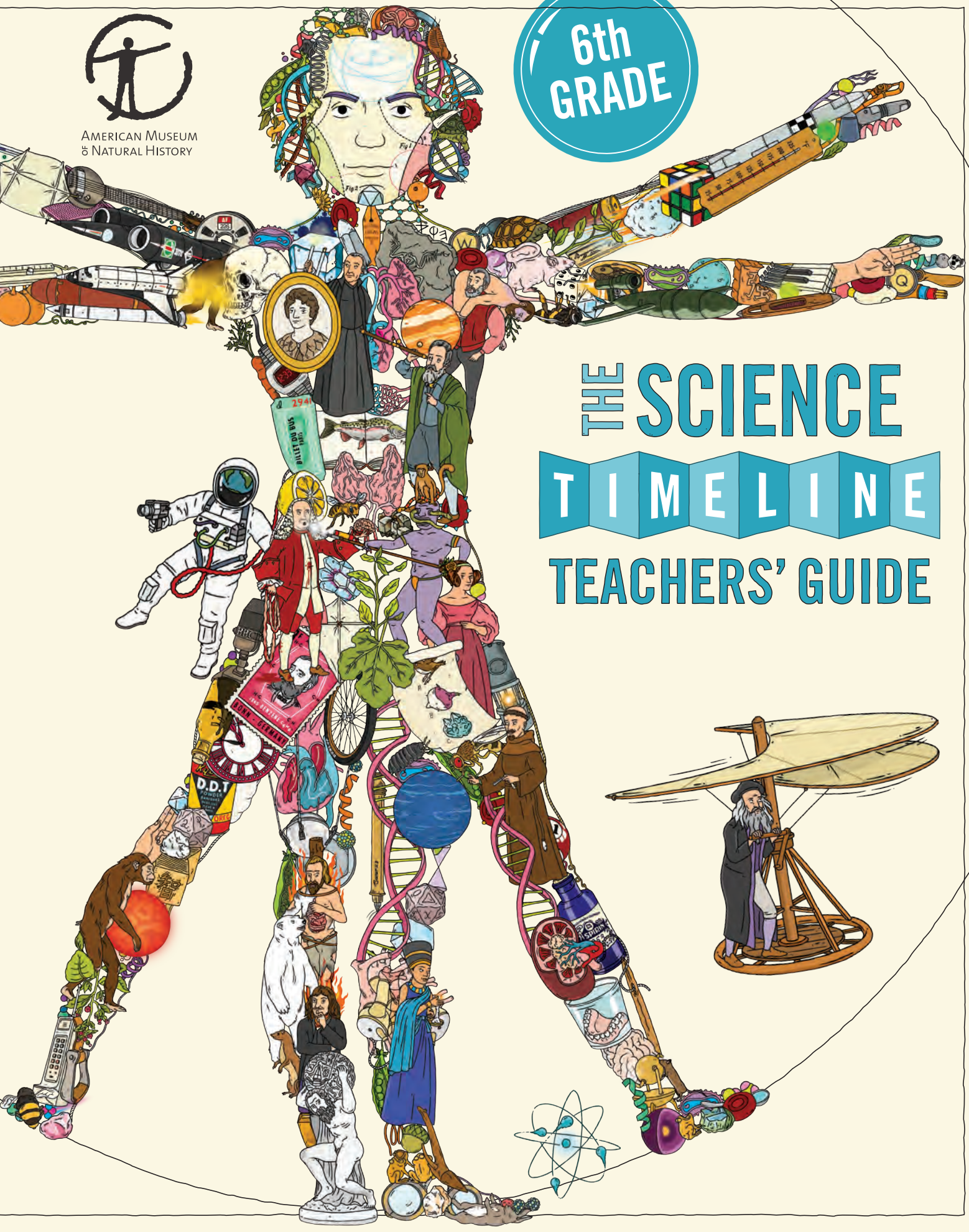
American Museum of Natural History

6th GRADE

THE SCIENCE TIMELINE

TEACHERS' GUIDE



ABOUT THIS GUIDE

Dear Educator,

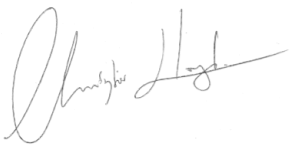
This Activity Guide is designed to be used in conjunction with a unique book on science history called **The Science Timeline Wallbook**, published in association with experts at the American Museum of Natural History.

On the six-foot-long timeline, using more than a thousand pictures and captions, we've told the extraordinary story of science from prehistoric times to the present day. Dates are contained in a beam of bright white light that eventually collides with a prism containing the picture of Sir Isaac Newton. As the dates slide down to the bottom of the timeline, each colored stream represents a different branch of science and engineering, rising up from abstract math (purple) at the bottom to the infinity of space (black) at the top.

But there is so much more to this amazing book than meets the eye! It can be used in countless ways to help students connect knowledge together and develop their own critical thinking skills. This Activity Guide, which is aligned to Common Core Standards, suggests various ways of using The Science Timeline Wallbook in class or as a curriculum-enrichment strategy.

We hope you will have as much fun using these activities as we have had making them! If you have any ideas for more activities based on using the Wallbook in class, then please feel free to email us at contactus@whatonearthbooks.com so that we can include them in future editions.

Very best wishes!



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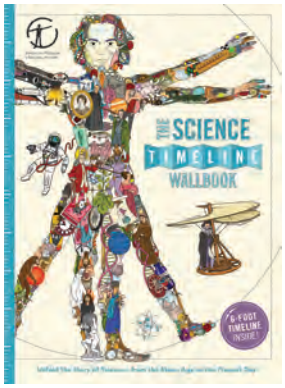

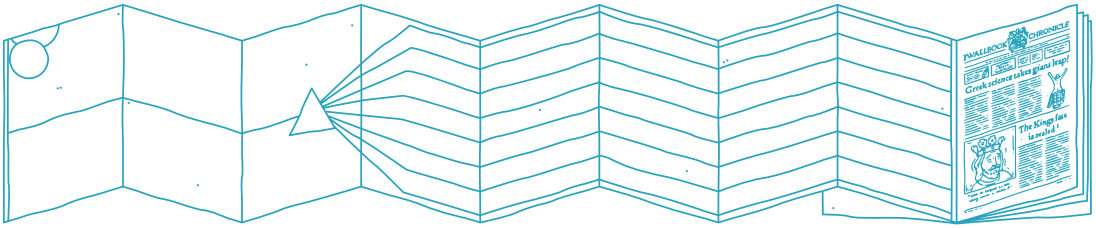

Fold out Timeline Wallbook

Chronicle

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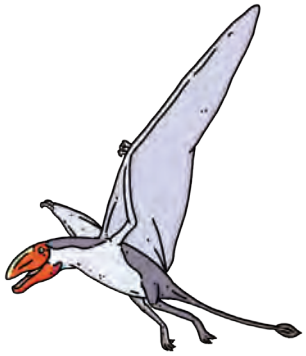

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INTRODUCTION

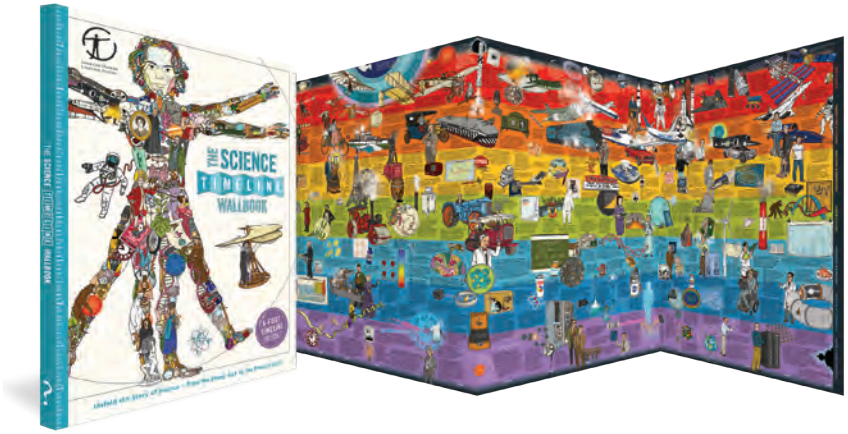
A Curiosity Manifesto!

Two things matter most when children launch into the world. First, they must have a treasure trove of general knowledge; second, they must carry with them a lifelong love of learning.

A free-wheeling study of history—one that encourages students' natural curiosity and teaches them to make unexpected connections—can help create and empower young adults with grit, flexibility, and a hunger for knowledge that will stand them in good stead throughout their lives. The Science Timeline Wallbook and the others in the Timeline Wallbook series from What on Earth Publishing are designed to help encourage your students along this path.

With this fresh and exciting format, you can present the extraordinary story of science from prehistoric times to the present day to your students. They will be eager to follow scientific advancements building on each other across time from the Stone Age to the present. When you display the six-foot-long Timeline, the array of achievements is revealed in its continuity, allowing students to follow progress in different branches of science and engineering.

For example, in medicine, it was in 400 BC when Hippocrates of Cos claimed that diseases are caused naturally and are not simply the whims of gods; it was 1150 when Hildegard of Bingen described the healing powers of plants and herbal remedies; William Harvey's discovery about how blood circulates came in 1628; and centuries later Christian Barnard performed the first heart transplant in 1967. That very first step, the recognition that human beings can understand how their bodies work when they are well or ill, allowed people to seek cures—a process that continues today.



Or in physics, although there were discoveries even before Isaac Newton (1643–1727), it was his discovery that light is made up of all the colors of the rainbow, his understanding of gravity, and his presentation of the three laws of motion that served as the foundation of the modern field of physics. The Timeline shows clearly how scientists after him stand on his shoulders.

In addition to the Timeline, the articles in The Wallbook Chronicle enable your class to learn about discoveries, inventions, and the "latest" theories as if they were living at the time and reading the daily newspaper. Of course, with the wisdom of hindsight and all that they learned from the Science Timeline, students are sure to have informed opinions about what they are reading. Further, in these articles they will meet important scientists in all fields who step out of the pages of dry science and history texts and into the here and now.

This guide offers activities that extend the learning, connect to the curriculum and support Common Core State Standards. Curriculum ties are noted at the start of each activity; Common Core Standards at the end of each activity.

Immerse your students in the fascinating and on-going story of science, and enjoy the journey together.


THE WALLBOOK CHRONICLE

AN AMAZING ADVENTURE THROUGH THE HISTORY OF SCIENCE & ENGINEERING

CAXTON'S ~ BOOKS ~

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Greek scientist takes giant leap!

Chinese monks accidentally invent explosive powder

Humans and apes have common descent

School of nursing opens thanks to a Nightingale

War hero's statistics prove that good hygiene is key to good health

Elementary idea solves order of chemicals

COMMON CORE STATE STANDARDS CODE

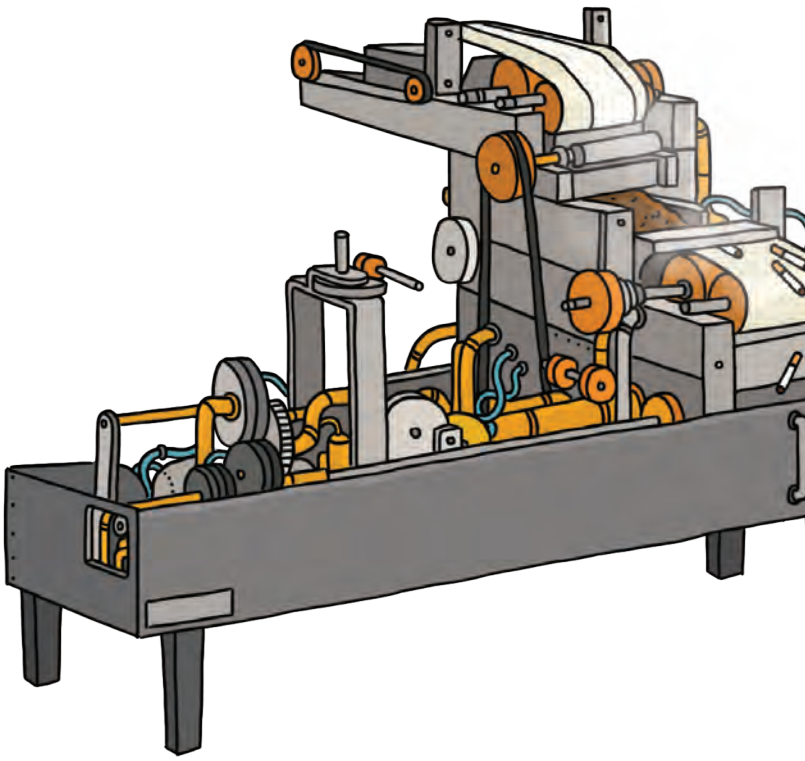
RI Reading Informational Text

W Writing

SL Speaking and Listening

RH Literacy in History/ Social Studies

WHST Writing in History/ Social Studies, Science, & Technical Subjects



ACTIVITY 1

Finding new words

Language Arts: Vocabulary

RI

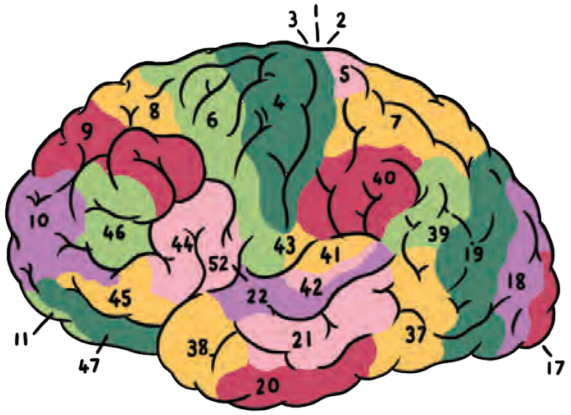
RH

The Science Timeline Wallbook contains many words and phrases that your students will be encountering for the first time. As they scan through the Timeline and read articles, they should take note of unfamiliar words or phrases, putting each at the top of a 4x6 index card, followed by the sentence in which that word appears. On the back of the card, they should write what they think the word means based on how it is used in the sentence.

They can begin the speculation with the words: "I think the word means...." Next, they should look up the word in a dictionary and write down the definition. As a fun additional step and to cement the meaning of the words in their minds, they can write their own sentences using the words and quiz one another on their meanings. Cards should be alphabetized and kept in a Timeline Wallbook Vocabulary Box.

RI: 6.4

RH: 6–8.4



ACTIVITY 2

Diving deeper: expanding the book with research and presentation

Science History
Language Arts: Writing, Research, Speaking and Listening
Cooperative Learning
Theater Arts

RI

W

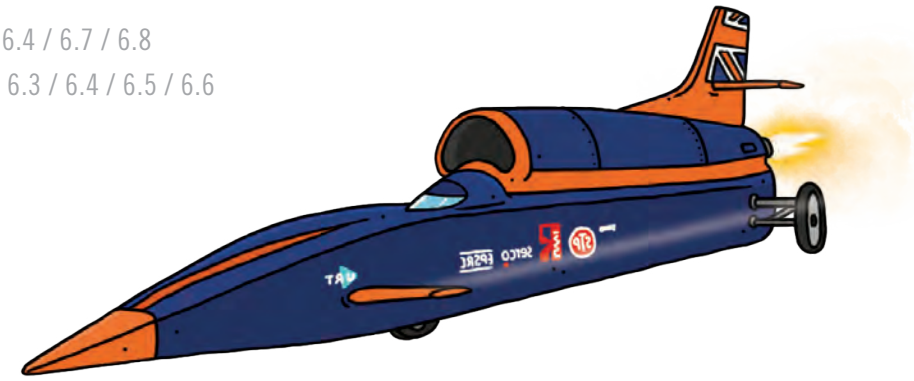
SL

Divide your class into teams of five. Assign each team five articles from The Science Wallbook Chronicle. Each member of the team will be responsible for researching one of the subjects of their articles and the scientist involved. In a team meeting each student will have the opportunity to share what they have learned and to answer questions from their fellow members.

From their discussions they will select three scientists to participate in a newsworthy roundtable discussion to be videotaped, to show to the entire class. Three students will be acting as the scientists they researched, one will be the moderator to facilitate the discussion, and the fifth will be the videographer.

Based on their group work, the team will work together to create a script for the actors to follow. The script should include, but not be limited to, opening statements from each scientist and a Q&A where they are able to respond to each other's questions.

RI: 6.1 / 6.2
W: 6.2 / 6.3 / 6.4 / 6.7 / 6.8
SL: 6.1 / 6.2 / 6.3 / 6.4 / 6.5 / 6.6



ACTIVITY 3

Standing on the shoulders of giants: researching Nobel Prize winners

Science History
Language Arts: Writing, Research, Speaking and Listening
Cooperative Learning

RI

Each student should look up the list of Nobel Prize winners in the categories of Physics, Chemistry, or Medicine. (The official category of the medicine prize is "Physiology or Medicine".)

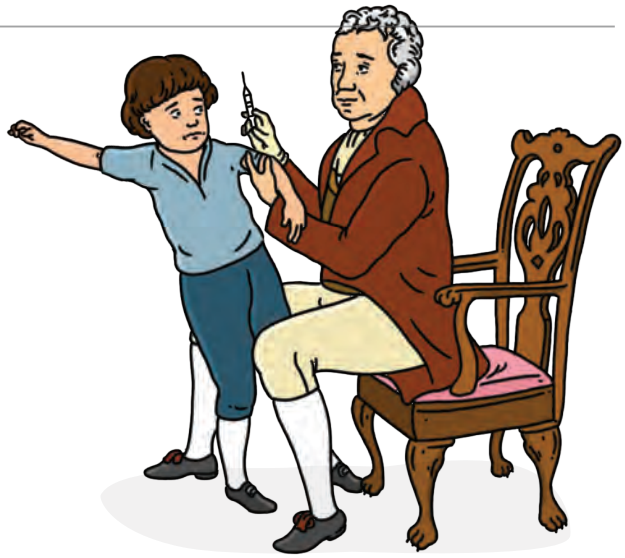
W

Each student should select one of the Nobel Laureates who is not included in the Timeline and research the scientist, his/her area of expertise, and who else's work led to their discovery or achievement. Then the student should create a Timeline entry for that scientist, including an illustration, a caption, and a label indicating where on the Timeline the person would be added.

SL

Conduct a mock Nobel Award ceremony where each student delivers a three-minute acceptance speech on behalf of their scientist. The speech should include thanks to the other scientists whose work made their work possible.

RI: 6.1 / 6.2 / 6.3 / 6.6
W: 6.3 / 6.4 / 6.7 / 6.8 / 6.9
SL: 6.1 / 6.2 / 6.4 / 6.6



ACTIVITY 4

Extending a graphic narrative: creating a graphic story based on an event in the book

Language Arts: Writing, Research
Art
Cooperative Learning

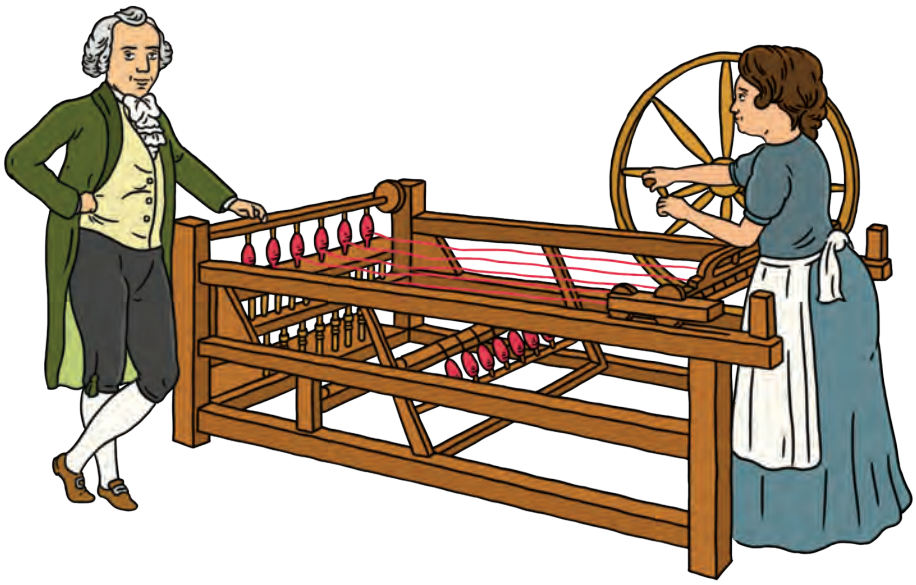
W

Learning from the Timeline is as much visual as it is textual. Young people find it easier to learn by focusing on visual representations, which is why many teachers use graphic novels in their classrooms as teaching tools. Any one of the illustrations in the Timeline can be looked at as the start of a graphic novel waiting for your students to complete.

Each student should select an image and text that interests them and find out more about it. Following that research, they should create a two-page spread made up of twelve graphic (comic) panels that complete the story. Each panel can include dialog bubbles, thought bubbles, narration, and sound effects.

Work should be shared with their classmates. If you have the ability, scan their stories and print and distribute the collection to the entire class.

W: 6.2 / 6.3 / 6.4 / 6.5 / 6.6 / 6.7 / 6.8



ACTIVITY 5

What's most important? Understanding how we decide what matters

Science History
Language Arts: Writing, Research, Speaking and Listening
Cooperative Learning

RI

W

SL

The Timeline is divided into two eras: before Isaac Newton and after Isaac Newton. His discoveries of the laws of motion, gravity, and the nature of white light heralded the Age of Enlightenment. Have your students study the advances in science and engineering made from his time until the present. For simplicity, they will view the time spans of scientific achievement page by page covering:

- **1730 to 1810**
- **1810 to 1870**
- **1870 to 1920**
- **1920 to 1970**
- **1970 to present**

Divide your class into five study groups. Each group will be responsible for one page of the Timeline. They should note that the Timeline has seven streams of science and engineering highlighted by the colors of the spectrum from Newton's prism.

They are:

- **Sky & Space:** red
- **Building & Invention:** yellow
- **Medicine & Biology:** blue
- **Mathematics & Measurement:** violet
- **Transportation & Communication:** orange
- **Earth & Land:** green
- **Physics & Chemistry:** indigo

Each group will survey the Timeline horizontally and vertically. Their task is to decide within their period of time, which was the most important advancement in each branch of science and engineering. For example, the group that is studying the period of 1810 to 1870 will have to decide whether Rene Laennec's invention of the stethoscope in 1810 was more important than William Morton's use of ether in 1846 as an anesthetic during surgery. Have them think about and discuss what "most important" means to them. Does it mean most famous? Creating the biggest change? Most surprising? Most beneficial? Something else? They should use these ideas to justify each of their choices. Working with the whole class, create a master chart (see template), showing their selections.

RI: 6.1 / 6.2 / 6.3 / 6.6 / 6.7

W: 6.1 / 6.4 / 6.7 / 6.8 / 6.9

SL: 6.1 / 6.2

Most Important Scientific and Technological Advancements 1810 to 1870

BRANCH OF SCIENCE AND ENGINEERING	ADVANCEMENT	WHY WE CHOSE IT
SKY & SPACE		
TRANSPORTATION & COMMUNICATION		
BUILDING & INVENTION		
EARTH & LAND		
MEDICINE & BIOLOGY		
PHYSICS & CHEMISTRY		
MATHEMATICS & MEASUREMENT		

ACTIVITY 6

Be the inventor!

Language Arts: Writing, Critical Thinking, Speaking and Listening
Cooperative Learning

RI

W

SL

The events that your students are reading about in The Science Timeline Wallbook can be divided into two branches, pure science and applied science. Pure scientists, also called basic or fundamental scientists, conduct research to understand the natural world. They are not primarily concerned with whether there is a practical use for their finding. Applied science, on the other hand, uses scientific theories (often those developed by basic scientists) to develop innovations in technology with specific goals in mind. Developments such as driverless cars and new medicines to fight disease are examples of applied science.

When your students look through the Timeline, they should be able to identify Albert Einstein's Special Theory of Relativity as pure science and the development of the first hydrogen-oxygen fuel cell by engineer Francis Bacon as applied science. This activity asks your students to be engineers and inventors, or applied scientists, and come up with innovations to solve practical problems.

Divide your class into development teams. The teams will first identify the problem they want to solve. They should write a statement of necessity for their invention that describes its need, who will use it, its size, how it works, and the benefits to be derived.

They should create a set of at least three drawings or illustrations of the invention from different perspectives, and they should construct a scale model of the invention.

When your students are ready, hold a fair for them to display and talk about their work. Invite other classes to view their work and videotape their presentations.

RI: 6.1 / 6.2 / 6.7

W: 6.2 / 6.3 / 6.4 / 6.5 / 6.6 / 6.7 / 6.8

SL: 6.1 / 6.4 / 6.5 / 6.6

ACTIVITY 7

Science is now: becoming aware of science in the news

Science
Current Events
Language Arts: Writing, Research

RI

W

After reading through The Science Timeline Wallbook, your students should be aware that the length and breath of scientific inquiry is ever expanding; scientists continue to do research improving or disproving theories and developing new technologies based on old ones.

In light of this, have your students research what is new in science today. Two examples are the continuing effort of physicists to prove the Unified Field Theory first proposed by Albert Einstein and the continuing development of smaller and more powerful computer chips.

Have them access newspapers, magazines, the Internet, and science-oriented programmes on television and report on one single development that is happening now in the scientific world.

Excellent sources are:

- The Tuesday Science section of *The New York Times*
- *Scientific American*
- www.pbs.org/nova
- The Discovery Channel
- NASA's website

RI: 6.1 / 6.2 / 6.3 / 6.7

W: 6.2 / 6.4 / 6.7 / 6.8 / 6.9

ACTIVITY 8

Quiz time!

Language Arts: Research, Speaking and Listening
Cooperative Learning
Science: Natural History

RI

W

SL

RH

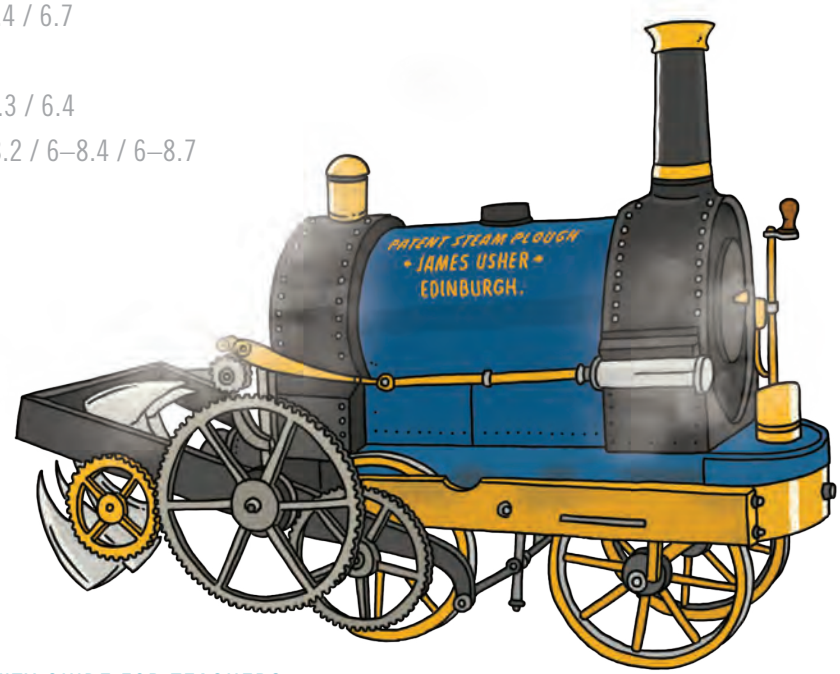
WHST

At the end of The Science Timeline Wallbook there are fifty "brain-teasing" science questions. All of the answers can be found in the fold-out Timeline.

For fairness to all of your students and to ensure that all of the questions are answered, have a lottery to see which student is responsible for answering particular questions. Write numbers from one to fifty on slips of paper. Each student will draw out two numbers. He/she will have to search through the Timeline for the answers to his/her questions.

Students may wish to learn more about their assigned questions. Their answers should be presented to the entire class along with what they learned from further research. Presenters should be prepared to answer questions from their peers about the event or person that was the subject of their query.

RI: 6.1 / 6.2 / 6.4 / 6.7
W: 6.2 / 6.4
SL: 6.1 / 6.2 / 6.3 / 6.4
RH: 6–8.1 / 6–8.2 / 6–8.4 / 6–8.7
WHST: 6–8.2



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