

Comprehensive Science II and Comprehensive Science II Advanced
Lesson Planning Resources

Big Idea 1: The Practice of Science (SC.7.N.1.1, SC.7.N.1.2, SC.7.N.1.3, SC.7.N.1.4, SC.7.N.1.5, SC.7.N.1.6, and SC.7.N.1.7)

A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation.

B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method."

C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge.

D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.

- Dissolving Gobstoppers Using Controls and Variables:
<http://www.scienceteacherprogram.org/genscience/Landau2007.html>. Students will conduct a simple laboratory experience that practices the proper use of controls and variables. Students will conduct a controlled experiment in their laboratory groups.
- Repetition and Replication Made Easy:
<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/76463>. This is a simple hands-on activity which will help students understand the difference between repetition and replication. It is designed to be science notebook friendly.
- Observation and Inference Using the Inquiry Activity "The Burning Candle":
[https://www.flinnsci.com/api/library/Download/9e90513b91154af6b82ac4dd5cbcafe#:~:text=Observations%20of%20the%20burning%20candle%20include%20the%20properties%20of%20the,sound%2C%20brightness%2C%20temperature\).&text=As%20an%20extension%20of%20this,happens%20when%20the%20candle%20burns.](https://www.flinnsci.com/api/library/Download/9e90513b91154af6b82ac4dd5cbcafe#:~:text=Observations%20of%20the%20burning%20candle%20include%20the%20properties%20of%20the,sound%2C%20brightness%2C%20temperature).&text=As%20an%20extension%20of%20this,happens%20when%20the%20candle%20burns.). In this demo, the teacher uses a seemingly innocent "candle" to practice observation and inference, then delivers a discrepant event to cause students to re-examine their theories about the situation.
- How far or fast can you roll a Tennis ball?:
<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/18980>. Students will be able to understand the importance and the difference between repetition and replication in a scientific experiment.
- Whirligig – The Importance of Repetition and Replication in Experiments:
<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/32362>. Students write a procedure and conduct an investigation that helps them to differentiate replication from repetition. Students drop the whirligig 3-5 times and record how long it takes to fall to the ground.
- Popping Balloons - Identifying Variables:
<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/72629>. This activity allows students to experiment with balloons. Students are given basic instructions to blow up and pop a balloon wearing goggles. A lesson is given on the different types of variables. Students then design an experiment coming up with the testable question and identifying the variables.
- Marshmallow Design Challenge: <http://teachers.egfi-k12.org/marshmallow-design-challenge/>. This fun design/build exercise teaches some simple but profound lessons in collaboration, innovation, hidden assumptions, and creativity that are central to the engineering process.
- Inquiry and Debate: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/21904>. Students will discover the importance of peer review and peer critique in the development of scientific proof.
- Fields of Science

<https://www.isd622.org/cms/lib07/MN01001375/Centricity/Domain/210/ListofFieldsofScience.pdf>

Additional Digital Resources:

- [Scholastic Study Jams](#)
- [Biology Corner](#)
- [The Science Spot](#)
- [Berkeley](#)
- [Marcia's Science Teaching Ideas](#)
- [UF Lesson Plans](#)
- [Mr. Lee's Scientific Method Rap](#)
- [Scientific Inquiry](#)

Big Idea 2: The Characteristics of Scientific Knowledge (SC.7.N.2.1)

A: Scientific knowledge is based on empirical evidence, and is appropriate for understanding the natural world, but it provides only a limited understanding of the supernatural, aesthetic, or other ways of knowing, such as art, philosophy, or religion.

B: Scientific knowledge is durable and robust, but open to change.

C: Because science is based on empirical evidence it strives for objectivity, but as it is a human endeavor the processes, methods, and knowledge of science include subjectivity, as well as creativity and discovery.

- Think Like a Scientist: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/155973>. Students will read a fun article about a caveman named Fred and his journey to discover gravity. They will trace the evidence and then conflicting evidence as he explores the world around him. Students will then research obsolete scientific theories to discover the conflicting evidence that led to changes in real scientific knowledge.
- Everyday Mysteries; Why Do We Yawn?: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/152503>. In this lesson, students will analyze an informational text that seeks to answer the question "Why do we yawn?" Students will learn that while many claims regarding the social and physiological functions of yawning have been presented from Hippocrates, 17th and 18th century scientists, and experts today, scientists have yet to reach a consensus about the answer to the title question.
- Three Types of Scientific Investigations: <http://mrcloudsclass.com/attachments/article/9/3%20Types%20of%20Investigations.pdf>. This is a one page document with brief descriptions of these methods.
- Theories, Hypothesis, Laws, Facts & Beliefs: https://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/SMII_Problem23.html. In this lesson, students will distinguish the difference between the terms theory, hypothesis, fact, law and belief. Student and teacher pages are included.
- Ted Talks Video: What's the difference between a scientific law and theory? - Matt Anticole <http://ed.ted.com/lessons/what-s-the-difference-between-a-scientific-law-and-theory-matt-anticole>

Big Idea 3: The Role of Theories, Hypotheses, and Models (SC.7.N.3.1 and SC.7.N.3.2)

The terms that describe examples of scientific knowledge, for example; "theory," "law," "hypothesis," and "model" have very specific meanings and functions within science.

- What are Scientific Laws? <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/154444>. During this 2-day lesson, students will watch a video to define the definition of Scientific Law, as well as identify various examples of scientific laws. Students will participate in various activities, including being scientists around the world to develop sentences with an increasing number of words.
- Climate Change as Scientific Theory: http://www.pbs.org/newshour/extra/lessons_plans/climate-change-scientific-theory/. This lesson is written for 9-12 but can easily be adapted for a 7th grade classroom. The warm up activity can stand on its own as a class lesson.
- Super Modeling: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/21163> In this lesson, students will understand the benefits and limitations of scientific models. Students will be able to identify the major benefits and limitations associated with the use of scientific models, specifically computer models/simulations, and physical models.

Big Idea 6: Earth Structures (SC.7.E.6.1, SC.7.E.6.2, SC.7.E.6.3, SC.7.E.6.4, SC.7.E.6.5, SC.7.E.6.6, and SC.7.E.6.7)

Standard 4: Over geologic time, internal and external sources of energy have continuously altered the features of Earth by means of both constructive and destructive forces. All life, including human civilization, is dependent on Earth's internal and external energy and material resources. (SC.7.E.6)

- 7th Grade Plate Tectonics: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/17106> This lesson plan uses recent earthquakes as a learning opportunity. Students will learn what causes earthquakes to happen by going through a series of activities that allow them to explore the structure of Earth's interior, convection currents in the mantle, motion of tectonic plates, and the relationship between plate tectonics and earthquakes.
- Eating Your Way Through Science: <https://www.polk-fl.net/staff/grants/pefgrants/documents/T2TGrants0708/NicoleMcClain.pdf>. The lessons you should use are Lesson Plan 1: The Earth's Layers and Lesson Plan 2: Milky Way Plate Tectonics.
- Shake, Rattle and Roll: http://www.windows2universe.org/teacher_resources/shake_edu.html. This experiment will guide students in quantitatively comparing the weathering of different-sized materials.
- The Layers of the Earth: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/75740>. Students will learn that the Earth is made of different layers with varying compositions and characteristics. Students can complete 4 activities in the course of this lesson.
- The Candyville Mall Dilemma- Radioactive Dating: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/75747>. The students will complete a hands-on activity using M&Ms to demonstrate the principles of radioactive decay.
- Back to the Past with the Geologic Time Scale: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/43470>. This lesson introduces the geologic time scale and the concept of time segments being divided by major events in Earth's history.
- Hands-on Activity: Faulty Movement: https://www.teachengineering.org/activities/view/cub_natdis_lesson02_activity3. Students are introduced to faults in the context of plate tectonics. They learn about different kinds of faults and their relationship to earthquakes.
- Text Resources: **SC.7.E.6.4 and 6.5** Earth changing over time, plate tectonics www.readworks.org/passages/history-planet-earth

Additional Digital Resources:

Layers of the Earth

- [Earth Layers Foldable](#)
- [Journey to the Center of the Earth](#): list for varied activities

Plate Tectonics

- [PBS](#): mountains
- [Geology.com](#): links to other activities
- [Snacktectonics](#)
- [Plate tectonics puzzle](#)
- [PBS](#)
- [Lunar and Planetary Institute](#)
- [BBC](#): Bitsize
- [Science-class.net](#)
- [Teach Engineering](#)
- [NOAA](#)

Rock Cycle

- [The Science Spot](#)
- [Science-class.net](#)
- [Marcia's Science Teaching Ideas](#)
- [Interactive rock cycle](#)
- [Geology.com](#)
- [California Academy of Sciences](#)
- [Teach Engineering](#)
- [Rock cycle game](#)
- [NASA](#)

Human Impact

- [Science-class.net](#)
- [The Henry Ford](#)
- [Earth Watch](#)
- [National Geographic](#)
- [NGSS Life Science](#)

Big Idea 10: Energy (SC.7.P.10.1, SC.7.P.10.2, and SC.7.P.10.3)

A. Energy is involved in all physical processes and is a unifying concept in many areas of science.

B. Energy exists in many forms and has the ability to do work or cause a change.

- 5E Refraction Inquiry Lab: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/76442>. In this lesson plan students learn about the property of light: refraction. The lesson begins with an engage demo placing a pencil in a glass of water. The students will be able to witness the effects of refraction.
- The Colors of Light: <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/18944>. The students will compare/contrast the colors that make up white light in terms of their arrangement in the visible light section of the electromagnetic spectrum.
- Text Resources: **SC.7.P.10.3** This article talks about laser tag and light waves. www.readworks.org/passages/tag-youre-hit **SC.7.P.10.3** Has vocabulary words like: atom, conduction, electromagnetic radiation, infrared light

<https://student.societyforscience.org/article/smart'-windows-could-save-energy> **SC.7.P.10.1**

Electromagnetic spectrum, radiation (more advanced article)

www.readworks.org/passages/electromagnetic-radiation

Additional Digital Resources:

Electromagnetic Spectrum

- [Cool Cosmos](#)
- [PBS Learning Media](#)
- [Earthguide](#)
- [Mission: Science NASA](#)
- [Glencoe: Virtual Lab](#)

Properties of Light

- [Science NetLinks](#)
- [PBS Learning Media](#)
- [Teach Engineering](#)
- [Molecular Expressions](#)
- [PhET Simulation](#)
- [NASA](#)

Energy

- [Energy Kids](#)
- [PBS Energy Lab Guides](#)
- [Science Kids](#)
- [Phet Interactive](#)

Big Idea 11: Energy Transfer and Transformations (SC.7.P.11.1, SC.7.P.11.2, SC.7.P.11.3, and SC.7.P.11.4)

A. Waves involve a transfer of energy without a transfer of matter. B. Water and sound waves transfer energy through a material.

C. Light waves can travel through a vacuum and through matter.

D. The Law of Conservation of Energy: Energy is conserved as it transfers from one object to another and from one form to another.

- Shaking Water. What Happens When You Add Energy?:
https://www.coned.com/kids/pdf/coned_shakingwater.pdf. This activity demonstrates several fundamental science and energy concepts. Students vigorously shake a small container of water and measure the change in temperature. In doing so, they discover that they are converting potential energy from their muscles into kinetic energy, which transfers thermal energy into the water as a result of the friction of the molecules bumping against each other and the sides of the container.
- Heat, Temperature and Conduction Lab:
<http://www.middleschoolchemistry.com/lessonplans/chapter2/lesson1>. In this activity, students will place a room-temperature set of washers in hot water and then place a set of hot washers in room-temperature water and find out what happens to the temperature of each.
- Light Wave Interaction with Matter:
<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/76126>. This lesson is designed for 7th grade students to investigate the different ways in which light waves interact with matter.
- Text Resources: **SC.7.P.11.2** Energy transformations
www.readworks.org/passages/heat-energy-and-bicycling-new-york-city **SC.7.P.11.1** changes of state "water" www.readworks.org/passages/different-forms-water

Big Idea 15: Diversity and Evolution of Living Organisms (SC.7.L.15.1, SC.7.L.15.2, and SC.7.L.15.3)

- A. The scientific theory of evolution is the organizing principle of life science.
- B. The scientific theory of evolution is supported by multiple forms of evidence.
- C. Natural Selection is a primary mechanism leading to change over time in organisms.

- Introduction to Natural Selection: <http://sciencenetlinks.com/lessons/introduction-to-natural-selection/>. This lesson will develop an understanding of natural selection, specifically, how it unfolds from generation to generation.
- Mystery Fossil Bones Activity: <http://mjksciteachingideas.com/pdf/MysteryBones.pdf>. Students are given a set of paper fossil bones. They need to cut them out and then decide as a group how to reconstruct the animal. They will then hypothesize about the animal's habitat, food source, etc.
- Understanding Geologic Time: <http://www.jsu.utexas.edu/glow/files/understanding-geologic-time-6-8.pdf>. Students will use relative and absolute time to construct a Geologic Time Scale on a pretend football field.
- Text Resources: **SC.7.L.15.2** Natural selection, butterflies www.readworks.org/passages/naturally-selected-survive **SC.7.L.15.2** and **15.3** Natural selection and survival www.readworks.org/passages/why-do-cave-fish-lose-their-eyes-0

Additional Digital Resources:

Evolution

- [NGSS Life Science](#)
- [nclark.net](#)
- [PBS](#): Evolution
- [Smithsonian](#) (targeted for grades 9-12 but may be adapted for middle school use)

Natural Selection

- [Science NetLinks](#)
- [GeneED](#)
- [Peer Curriculum](#)
- [Serendip](#)

Fossil Evidence

- [PBS](#)
- [The Great Fossil Find](#)
- [Berkeley](#)
- [Science NetLinks](#)

Big Idea 16: Heredity and Reproduction (SC.7.L.16.1, SC.7.L.16.2, SC.7.L.16.3, and SC.7.L.16.4)

- A. Reproduction is characteristic of living things and is essential for the survival of species.
- B. Genetic information is passed from generation to generation by DNA; DNA controls the traits of an organism.
- C. Changes in the DNA of an organism can cause changes in traits, and manipulation of DNA in organisms has led to genetically modified organisms.

- Snurffle Meiosis App: description-<http://www.sciencegamecenter.org/games/snurffle-meiosis-and-genetics>. By the end of this game, students will understand how MEIOSIS and FERTILIZATION work to make offspring. They will also see how GENETIC characteristics are passed on through these processes and the connection between meiosis and genetics.
- Gene Screen App: description-<http://sciencenetlinks.com/tools/gene-screen-app/>. Gene Screen is a fun

way to learn how recessive genetic traits and diseases are inherited and how certain diseases are more prevalent in different populations. Gene Screen also provides information on some recessive genetic diseases and genetic screening programs. The app also includes Punnett Square practice.

- Alien Life Form Genetics Activity:
http://www.wsfcs.k12.nc.us/site/handlers/filedownload.ashx?moduleinstanceid=138472&dataid=217523&FileName=alien_life_form_project.pdf. This unit has several activities. You can pick and choose what you want to do. One of the activities has students flip coins to randomly assign genotypes and phenotypes to alien creatures. Students get a better understanding of how traits are passed to offspring.

Additional Digital Resources:

Genetics

- [Teach.Genetics](#)
- [nclark](#)

DNA

- [Science NetLinks](#)
- [NGSS Life Science](#)
- [DNA Learning Center](#)
- [Yourgenome](#)

Punnett squares

- [NGSS Life Science](#)
- [Comelearnmore](#): game list
- [NIH](#): Harry Potter genetics
- [Drag and Drop Genetics](#)

Meiosis/Mitosis

- [PBS](#)
- [Cells Alive](#)
- [Northeastern University and Science Technologies](#)

Biotechnology

- [Genetic Science Learning Center](#)

Big Idea 17: Interdependence (SC.7.L.17.1, SC.7.L.17.2, and SC.7.L.17.3)

A. Plants and animals, including humans, interact with and depend upon each other and their environment to satisfy their basic needs.

B. Both human activities and natural events can have major impacts on the environment. C. Energy flows from the sun through producers to consumers.

- Ecological Interactions Activity:
http://ysp.wustl.edu/KitCurriculum/EcologicalInteractions/EcoEvo_Ecological%20Interactions%20Kit_TeacherHandout.pdf. Students will be introduced to basic vocabulary about ecological relationships (symbiosis, mutualism, competition, parasitism, commensalism, generalists, and specialists). Then, students will be split up into groups of three to do an activity that simulates these different relationships.
- Who am I?- lesson on producers, consumers and decomposers:
<http://resources.premier.schoolspecialty.com/delegate/ssi-wdf-ucm-webContent/groups/public/@guest>

mktgprempor/documents/document/mdax/mzy0/~edisp/d3048514.pdf. Students have an animal name or picture on their back. They ask questions about their animal. They will eventually get into groups of producers, consumers or decomposers.

- Biomes Activity:
<http://www.hamilton-local.k12.oh.us/Downloads/Biomes%20Activity%20Instructions.pdf>. Students will take a biome of the world and create an organism that is adapted to that biome. They will include adaptations such as claws, fur, etc.
- Text Resources: **SC.7.L.17.2** Article about brine shrimp, parasitism, and mutualism
<https://student.societyforscience.org/article/parasites-give-brine-shrimp-super-powers>
SC.7.L.17.2, 17.3, 17.6 these articles have vocabulary to support the mentioned standards.
www.readworks.org/passages/great-barrier-reef **SC.7.L.17.1** Food Pyramid and energy transformation in life science www.readworks.org/passages/eco-pyramid

Additional Digital Resources:

Energy in an Ecosystem

- [NGSS Life Science](#)
- [Nclark](#)
- [Science-class](#)

Symbiosis

- [National Geographic](#)

Competition

- [The Concord Consortium](#)
- [Pearson](#)
- [SIMs](#)
- [Wolf Quest](#)
- [Biology Corner](#)

Carrying capacity and Limiting factors

- [Population Education](#): needs to be modified for middle school
- [Pop Ecology](#)
- [National Park Service](#)
- [Naturebridge](#)
- [Fishery Simulation](#)
- [phET](#)