports building student mastery of **Performance Expectation HS-ESS2-2**. Students will design maps with keys to illustrate various features of their school. They chose what features to emphasize in order to communicate different types of information, such as fire exits or rooms containing computers or video equipment. Maps should help others understand how different parts of the school are interrelated and perhaps allow them to identify why certain areas of the school may have certain features.	• Developing and Using Models • Analyzing and Interpreting Data • Obtaining, Evaluating, and Communicating Information	• **HS-ESS1.A** Earth's Materials and Systems • **HS-ESS2.E** Biogeology	• Patterns • Systems and System Models • Scale, Proportion, and Quantity

Classroom Management	Suggested Materials	Safety
• Individuals or small groups • 1–2 class periods	• See the procedure for detailed materials list for the lab. • Online mapmaking tools • Colored markers, pens, or pencils • Digital camera (to record different areas for future reference) • Ruler • Atlas or printed samples of maps	• Students will probably want to walk around the school building and grounds to take photos, take notes, or make sketches. Caution them not to go into any otherwise restricted area to them without permission.

Getting Started

Introducing the Project

Prepare students for their investigation by asking the following questions:

- **What features about any building are most interesting to you?**
- **What would be the most useful things to know about your school?**
- **What would be the best way to represent the type of information you want to present? Contrasting colors? Lines of varying length? How could you make that information readily apparent?**
- **Should your map represent a single or many features?**

Student Deliverables

A **student worksheet** is available to help students in planning and completing the project. Students can turn in their worksheets, or they can be assessed on final maps or final presentations explaining their maps.

In addition to the worksheet and map, students should also show they've considered different types of maps and include any information they've used (photos, sketches, notes, etc.) to make their final maps.

Scoring Rubric for Unit Project	
	The worksheet, map with key, and/or presentation clearly indicates what feature or features of the school are being mapped and describes how the map can be used.
	The worksheet and/or presentation includes notes, rough sketches, photographs or other supporting materials supporting the map.
	The worksheet, map, and/or presentation identifies the spheres that the map includes and explains the interactions it reveals.
	The worksheet, map, and/or presentation describes the scale to which the map was drawn and how the map relates to other maps of the same area.

Differentiate Instruction

Extra Support Suggest students work in small groups to create their maps. Suggest that they start by identifying the area they'd like to map, what would be useful information to know about this area, and then decide on what type of map would best present this information.

Suggested Resources

- **National Geographic:** offers a free online mapmaking tool
- **Google Maps:** offers satellite images, street maps, and 360 panoramic views of almost any area of the country
- **WorldMap:** open source software from Harvard University allows users to create and publish to the web or share maps with collaborators

Guiding Students on Project Planning

Once students understand the project goals and their deliverables, the next step is for students:

- **What spheres are represented in the area you chose to map?**
  Students might identify living things, rocks, buildings, and air and relate these to the various Earth spheres
- **What types of interactions does your map help illustrate?**
  Students could focus interactions between people and objects, such as how normally crowded areas coincide with areas containing lots of light, vending machines, or drinking fountains.
- **To what scale should you draw your map?**
  Students should consider the size of the area they are mapping and how they'd wish their maps to be used. Are they made to be carried and consulted or would they be hanging on a wall?

Be sure to review and approve project plans before students begin. The Unit Project Worksheet can be used for formal approval.

Go Online

Go online to download the Teacher's Edition of the students worksheet for this unit project to access additional questions, sample answers, and additional scaffolding to help students use claims, evidence, and reasoning to support their conclusions.

UNIT 1

Performance Task

Using Maps to Assess Problems

A company is planning to build a complex of offices, workshops, and warehouses along the Mississippi River. The land is inexpensive, and the location along the river will be ideal for shipping materials to and from the complex. The owners of the company have been warned that the river periodically floods, but they are not sure why that would happen or what the effects could be. They are not sure whether or not they should be worried, or if there is any way they

Download Unit Performa
Task Worksheet



The company plans to build the new comp
the area marked in white.

UNIT PERFORMANCE TASK

Using Maps to Assess Problems

A company is planning to build a complex of offices, workshops, and warehouses along the Mississippi River. The land is inexpensive and the location along the river will be ideal for shipping materials to and from the complex. The owners of the company have been warned that the river periodically floods, but they are not sure why that would happen or what the effects could be. They are not sure whether or not they should be worried, or if there is any way they could prevent flooding or its effects.

1. DEFINE THE PROBLEM

With your group, look carefully at the map showing where the company wants to build. Does it look like the area is at risk of flooding or not? What makes you think so? Brainstorm the possible problems the company could have if they build in the area shown along the river. Make a chart that describes possible causes of each problem and the specific effects of each problem on the new business development.

2. CONDUCT RESEARCH

With your team, add to what you already know by researching the causes and effects of flooding on a river like the Mississippi. Then research the ways that engineers try to prevent or deal with flooding and its effects. Can these solutions cause other problems to people or to other living or non-living parts of the ecosystem?

3. ANALYZE DATA

On your own, analyze the company's situation. What specific risks do they face by building in this location? What evidence and reasoning supports your claim that they are at risk? What can the company do to minimize these risks? What would you recommend?

4. IDENTIFY AND RECOMMEND A SOLUTION

Present your suggested solution to your team, with reasoning to back it up. Listen to others' solutions. As a team, weigh the pros and cons of each solution. Come to a consensus on which solution you recommend, as a team.

The company plans to build the new complex just east of the Mississippi River, somewhere in the area marked in white.



©LandsatLook/USGS

5. COMMUNICATE

Present a brief report to the company explaining the problem, its causes, and the solution your recommend. Be sure to include the reasoning behind your recommendation.

CHECK YOUR WORK

A complete report should include the following information:

- A clear description of the problems that the business could have if they were to build the new complex in this area.
- Evidence that supports the claims.
- A recommendation for preventing the predicted problems.
- Reasoning to support the recommendation.

Performance-Based Assessment **Unit Project** **Unit Performance Task**

Rubrics and Teacher Planning Pages Included

3 Formats of Assessments

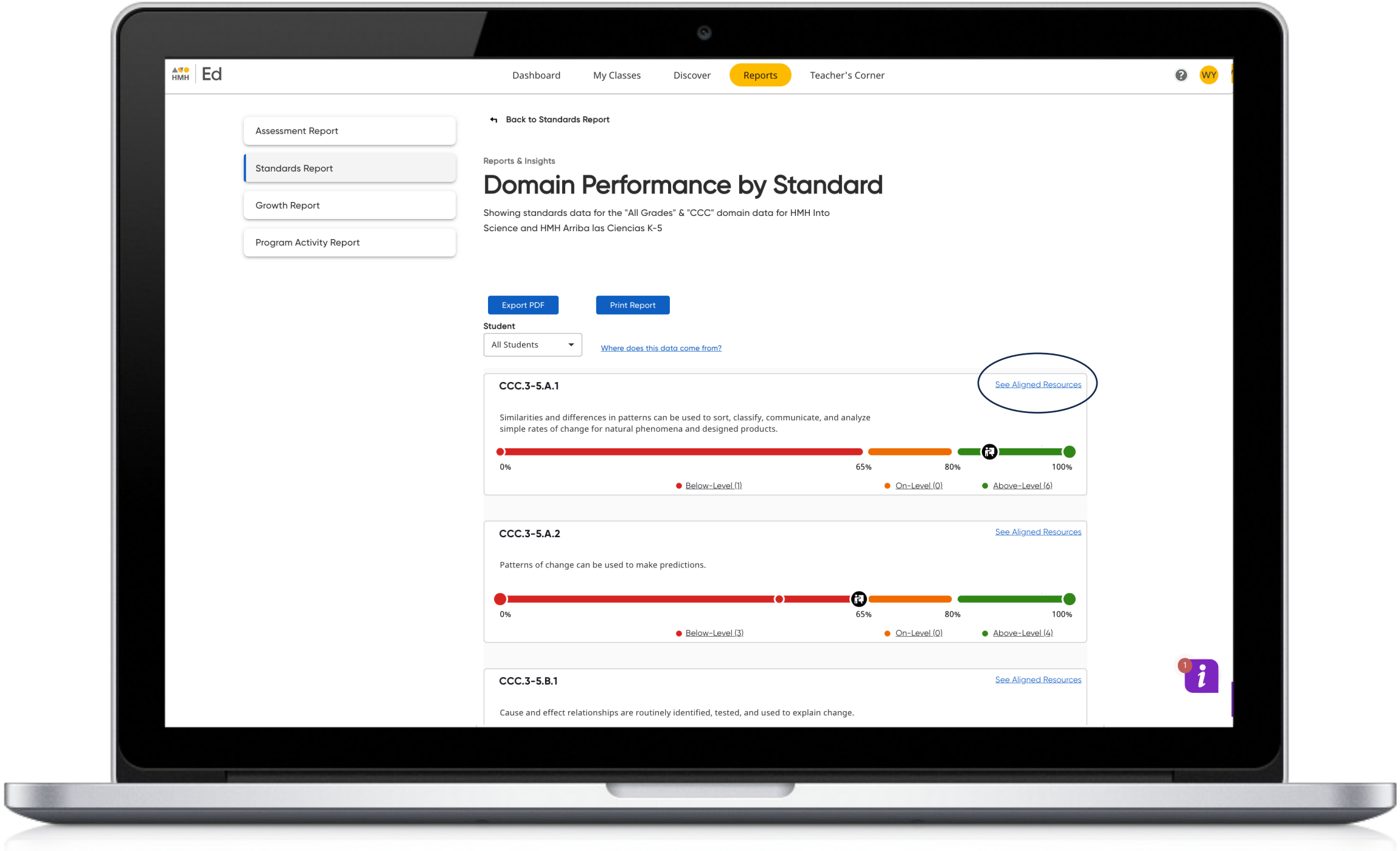
Printable PDF **Customizable Word doc** **Digital Assessment**

- Benchmark Assessments:
  - Beginning of Year
  - Mid Year
    - Form A & Form **B**
  - End of Year
    - Form A & Form **B**

- Unit Assessments:
  - Unit Pre-Assessments
  - Unit Post Assessments
    - Form A & Form **B**

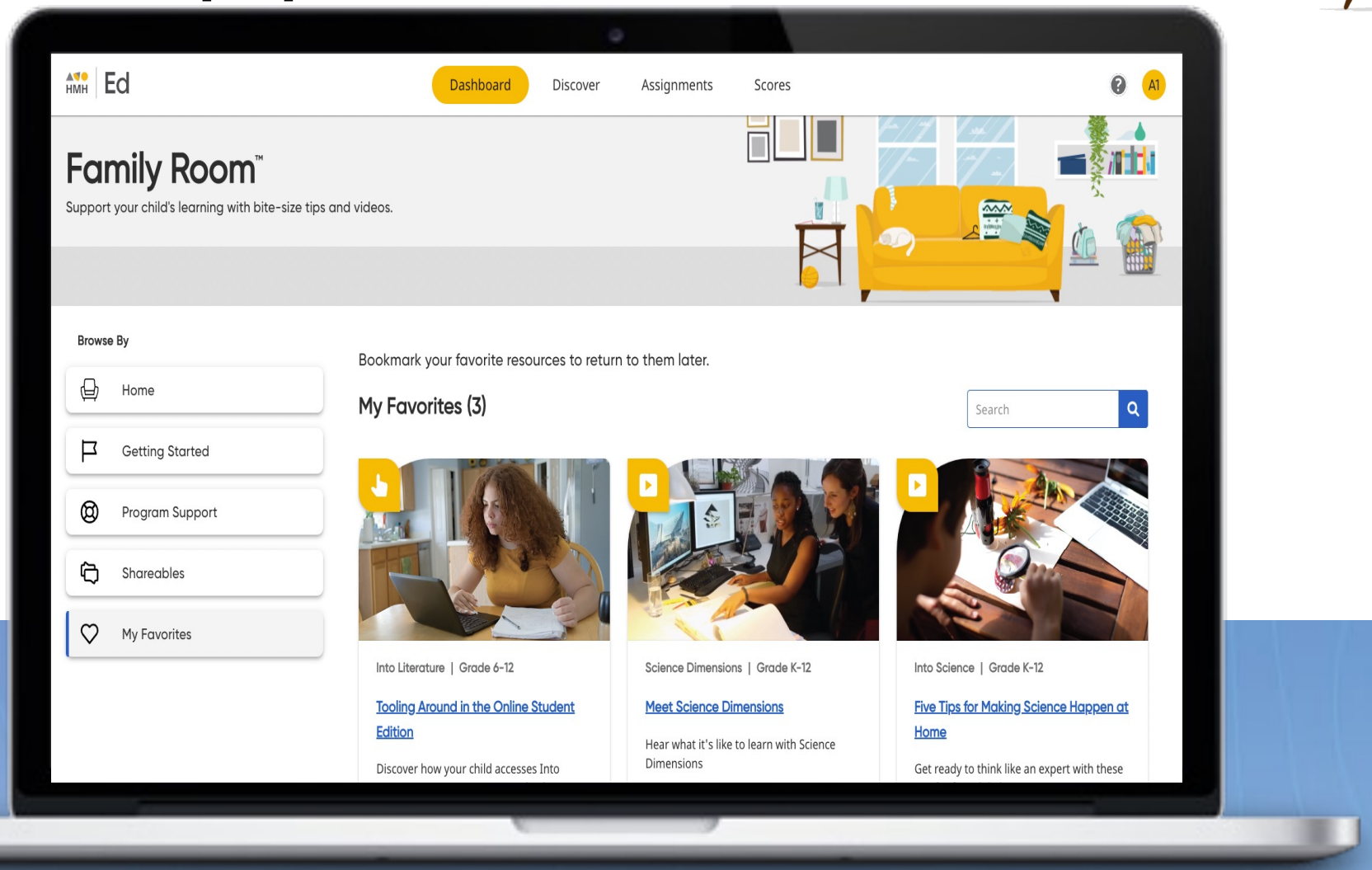
- Lesson Quiz

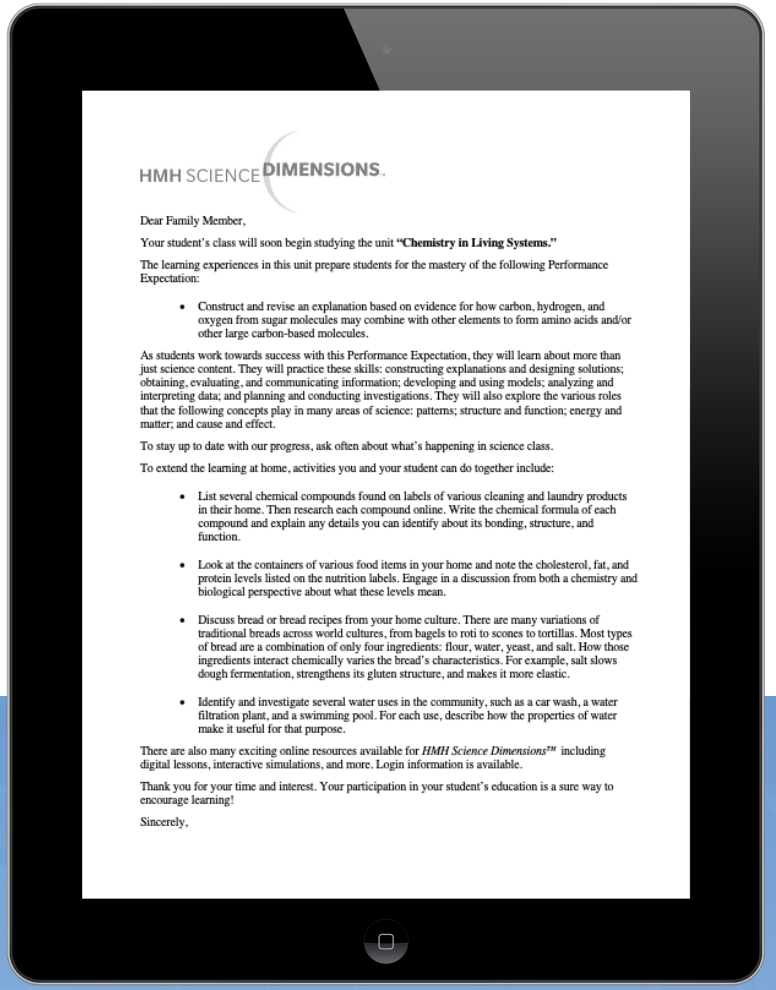
- Performance-Based Assessment


HMH Ed
Dashboard
My Classes
Discover
Reports
Teacher's Corner
WY
Assessment Report
Standards Report
Growth Report
Program Activity Report
Back to Standards Report
Reports & Insights
Domain Performance by Standard
Showing standards data for the "All Grades" & "CCC" domain data for HMH Into Science and HMH Arriba las Ciencias K-5
Export PDF
Print Report
Student
All Students
Where does this data come from?
CCC.3-5.A.1
See Aligned Resources
Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.
0%
65%
80%
100%
Below-Level (1)
On-Level (0)
Above-Level (6)
CCC.3-5.A.2
See Aligned Resources
Patterns of change can be used to make predictions.
0%
65%
80%
100%
Below-Level (3)
On-Level (0)
Above-Level (4)
CCC.3-5.B.1
See Aligned Resources
Cause and effect relationships are routinely identified, tested, and used to explain change.

Support On Demand







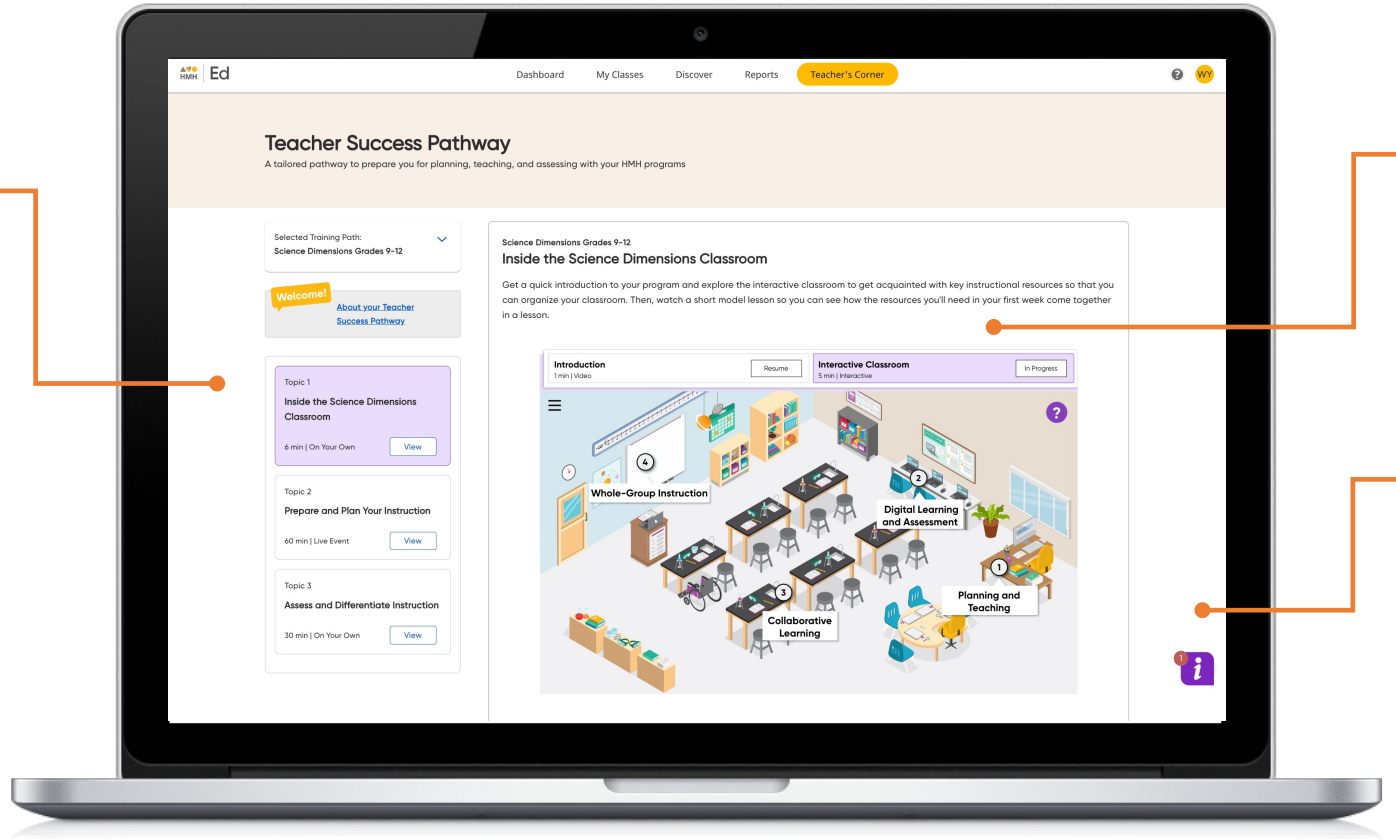
Family Room

Home Letters

Build teacher confidence in 30 days

Teacher Success Pathway

Quickly gain familiarity with your program and build knowledge at your own pace.



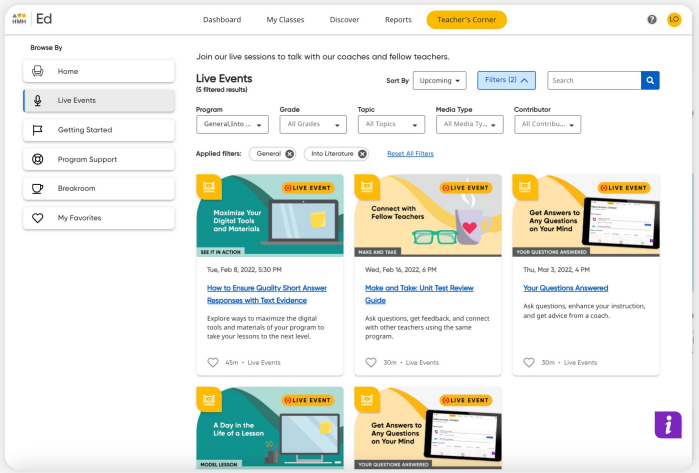
Week-by-week planning guidance

Choose the best live online session for your schedule.

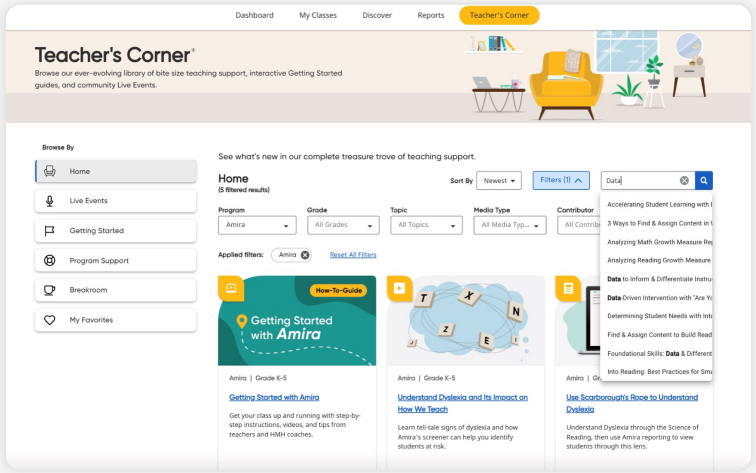
Teacher Choice

Select the topics that matter most to you.

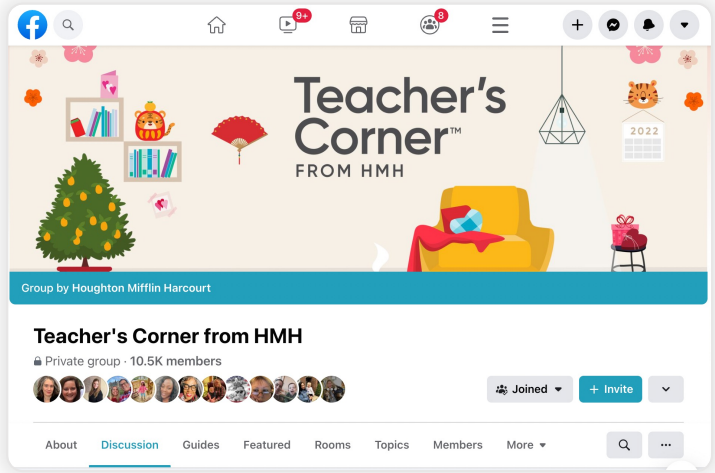
Build Community



Live, Online Events



Searchable Library



Facebook Community


HMH Science Dimensions®

HMH SCIENCE DIMENSIONS™
ENGINEERED for the NEXT GENERATION

Earth & Space Science







