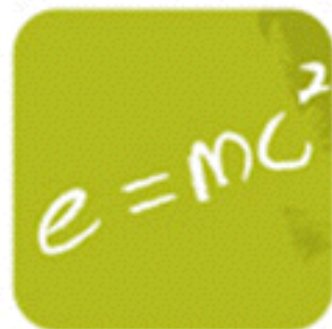


**Mc
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Hill
Education**



STEM

science • technology
engineering • math



STEM job growth projected to significantly outpace all other fields by 2020

THE STEM CRISIS

Requirement for STEM Skills

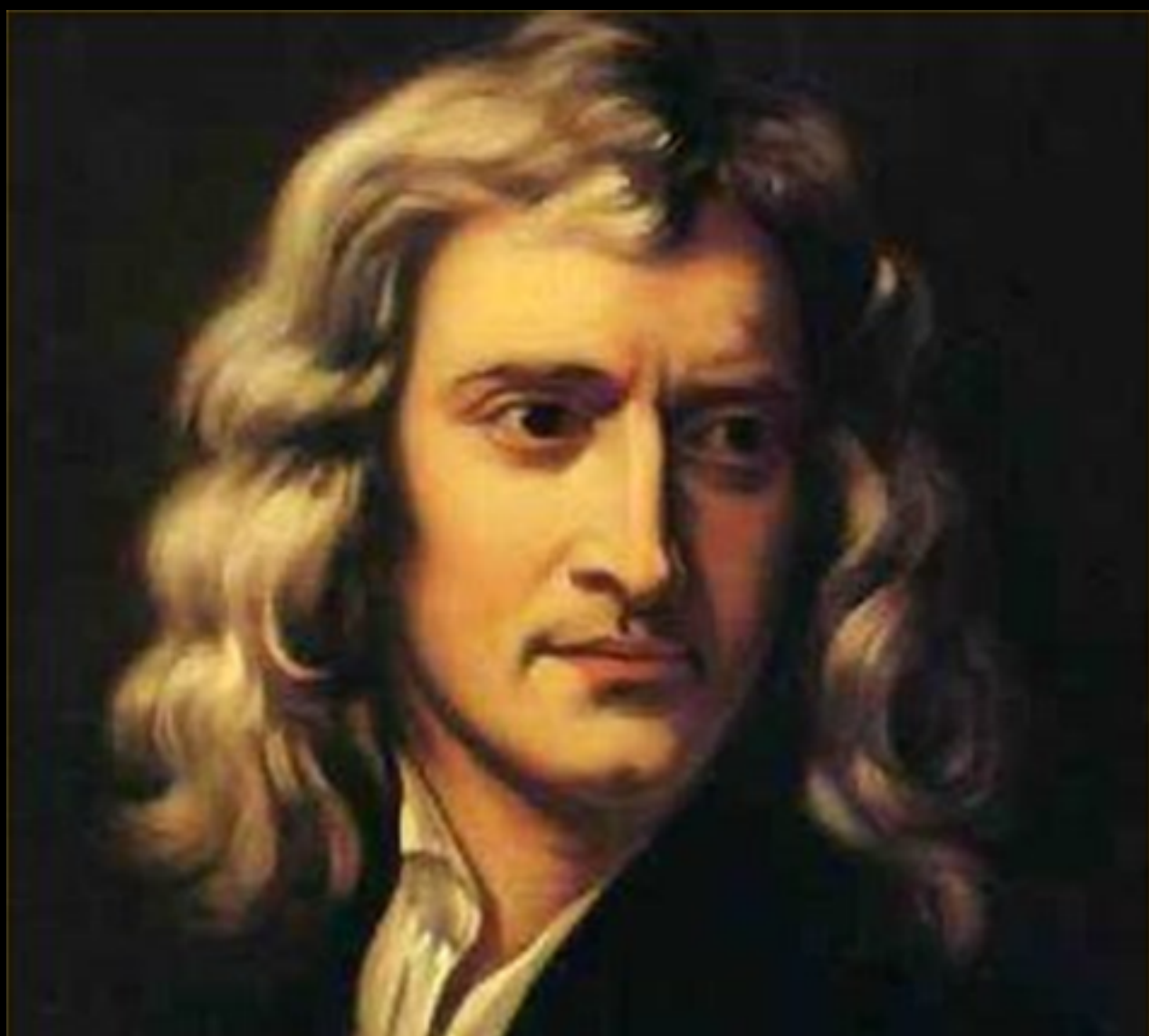
Qualified or interested candidates for STEM Jobs

Global Innovation Leadership

Kids not college ready for science and math

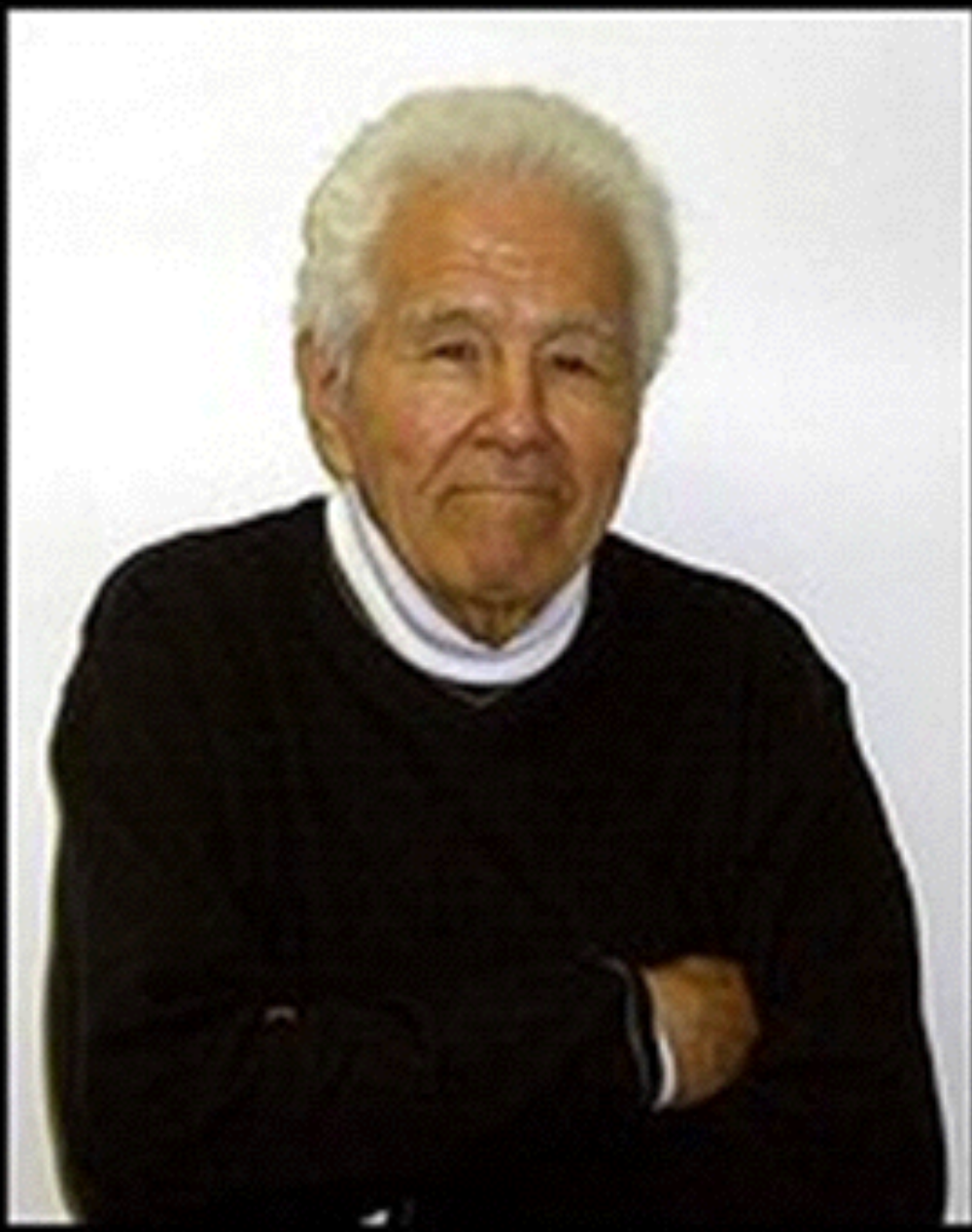
38% STEM majors abandon their path

Global ranking for science and math slipping









JEDOPAL





More children ages **3 to**
with home internet access know
how
to use **computers** and **smartphones**
than know how to



ride a bike

OR



tie their shoes

Careers in STEM
earn an average of



Of grade 8 students, more than 20% have chosen a career not yet invented.

Of hiring managers, 77% struggle to fill science and engineering positions.





NEXT GENERATION
SCIENCE
STANDARDS

What is “3-D Learning”?



What best describes 3-D Learning?

A: A lesson that incorporates the 3 dimensions of NGSS.

B: A lesson that incorporates hands on science and labs.

C: A lesson in which something is built by the students.

D: A lesson that has online virtual simulations and experiences.

11 DCIs

Disciplinary Core Ideas

Physical Science

- Matter & Interactions
- Motion & Stability, Forces & Interaction
- Energy
- Wave Properties

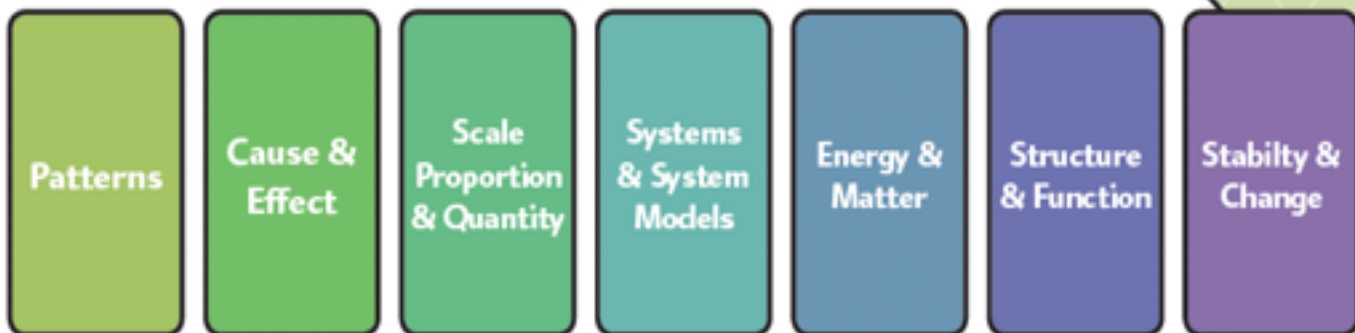
Life Science

- From molecules to organisms
- Ecosystems
- Heredity
- Biological Evolution

Earth & Space Science

- Earth's Place in the Universe
- Earth Systems
- Earth and Human Activity

7 CCCs
Crosscutting Concepts



8 SEPs

(Science & Engineering Practices)

1.
Asking Questions
and Defining
Problems

2.
Developing and
Using Models

3.
Planning and
Carrying Out
Investigations

4.
Analyzing and
Interpreting Data

5.
Using
Mathematics and
Computational
Thinking

6.
Constructing
Explanations
and Designing
Solutions

7.
Engaging in
Argument from
Evidence

8.
Obtaining,
Evaluating, and
Communicating
Information

Three Dimensional Learning

Disciplinary Core Ideas
(The Content in Focus)

Science and
Engineering Practices
(The Skills)

Crosscutting Concepts
(The Common Themes)



Performance
Expectations

Students apply and demonstrate their understanding by using the **Disciplinary Core Ideas**, the **Science and Engineering Practices** and the **Crosscutting Concepts** together.

Math and ELA
Cross Curricular
Connections

Phenomena





I. Alignment to the NGSS

The lesson or unit aligns with the the NGSS:

- A. Grade-appropriate elements of engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), support students in three-dimensional learning to make sense of **phenomena** and/or to design solutions to problems.
 - i. Provides opportunities to develop and use specific elements of the disciplinary core idea(s) to make sense of **phenomena** and/or to design solutions to problems.
 - ii. Provides opportunities to develop and use specific elements of the crosscutting concept(s) to make sense of **phenomena** and/or to design solutions to problems.
 - iii. Provides opportunities to develop and use specific elements of the engineering practice(s) to make sense of **phenomena** and/or to design solutions to problems.
 - iv. The three dimensions work together to support students to make sense of **phenomena** and/or to design solutions to problems.

A unit or longer lesson will also:

- B. Lessons fit together coherently to meet performance expectations.
 - i. Each lesson links to previous learning and provides a need to engage in the next lesson.
 - ii. The lessons help students build on their previous learning to reach a targeted set of performance expectations.
- C. Where appropriate, disciplinary core ideas from different disciplines are used to explain **phenomena**.
- D. Where appropriate, crosscutting concepts are used in the explanation of **phenomena** across disciplines.
- E. Provides grade-appropriate connections to Common Core State Standards for Mathematics and/or English Language Arts, History/Social Studies, Science, and Technical Subjects.

- A. Grade-appropriate elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), work together to support students in three-dimensional learning to make sense of **phenomena** and/or to design solutions to problems.
 - i. Provides opportunities to develop and use specific elements of the practice(s) to make sense of **phenomena** and/or to design solutions to problems.
 - ii. Provides opportunities to develop and use specific elements of the disciplinary core idea(s) to make sense of **phenomena** and/or to design solutions to problems.
 - iii. Provides opportunities to develop and use specific elements of the crosscutting concept(s) to make sense of **phenomena** and/or to design solutions to problems.
 - iv. The three dimensions work together to support students to make sense of **phenomena** and/or to design solutions to problems.



Monitoring Student Progress

The rubric supports monitoring student progress by:

- providing observable evidence of three-dimensional learning by students using disciplinary core ideas and crosscutting concepts to make sense of **phenomena** and/or to design solutions.
- providing assessments of three-dimensional learning embedded throughout the lesson.
- providing designed rubrics and scoring guides that provide guidance for assessing student performance along the dimensions of (a) providing instruction and (b) providing feedback to students.
- providing evidence of student proficiency using methods, representations, and examples that are accessible and unbiased for all students.

The lesson will also:

- include formative, summative, and self-assessments that assess three-dimensional learning.
- provide multiple opportunities for students to demonstrate performance of practices with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback.

What are “Phenomena”?

What best describes a “phenomena”?

- A: Someone, or something possessing an incredible level of skill.
- B: A rare event, or occurrence in nature that students must explain.
- C: An event, object or situation, either natural or manmade, that must be explained.
- D: Something which is unseen, but must be proven through experimentation.







- **Phenomenon:** Singer shattering a glass with his voice
- **Driving Question:** Why was the singer able to shatter the glass?

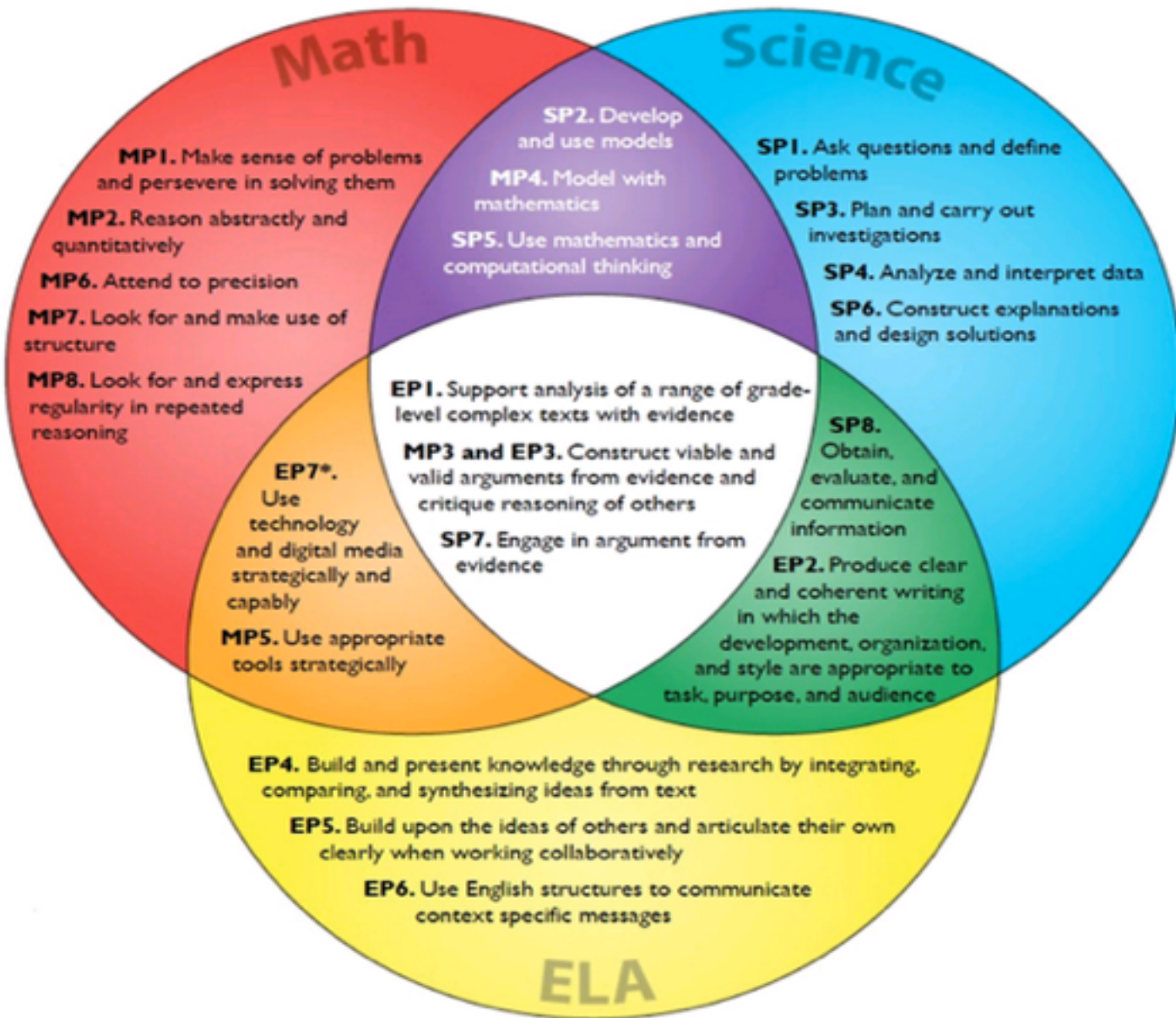
Science in My World

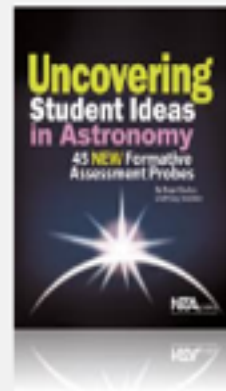
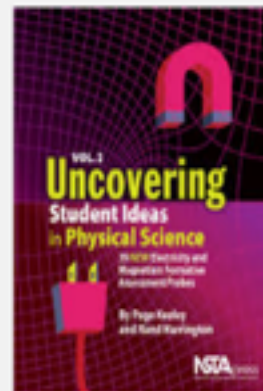
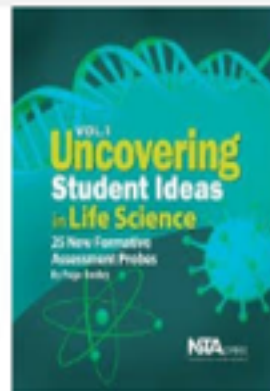
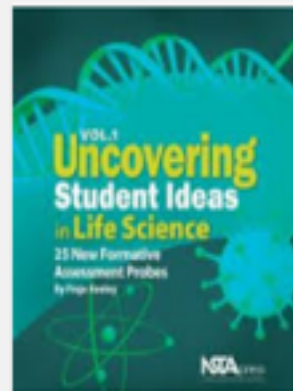
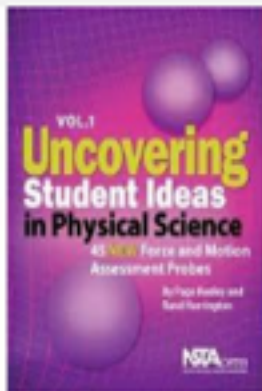
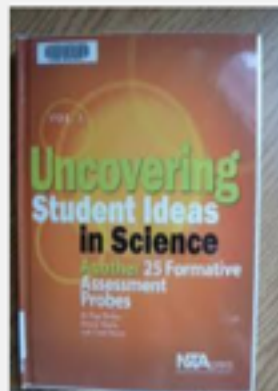
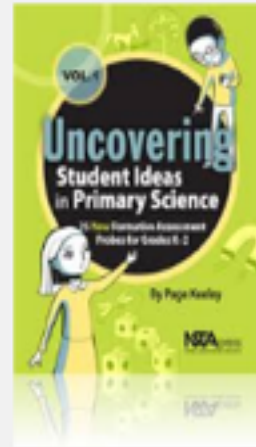
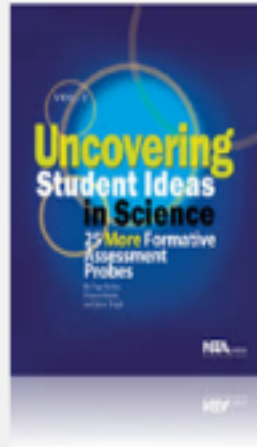
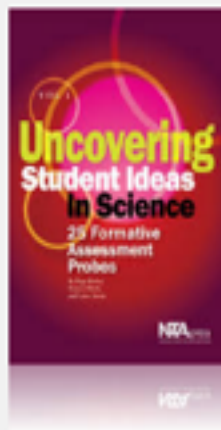
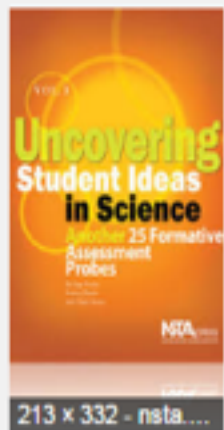


©Image Source/Getty Images

Aligned to the Common Core State Standards (CCSS)







Vernacular Misconceptions:

- Acceleration
- Theory
- Heat

Page Keeley Probes



Ball Toss

Jose tosses a ball high into the air. The ball eventually comes down so his friends can catch it. Jose and his friends have different ideas about why the ball comes back down. This is what they said:

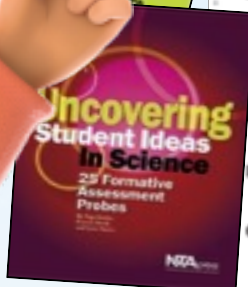
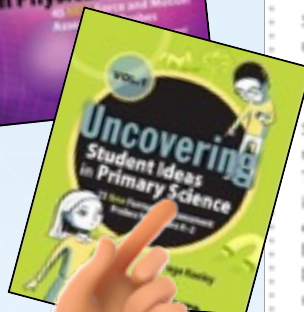
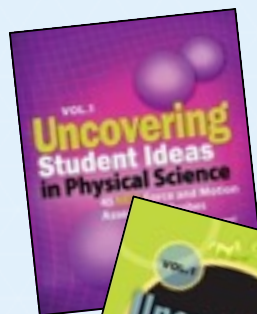
Jose: I think it comes down because Earth is pulling on it.

Eddie: I think it comes down because it runs out of force.

Lucy: I think it comes down because air pressure pushes it down.

Dinah: I think it comes back down because no forces are acting on it.

Who do you most agree with? _____ Explain your thinking about why the ball comes back down.



The Mitten Problem

Sarah's science class is investigating heat energy. They wonder what would happen to the temperature reading on a thermometer if they put the thermometer inside a mitten.



Sarah's group obtained two thermometers and a mitten. They put one thermometer inside the mitten and the other thermometer on the table next to the mitten. An hour later they compared the readings on the two thermometers. The temperature inside the room remained the same during their experiment.

What do you think Sarah's group will discover from their investigation? Circle the response that best matches your thinking.

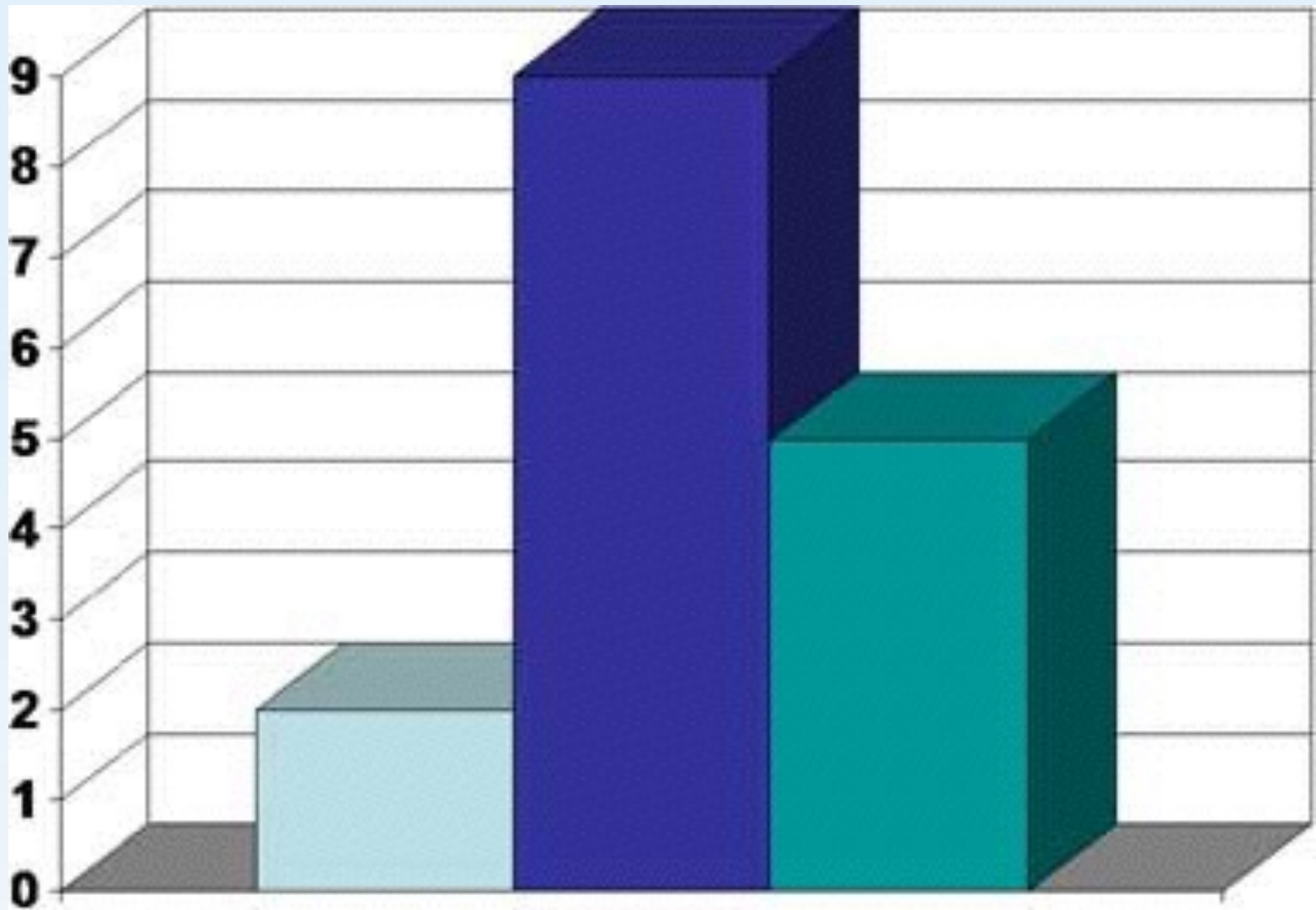
- A** The thermometer inside the mitten will have a lower temperature reading than the thermometer on the table.
- B** The thermometer inside the mitten will have a higher temperature reading than the thermometer on the table.
- C** Both thermometers will have the same temperature reading.

Describe your thinking. Provide an explanation for your answer.

What do you think Sarah's group will discover from their investigation? Circle the response that best matches your thinking.

- A** The thermometer inside the mitten will have a lower temperature reading than the thermometer on the table.
- B** The thermometer inside the mitten will have a higher temperature reading than the thermometer on the table.
- C** Both thermometers will have the same temperature reading.

Describe your thinking. Provide an explanation for your answer.

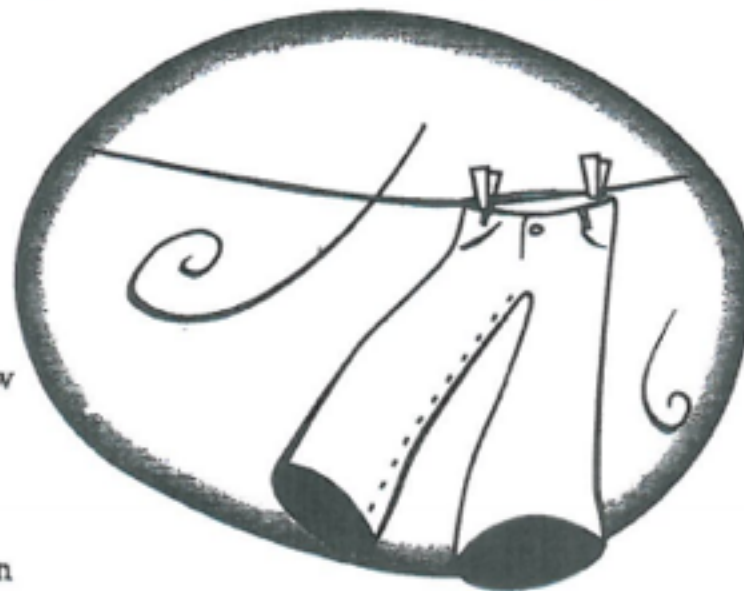


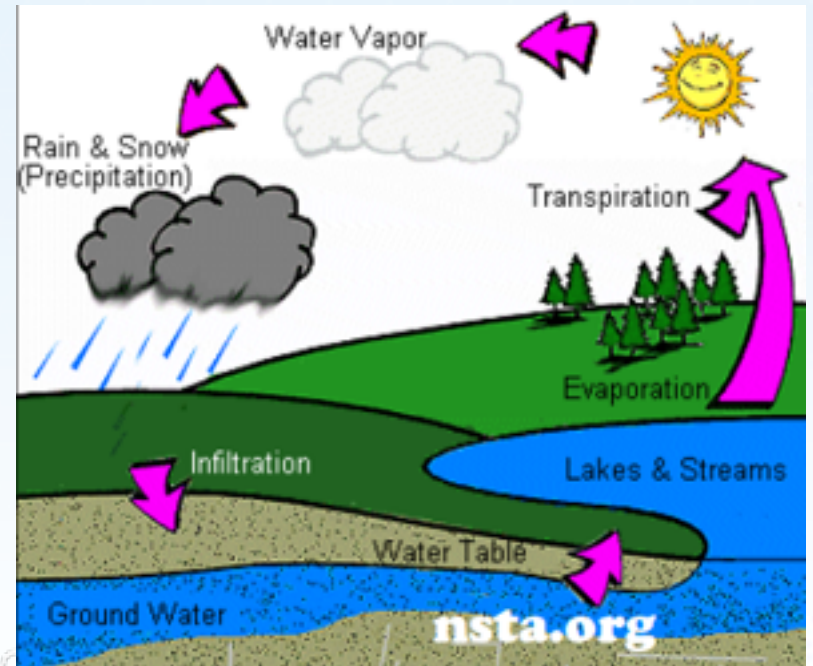
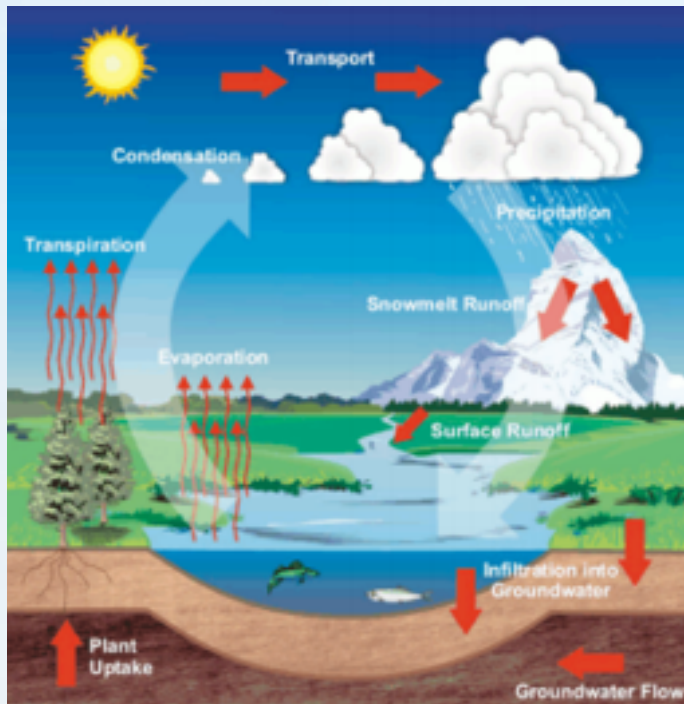
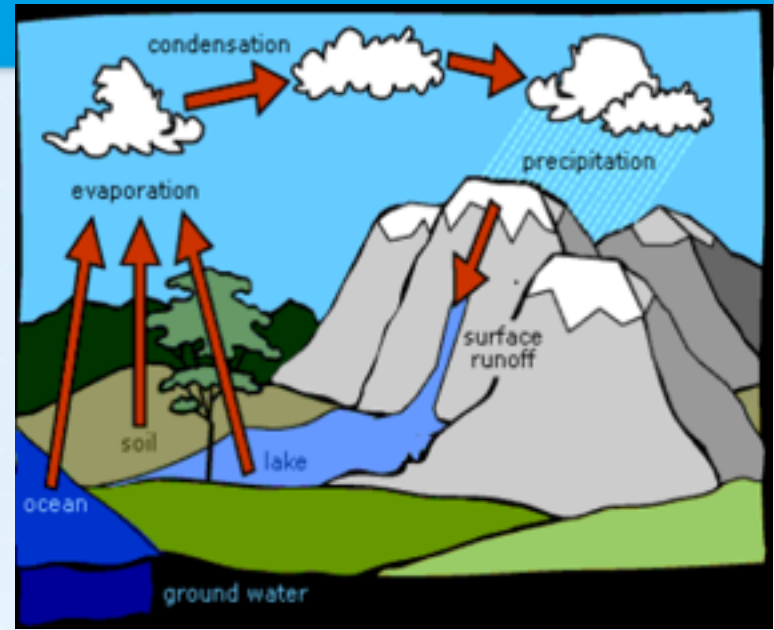
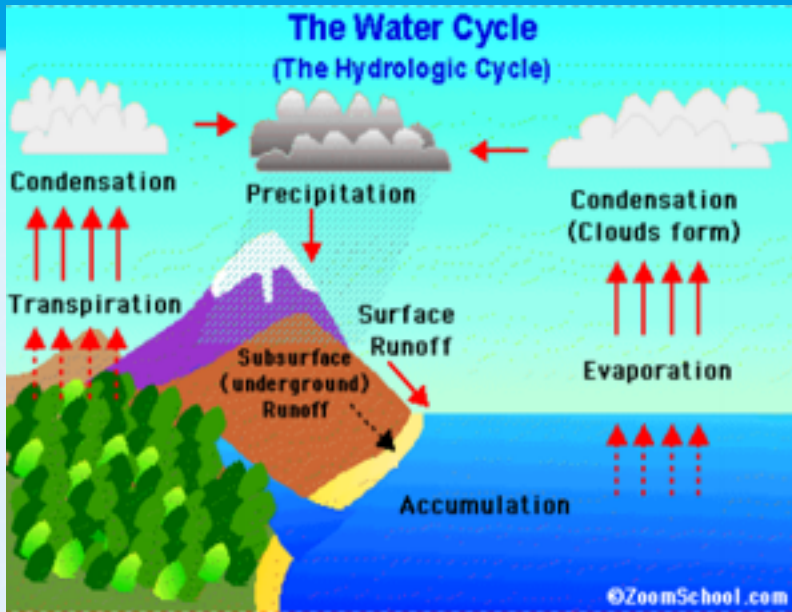
Wet Jeans

Sam washed his favorite pair of jeans. He hung the wet jeans on a clothesline outside. An hour later the jeans were dry.

Circle the answer that best describes what happened to the water that was in the wet jeans *an hour later*.

- A** It soaked into the ground.
- B** It disappeared and no longer exists.
- C** It is in the air in an invisible form.
- D** It moved up to the clouds.
- E** It chemically changed into a new substance.
- F** It went up to the Sun.
- G** It broke down into atoms of hydrogen and oxygen.

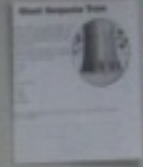




Everyone has misconceptions. Not just “those” people?



"Where did most of the matter that makes up
a huge tree originally come from?"
⇒ LETS KEEP THINKING. ←



April 15
April 22
April 29



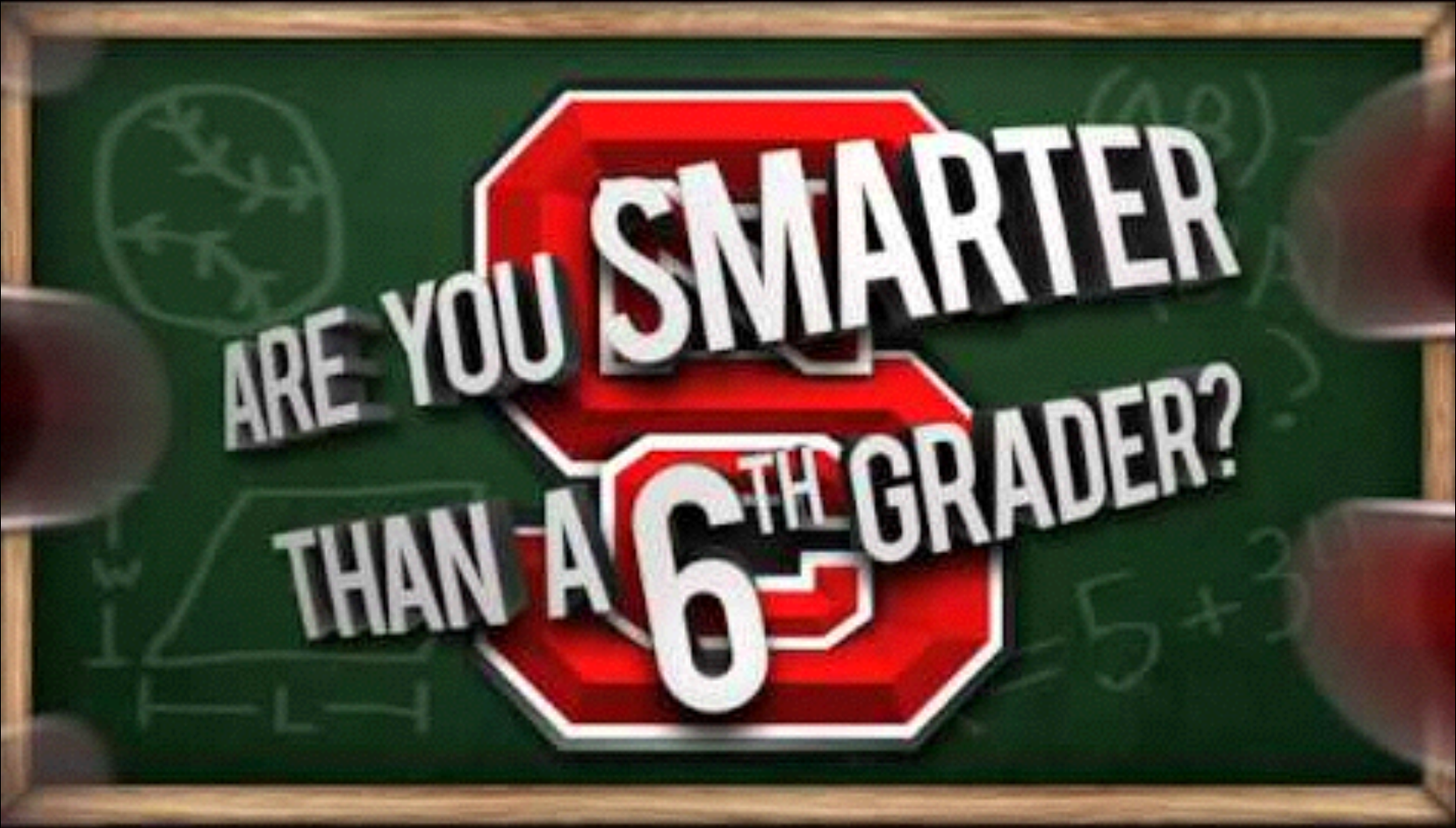
InspireScience

Formative Assessment Strategies
with Page Keeley

Uncovering Student Ideas







ARE YOU SMARTER
THAN A 6TH GRADER?

MHE
EXCLUSIVE



LEARNSMART

**Mc
Graw
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Education**

SB
SMARTBOOK

The Outside of a Cell

As you have just read, the cell membrane surrounds a cell. Much like a fence surrounds a school, the cell membrane helps keep the substances inside a cell separate from the substances outside a cell. Some cells also are surrounded by a more rigid layer called a cell wall.

Cell Membrane

The cell membrane is made of lipids and proteins. Recall that lipids and proteins are macromolecules that help cells function. Lipids in the cell membrane protect the inside of a cell from the external environment. Proteins in the cell membrane transport substances between a cell's environment and the inside of the cell. Proteins in the cell membrane also communicate with other cells and organisms and sense changes in the cell's environment.

 **Reading Check** Summarize the major components of cell membranes.

Cell Wall

In addition to a cell membrane, some cells also have a cell wall as shown in **Figure 10**. The cell wall is a strong, rigid layer



How does ozone form in the upper stratosphere?

Click the correct answer.

Ozone is a greenhouse gases that drifts up from the lower atmosphere.

Ultraviolet radiation converts oxygen molecules and water molecules to ozone molecules.

The heat of the Sun converts oxygen molecules to ozone molecules.

Ultraviolet radiation converts oxygen molecules to ozone molecules.

Do you know the answer?



Read about this

I KNOW IT

THINK SO

UNSURE

NO IDEA



How does ozone form in the upper stratosphere?

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The heat of the Sun converts oxygen molecules to ozone molecules.

Ultraviolet radiation converts oxygen molecules to ozone molecules.

Do you know the answer?

Close book

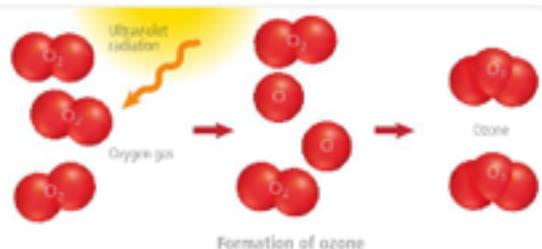
I KNOW IT

THINK SO

UNSURE

NO IDEA

Figure 3 Ultraviolet radiation from the Sun causes some oxygen gas (O_2) to break into individual particles of oxygen (O). These individual particles combine with oxygen gas (O_2) to form ozone (O_3). **Figure 3** illustrates this process. Ozone can also absorb radiation and break apart to reform oxygen gas. Thus, there tends to be a balance between oxygen gas and ozone levels in the stratosphere.



Ozone formation How does ozone enter the stratosphere? When oxygen gas (O_2) is exposed to ultraviolet radiation in the upper regions of the stratosphere, ozone (O_3) is formed. Molecules of oxygen gas are made of two smaller oxygen particles. The energy of the radiation breaks the oxygen gas into individual oxygen particles (O), which then interact with O_2 to form O_3 . **Figure 3** illustrates this process. Ozone can also absorb radiation and break apart to reform oxygen gas. Thus, there tends to be a balance between oxygen gas and ozone levels in the stratosphere.

Ozone was first identified and measured in the late 1800s, so its presence has been studied for a long time. It was of interest to scientists because air currents in the stratosphere move ozone around Earth. Ozone forms over the equator, where the rays of sunlight are the strongest, and then flows toward the poles. Thus, ozone makes a convenient marker to follow the flow of air in the stratosphere.

In the 1920s, British scientist G.M.B. Dobson (1889–1976) began measuring the amount of ozone in the atmosphere. Although ozone is formed in the higher regions of the stratosphere, most of it is stored in the lower stratosphere. Ozone can be measured in the lower stratosphere by instruments on the ground or in balloons, satellites, and rockets. Dobson's measurements helped scientists determine the normal amount of ozone that should be in the stratosphere. Three hundred Dobson units (DU) is considered the normal amount of ozone in the stratosphere. Instruments, like those shown in **Figure 4**, monitor the amount of ozone present in the stratosphere today.

Figure 4 Scientists use a variety of equipment, including this Brewer spectrometer, to take ozone measurements.





The correct answer is shown.

The **cytoskeleton** is a supporting network of long, thin protein fibers that form a framework for the cell and provide an anchor for the organelles inside the cells.

✓ Your answer is almost correct.

 [Read about this](#)

Notice the spelling difference: you wrote ✓ Cytoskelten instead of ✓ **cytoskeleton**.

Challenge

Ok





Progress Overview ▶

View student progress broken down by module.



Student Details ▶

View student progress details plus completion level breakdown for each module.



Module Details ▶

View information on how your class performed on each section of their assigned modules.



Practice quiz ▶

This gives you a quick overview of the quizzes results for your students.



Missed Questions ▶

View frequently missed questions.



Metacognitive Skills ▶

View statistics on how knowledgeable your students are about their own comprehension and learning.



Most Challenging Learning Objectives ▶

View the most challenging learning objectives.

Teacher Reports



Student	Time spent (h:mm)	% complete	Standing	Email
Average	0:57	72%	5715	
Student, 1	0:03	8%	462	student1@mail.com
Student, 33	1:18	90%	7707	student33@mail.com
Student, 2	1:16	88%	7397	student2@mail.com
Student, 34	1:10	92%	6705	student34@mail.com
Student, 3	0:00	1%	73	student3@mail.com
Student, 35	1:10	90%	6481	student35@mail.com
Student, 4	1:11	88%	6894	student4@mail.com
Student, 36	0:34	62%	3131	student36@mail.com
Student, 5	0:37	66%	3708	student5@mail.com
Student, 37	1:11	88%	6716	student37@mail.com
Student, 6	1:23	91%	8601	student6@mail.com
Student, 38	0:40	64%	4202	student38@mail.com
Student, 7	1:04	84%	6826	student7@mail.com
Student, 39	1:16	85%	7671	student39@mail.com

○ Think Deep, Learn Smart

● 0-25% ● 26-50% ● 51-75% ● 76-99% ● 100%							
Student	Time spent (hh:mm)	Chapter 1. Major Themes of Ana...	Chapter 2. The Chemistry of Li...	Chapter 3. Cellular Form and F...	Chapter 4. Genetics and Cellul...	Chapter 5. Histology	Chapter 6. Integumentary Syste...
Average progress	39:32	● 78%	● 72%	● 79%	● 74%	● 83%	● 68%
Student, 1	14:30	● 59%	● 8%	● 57%	● 22%	● 47%	● 39%
Student, 33	47:58	● 86%	● 90%	● 90%	● 92%	● 92%	● 76%
Student, 2	41:31	● 83%	● 88%	● 71%	● 87%	● 89%	● 70%
Student, 34	42:41	● 77%	● 92%	● 93%	● 89%	● 89%	● 80%
Student, 3	22:47	● 70%	● 1%	● 76%	● 69%	● 79%	● 29%
Student, 35	44:52	● 84%	● 90%	● 90%	● 90%	● 93%	● 84%
Student, 4	40:59	● 88%	● 88%	● 86%	● 93%	● 89%	● 74%
Student, 36	16:16	● 59%	● 62%	● 57%	● 35%	● 57%	● 11%
Student, 5	42:00	● 28%	● 66%	● 89%	● 89%	● 92%	● 71%
Student, 37	16:13	● 88%	● 88%	● 88%	● 97%	● 88%	● 85%

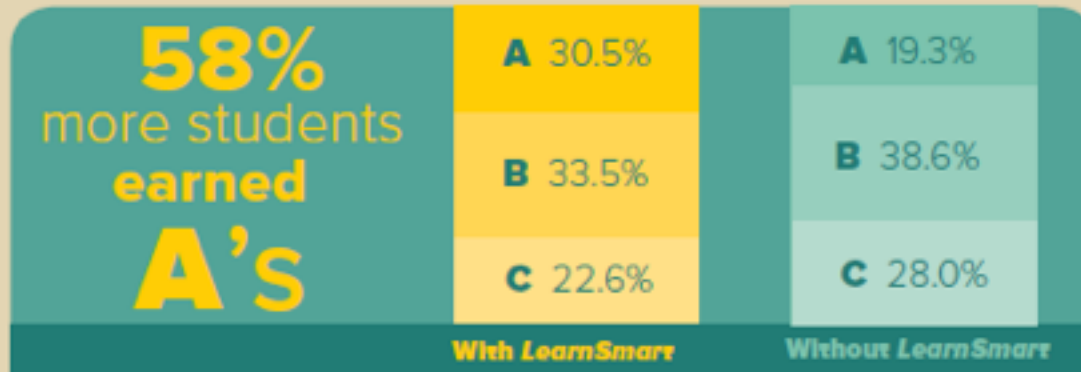
○ Think Deep, Learn Smart

Frequency	Question
17	Define glycolipid (Try probe)
15	Which are true of proteins? Choose all that apply. (Try probe)
15	X-rays and gamma rays are examples of _____ radiation. (Try probe)
15	The particle found in the nucleus with a neutral charge is known as a(n) _____. (Try probe)
14	Define mole (Try probe)
14	Define oxidation (Try probe)
14	Define phospholipid (Try probe)
14	The sum of the atomic weights of the atoms in a molecule is known as the _____ weight. (Try probe)
14	What is the name of the subatomic particle with a negative charge? (Try probe)
13	Describe the properties of water that account for its ability to support life. (Try probe)

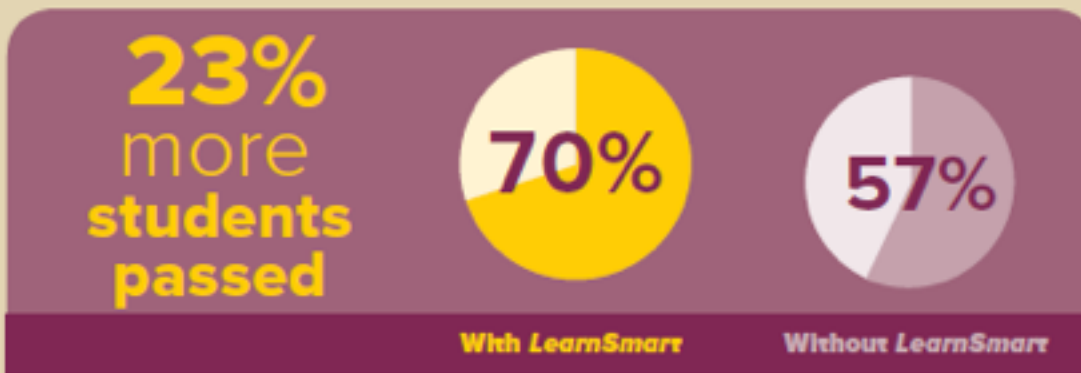
Student	Correct & aware	Correct & unaware	Incorrect & aware	Incorrect & unaware	E-mail
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Student, 49	35%	22%	16%	27%	student49@mail.com
Student, 18	9%	77%	13%	1%	student18@mail.com
Student, 50	10%	54%	30%	6%	student50@mail.com
Student, 19	10%	79%	11%	1%	student19@mail.com
Student, 20	9%	78%	11%	1%	student20@mail.com
Student, 21	41%	38%	10%	11%	student21@mail.com
Student, 22	9%	62%	26%	4%	student22@mail.com
Student, 23	39%	50%	6%	5%	student23@mail.com
Student, 24	7%	66%	24%	3%	student24@mail.com
Student, 25	7%	70%	21%	2%	student25@mail.com
Student, 26	8%	72%	18%	2%	student26@mail.com
Student, 27	8%	73%	17%	2%	student27@mail.com
Student, 28	41%	32%	11%	16%	student28@mail.com
Student, 29	6%	51%	38%	4%	student29@mail.com
Student, 30	7%	66%	24%	3%	student30@mail.com
Student 31	17%	58%	19%	6%	student31@mail.com

○ Think Deep, Learn Smart

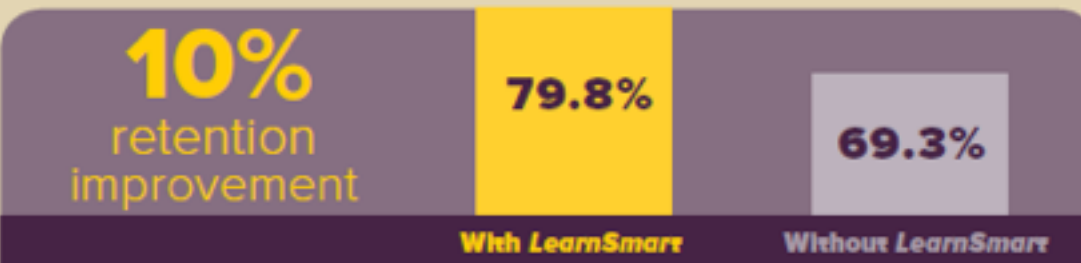
Grade Distribution



Pass Rate



Retention Rate



MHE
EXCLUSIVE



LEARNSMART

**Mc
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Education**

SB
SMARTBOOK

**Mc
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Hill
Education**