



Standard #: SC.912.N.1.7

This document was generated on CPALMS - www.cpalms.org

Recognize the role of creativity in constructing scientific questions, methods and explanations.

General Information

Subject Area: Science

Grade: 912

Body of Knowledge: Nature of Science

Idea: Level 1: Recall

Standard: [The Practice of Science](#) -

Date Adopted or Revised: 02/08

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.

Content Complexity Rating: [Level 1: Recall](#) - [More Information](#)

Date of Last Rating: 05/08

Status: State Board Approved

Related Courses

Course Number	Course Title
2001350:	Astronomy Solar/Galactic (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2020910:	Astronomy Solar/Galactic Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2000330:	Biology 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2022 (current), 2022 and beyond)
3027020:	Biotechnology 2 (Specifically in versions: 2015 and beyond (current))
2003340:	Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003350:	Chemistry 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003360:	Chemistry 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2000380:	Ecology (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002400:	Integrated Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002410:	Integrated Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002420:	Integrated Science 2 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002430:	Integrated Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002440:	Integrated Science 3 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002450:	Integrated Science 3 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2000390:	Limnology (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))
2002500:	Marine Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002510:	Marine Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002520:	Marine Science 2 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002530:	Marine Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003400:	Nuclear Radiation (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))
2020710:	Nuclear Radiation Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003310:	Physical Science (Specifically in versions: 2015 - 2022 (current), 2022 and beyond)
2003320:	Physical Science Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003380:	Physics 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003390:	Physics 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003410:	Physics 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003600:	Principles of Technology 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003610:	Principles of Technology 2 (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))

2002540:	Solar Energy Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002550:	Solar Energy 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))
2002330:	Space Technology and Engineering (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))
1700320:	Research 3 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
7920011:	Access Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
7920025:	Access Integrated Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
2000500:	Bioscience 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2000510:	Bioscience 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2000520:	Bioscience 3 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002405:	Integrated Science 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
2002425:	Integrated Science 2 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
2002445:	Integrated Science 3 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
2003345:	Chemistry 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003385:	Physics 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
2003500:	Renewable Energy 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003836:	Florida's Preinternational Baccalaureate Physics 1 (Specifically in versions: 2015 - 2022 (current), 2022 and beyond)
2003838:	Florida's Preinternational Baccalaureate Physics 2 (Specifically in versions: 2015 and beyond (current))
7920022:	Access Physical Science (Specifically in versions: 2016 - 2018, 2018 and beyond (current))
2001330:	Meteorology Honors (Specifically in versions: 2016 - 2019, 2019 - 2022 (current), 2022 and beyond)

Related Access Points

Access Points Number	Access Points Title
SC.912.N.1.In.4:	Identify that scientists use many different methods in conducting their research.
SC.912.N.1.Su.4:	Recognize that scientists use a variety of methods to get answers to their research questions.
SC.912.N.1.Pa.4:	Recognize that people try different ways to complete a task when the first one does not work.

Related Resources

Lesson Plans

Name	Description
Some Assembly Required: Fighting Cancer with DNA:	This lesson utilizes an informational text intended to support reading in the content area. The article describes a new nanotechnology technique that uses computers to rapidly and accurately assemble molecules that can fight cancer. The article also emphasizes how scientific research is supported monetarily through public (NSF) and private partnerships. The lesson plan includes a note-taking guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric. Numerous options to extend the lesson are also included.
Size Does Matter: Brain Size in Mammalian Carnivores:	This lesson is designed to support reading in the content area. In this lesson, students will analyze an informational text that describes a recent experiment that helps to prove that larger brain size could indicate higher intelligence within carnivorous mammals. The research was conducted at nine U.S. zoos and included 140 animals from 39 mammalian carnivore species. The lesson plan includes text-dependent questions, a writing prompt, sample answers, and a writing rubric.
Purple Haze:	In this lesson, students will analyze an informational text designed to support reading in the content area. An ancient coloring pigment is leading to new research in magnetic fields and superconductivity. Will this lead to new technologies involving quantum computers? The lesson plan includes a note-taking guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric. Options to extend the lesson are also included.
Innovative Methods: Using Drones to Study Glaciers:	In this lesson, students will read a text that describes new and creative technologies that are being used in climate research to study high-altitude glaciers and map how they are changing. The text describes the ways in which the use of drones with time-lapse thermal camera systems are being used to gather data over the Peruvian Andes more effectively than satellites or planes. The text also describes some of the researchers' early findings based on the data they have gathered through the use of these drones. The text used in this lesson is designed to support reading in the content area. The lesson includes a note-taking guide, text-dependent questions and a writing prompt, sample answer keys, and a writing rubric.
Virtually Possible:	This is a ray drawing activity to aid students in their understanding of how virtual images are formed by plane mirrors, and how the image size and distance from the mirror compare to those of the object.
Can You Read My Mind?:	This engaging activity is a fun game requiring a teacher to team up with a student and provide insider information before the activity begins. The team will cleverly involve the rest of the class in a guessing game where students must apply logic and their understanding of variables to devise questions aimed at figuring out the trick, which allows the chosen student and the teacher to always know what the other is thinking! The concept of changing one variable at a time is critical to making progress in this game of reasoning and observation.
Profile: Judah Folkman Cancer Research:	This PBS/NOVA lesson combines a discussion of the Nature of Science using a renowned Cancer researcher (and supported by the profiles of several other renowned scientists in the activities) to study concepts of creativity and tentativeness in the Nature of Science with a study of the biological characteristics of cells in disease (cancer).
Checks Lab:	Each team has an envelope containing a series of bank checks. A few are removed at a time, and the team attempts to construct a plausible scenario which involves those checks. With each subsequent removal of checks, appropriate revision of the scenario is done. Final scenarios are compared by the class. Class discussion is designed to show how human values and biases influence observation and interpretation, even in science. This is one of the few nature-of-

science lessons which have a biological connection.

"Sunburn Stamp Out" MEA gives student an everyday problem they are familiar with in which they must work as a team to develop a procedure to choose the best sunscreen product for children ages 8 to 10. Students will read an informational text and then create a ranking system for the sunscreens in order to decide which product meets the client's needs.

[Sunburn Stamp Out:](#)

Perspectives Video: Expert

Name	Description
Reef Sampling:	NOAA Scientist, Doug Devries talks about fish survey techniques and technologies. Download the CPALMS Perspectives video student note taking guide .

Perspectives Video: Professional/Enthusiast

Name	Description
How to Build a Research Study on Education:	This researcher explains common methods behind randomized studies in the social sciences, specifically in education. Download the CPALMS Perspectives video student note taking guide .

Perspectives Video: Teaching Idea

Name	Description
Citizen Science: Getting Students Involved in Conservation with Project GQQ:	What could be better than having class on the beach and conducting actual research to boot? See how this marine science teacher transforms his students into scientists. Download the CPALMS Perspectives video student note taking guide .

Teaching Ideas

Name	Description
Island of Stability:	A video and supporting activities about the Periodic Table. The context is man's quest to create elements. The focus is atomic structure and atomic theory.
Zip-lock Bag Reactions:	Students conduct and observe a chemical reaction in a sealable plastic bag. Students then devise and conduct their own experiments to determine the identity of two unknown substances used in the reaction.

Text Resources

Name	Description
Drag-and-Drop DNA: Novel Technique Aiding Development of New Cancer Drugs:	This informational text resource is designed to support reading in the content area. It informs readers of how cutting edge nanotechnology is being combined with supercomputing and drug production. The new process it describes uses unique algorithms to search for DNA sequences that will self-assemble molecules tailored to locate, attach, and kill cancer cells. The passage also is a good example of how public agencies can support private-sector entities through various grants.
Do Bigger Brains Make Smarter Carnivores?:	This informational text resource is designed to support reading in the content area. The text describes an experiment that helps to confirm that larger brain size could indicate higher intelligence within carnivorous mammals. The experiment involved 140 animals and each was given the same task of retrieving food from a locked box within 30 minutes. The results of the test show that having a larger brain really does improve an animal's ability to solve a problem it has never encountered before.
Text Resource - Purple Haze: Ancient Pigment Reveals Secrets about Unusual State of Matter:	This informational text resource is designed to support reading in the content area. The text explains how extreme cooling of an ancient pigment comprised of metallic compounds, as well as exposure to strong magnetic fields, converts the matter into a state called a Bose-Einstein condensate. In this state, the behavior of electrons within the pigment's atoms shifts and they form a single magnetic threedimensional structure. When the condensate is cooled even further in this case, the magnetic structure loses a dimension.
Three Miles High: Using Drones to Study High-Altitude Glaciers:	This informational text resource is designed to support reading in the content area. This text describes new and creative technologies that are being used in climate research to study high-altitude glaciers and map how they are changing. The text describes the ways in which the use of drones with time-lapse thermal camera systems are being used to gather data over the Peruvian Andes more effectively than satellites or planes. The text also describes some of the researchers' early findings based on the data they have gathered through the use of these drones.
Feathers Yield Mysteries of Pigment Chemistry to Spectroscopic Analysis:	This informational text resource is intended to support reading in the content area. The pigments in the feathers of bird specimens have been traditionally hard to analyze because it required destroying the feathers. Now, scientists have come up with a new, non-destructive way to explore the complex chemistry of bird feather pigments, using lasers and Raman spectroscopy.
How Basic Research Fuels Medical Advances:	This informational text resource is intended to support reading in the content area. Research out of Scripps Research Institute's Florida campus illustrates how studying simple processes, such as DNA replication, can lead to highly beneficial medical advances: in this case, a possible cure for adult-onset muscular dystrophy. The article also shows how basic research has led to some familiar medical applications.
Deploying the Body's Army:	This informational text resource is intended to support reading in the content area. Scientists have been making breakthroughs in immunotherapy: the use of infectious pathogens as a method for treating cancer. The infections heighten the response of the immune system and eradicate the cancer in the process.
Antimatter:	This informational text is intended to support reading in the content area. The article describes the history of the study of antimatter in language that is easier to understand than most technical texts.

The Story of Serendipity:	The article explains how some famous scientific discoveries that happened "by accident" more accurately resulted from scientific habits of mind, which allowed researchers to take full advantage of these serendipitous moments.
The Structure of DNA: Cooperation and Competition:	The insight, innovation, and persistence of James Watson, Rosalind Franklin, Francis Crick, and Maurice Wilkins led to a detailed understanding of the structure of DNA, the stuff that genes are made of. This discovery brought together information from many disciplines and many researchers to answer one of the most fundamental questions in life science: How do living things pass on traits to their offspring?

Video/Audio/Animation

Name	Description
Inquiry and Ocean Exploration:	Ocean explorer Robert Ballard gives a TED Talk relating to the mysteries of the ocean, and the importance of its continued exploration.

Virtual Manipulative

Name	Description
Mesquite - Phylogenetic Trees:	Students use software to create evolutionary trees by comparing and contrasting physical traits. This activity demonstrates the complexity of creating evolutionary trees when multiple traits are being analyzed. The use of the software simplifies the analysis without compromising the learning objectives.

Student Resources

Video/Audio/Animation

Name	Description
Inquiry and Ocean Exploration:	Ocean explorer Robert Ballard gives a TED Talk relating to the mysteries of the ocean, and the importance of its continued exploration.