



Standard #: SC.912.N.1.2

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Describe and explain what characterizes science and its methods.

General Information

Subject Area: Science

Grade: 912

Body of Knowledge: Nature of Science

Idea: Level 2: Basic Application of Skills & Concepts

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 2: Basic Application of Skills & Concepts](#) - [More Information](#)

Date of Last Rating: 05/08

Status: State Board Approved

Related Courses

Course Number	Course Title
2000350:	Anatomy and Physiology (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2000360:	Anatomy and Physiology Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
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)
3027010:	Biotechnology 1 (Specifically in versions: 2015 and beyond (current))
2000370:	Botany (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
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)
2001340:	Environmental Science (Specifically in versions: 2015 - 2022 (current), 2022 and beyond)
2002480:	Forensic Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2017, 2017 - 2022 (current), 2022 and beyond)
2002490:	Forensic Sciences 2 (Specifically in versions: 2014 - 2015, 2015 - 2017, 2017 - 2022 (current), 2022 and beyond)
2000440:	Genetics Honors (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)
2002440:	Integrated Science 3 (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))
2000410:	Zoology (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2003800:	Florida's Preinternational Baccalaureate Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002340:	Experimental Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002350:	Experimental Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002360:	Experimental Science 3 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2002370:	Experimental Science 4 Honors (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))
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))
2001341:	Environmental Science Honors (Specifically in versions: 2016 - 2022 (current), 2022 and beyond)
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.2:	Describe the processes used in scientific investigations, including posing a research question, forming a hypothesis, reviewing what is known, collecting evidence, evaluating results, and reaching conclusions.
SC.912.N.1.Su.2:	Identify the basic process used in scientific investigations, including questioning, observing, recording, determining, and sharing results.
SC.912.N.1.Pa.2:	Recognize a process used in science to solve problems, such as observing, following procedures, and recognizing results.

Related Resources

Lesson Plans

Name	Description
Citizen Science:	Citizen science is a critical component to many different scientific studies, and gives citizen scientists the opportunity to better understand the research and the process. In some studies, citizen scientists assist in major scientific discoveries that can change or create legislature. Students will participate in ongoing citizen science projects to learn more about the scientific method.
Modeling Moon Craters:	In this lesson, students will analyze an informational text that highlights current research on high impact craters on the moon. Scientists have been studying the largest impact basins on the moon, such as the Orientale basin. Until now, how impact craters with rings form had not been well understood, but scientists have modeled Orientale's formation using data from NASA's GRAIL mission. This lesson is designed to support reading in the content area. The lesson plan includes a vocabulary guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric.
Antifreeze Proteins Both Help and Hurt Fish:	This informational text resource is intended to support reading in the content area. The article from the National Science Foundation discusses research conducted in the Antarctic concerning the notothenioid fish, which contains "antifreeze" proteins. The proteins prevent the fish from freezing in the cold waters of the Southern Ocean, but it was also discovered that these same proteins prevent ice crystals from melting when temperatures warm. The lesson plan includes a note-taking guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric.
Far From Home: NASA's Year in Space Mission:	In this lesson, students will analyze an informational text that presents information on a year-long space mission aboard the International Space Station. This lesson is designed to support reading in the content area. The text describes the mission of studying the long-term effects of microgravity on human health. Astronaut Scott Kelley and Cosmonaut Mikhail Kornienko were used in the year-long study, along with Kelly's identical twin brother, Mark Kelly, who remained on Earth and was used as a control subject. 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.

Submarines of Jelly: The Remarkable Siphonophore:	This lesson uses an informational text resource intended to support reading in the content area. The text informs readers about siphonophores, a relatively little-studied organism related to jellyfish and corals. It can grow as long as 160 ft. (49 m) and can move through the water column in a coordinated fashion, and knowledge of its locomotion may help humans propel themselves efficiently underwater. 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.
Using Scientific Methods to Starve the Beast:	In this lesson, students will analyze an informational text that describes how scientists employed use of scientific methods to discover what may lead to a new method to treat cancer. The article describes the preliminary research done in eliminating protein cell chaperones that bring copper into cancer cells. Depriving cancer cells of copper causes them to stop growing. Use of this informational text is designed to support reading in the content area. The lesson plan includes a note-taking guide, text-dependent questions, a writing prompt, sample answers, and a writing rubric.
Landing on Mars and Beyond – A 3D Printer Design Challenge:	Students will utilize a 3D printer to design a landing device simulating landing men and equipment on Mars safely. Once they have settled on a design, then they will move to designing a parachute that, when attached to the lander, provides a slow, low impact landing.
One Fly, Two Fly, Red Fly, Blue Fly:	Students apply the scientific process in an online lab inquiry of how traits are inherited with the fruit fly <i>Drosophila melanogaster</i> . They also learn and apply the principles of Mendelian inheritance. Students make hypotheses for monohybrid, dihybrid and sex-linked traits and test their hypotheses by selecting fruit flies with different visible mutations, mating them, and analyzing the phenotypic ratios of the offspring. Students record their observations into an online notebook and write an online lab report.
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.
Personal DNA Testing:	A lesson with multi-media components from PBS/NOVA that focuses on DNA testing, including techniques, purposes, and considerations for biotechnology and human decisions regarding health. Students will learn about single nucleotide polymorphisms, how they are used in science, and how they are being used in the medical field. Students will apply this knowledge by looking at a mock data set and probabilities to inform medical recommendations.
Discover the Planimal:	In this lesson, students will analyze an informational text intended to support reading in the content area. The article explains how scientists utilized the scientific method to discover a plant-animal hybrid between a sea slug and algae. Students also analyze another text reviewing the attributes of scientists that are employed to make discoveries. By reading and synthesizing two texts, students will explore a real-world example of how the scientific method led to the discovery of the first case of gene transfer between multicellular organisms. This lesson includes a note-taking guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric.

Lesson Study Resource Kit

Name	Description
Exploring Diversity and Evolution: A Lesson Study Resource Kit for grades 9-12:	This lesson study resource kit is designed to support lesson study teams in developing a unit of instruction for students in grades 9-12 on the topic of diversity and evolution.

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: Teaching Ideas

Name	Description
The Value of Marine Science Field Research Experiences for Teachers:	In this video, Angela Lodge describes the value of hands-on experiences gained from field research for transforming both teachers and their classroom practices. This research is made possible by a grant from the Gulf of Mexico Research Initiative (GoMRI/C-IMAGE II). This research is made possible by a grant from the NOAA Gulf of Mexico BWET program. Download the CPALMS Perspectives video student note taking guide .
Enhancing Teaching Practices through Watershed Research Outreach Programs:	Field experiences are powerful and capable of improving teachers' ability to impact students in the classroom. Watch as USF Outreach Coordinator Teresa Greely explains the experiences offered to teachers through the NOAA Bay Watershed Education and Training (B-WET) program. This research is made possible by a grant from the Gulf of Mexico Research Initiative (GoMRI/C-IMAGE II). This research is made possible by a grant from the NOAA Gulf of Mexico BWET program. Download the CPALMS Perspectives video student note taking guide .

Problem-Solving Task

Name	Description
	Students "take a trip" to the Greater Antilles to figure out how the Anolis lizards on the islands might have evolved.

[Anolis Lizards of the Greater Antilles: Using phylogeny to test hypotheses :](#)

They begin by observing the body structures and habitat of different species, then plot this data on a map of the islands to look for patterns in their distribution. From the patterns they observe, students develop alternative hypotheses about how these lizards colonized the islands and evolved. To test their hypotheses, they are given a phylogeny which they color code according to their previous data. By combining both types of data, students make a final hypothesis about how they think the lizards colonized the islands.

Professional Development

Name	Description
The Nature of Science: Presenting Lessons for Maximum Effect & Dispelling Popular Myths :	The webmaster for the ENSI web site (http://www.indiana.edu/~ensiweb), a popular repository for Nature of Science Lessons, describes some educational philosophy about teaching the Nature of Science, including dispelling some teacher-held misconceptions.

Text Resources

Name	Description
A Green Sea Slug Steals Power from Algae:	This informational text resource is intended to support reading in the content area. Researchers are gaining more insight into how <i>Elysia chlorotica</i> can survive for months without food in a well-lit laboratory. It is well known that the slug can store plastids from the algae it consumes. However, scientists questioned how the organelles remained active for several months in the slug's gut even after a drug was given to shut down photosynthesis. Using fluorescent DNA markers, scientists were able to find a gene that allows the slug to keep the chloroplasts working. It is the first known case of gene transfer from one multicellular organism to another.
Antifreeze Proteins in Antarctic Fish Prevent Both Freezing and Melting:	This informational text resource is intended to support reading in the content area. The National Science Foundation article discusses research conducted in the Antarctic concerning the notothenioid fish, which contains "antifreeze" proteins. These proteins are essential because they prevent the fish from freezing in the cold waters of the Southern Ocean, but it was discovered that these same proteins prevent ice crystals from melting when temperatures warm.
NASA Moon Mission Shares Insights into Giant Impacts:	This informational text resource supports reading in the content area. The GRAIL mission is a research project tasked with studying large impact basins. Orientale basin is a giant, ringed impact crater on Earth's moon. Until now, how impact craters with rings form had not been well understood. Scientists have reconstructed Orientale's formation using data from NASA's GRAIL mission.
Ten things to know about Scott Kelly's #YearInSpace:	This informational text resource is designed to support reading in the content area. The article describes an ongoing NASA research project where astronaut Scott Kelly and cosmonaut Mikhail Kornienko are being tested for the effects of a year-long spaceflight. However, the science of their mission spans three years: one year before they left, one year in space, and another upon their return. In addition, part of the research also includes the Twin Study; Scott's identical twin brother, and a former astronaut, served as a human control on the ground during Scott's year-long stay in space.
Clues to Future of Undersea Exploration May Reside Inside a Jellyfish-like Creature:	This informational text resource is designed to support reading in the content area. The article relates the findings of a study by four scientists about siphonophores, a relatively little-studied organism related to jellyfish and corals. Their study focuses on this organism's ability to move through the water column in a coordinated fashion and how this knowledge may help humans propel themselves efficiently underwater.
Starving the Beast: New NSF-Funded Research Finds Way to Withhold Cancer Cells' Favorite Food:	This informational text resource supports reading in the content area. This text describes the findings of a scientific study to determine how cancer cell growth can be halted by reducing the amount of copper that is transported to the cell. The text also describes how the scientists used the scientific method to develop their experiment.
Killing a Patient to Save His Life:	This informational text resource is intended to support reading in the content area. This article explores a controversial clinical trial being conducted by the University of Pittsburgh. Scientists are exploring more efficient ways to save lives when patients enter the emergency room in critical condition. The idea involves draining the patient's blood and replacing it with freezing saltwater to induce a hypothermic state that will buy doctors more time to save human lives. This is causing an ethical debate as patients will be essentially clinically dead during this procedure. The technique is known as Emergency Preservation and Resuscitation (EPR).
Phrenology-History of a Science and Pseudoscience:	This informational text resource is intended to support reading in the content area. This article discusses phrenology, which is a pseudoscience that claims to be able to use bumps on human skulls to make inferences about personality traits. The article details why phrenology is not a true science, and reviews the history of phrenology, the role of phrenology in the debate about the organization of the brain, how phrenology came under scientific criticism, and modern iterations of the technique.
Heaviest Named Element is Official:	This informational text resource is intended to support reading in the content area. The article describes the addition of copernicium, the heaviest named element, to the periodic table. It discusses the process of validation required for elements to be named and added to the periodic table.
The Weird, Wild World of Citizen Science is Already Here:	This informational text resource is intended to support reading in the content area. This article describes the collision course between citizens and scientists as "makers" and "hobbyists" begin aiding and supplementing the scientific community more and more. The article gives many examples of amateurs helping out on active projects, especially when science cannot dedicate the hours or money necessary to complete them.
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.
Illuminating the Perils of Pollution, Nature's Way:	This informational text resource is intended to support reading in the content area. This article explores the work of Dr. Edith Widder in researching animals that make light. Specifically, she has found a way use bioluminescence to fight pollution in the Indian River Lagoon.
"Top Ten Things to Know About Stem Cell Treatments":	This informational text resource is intended to support reading in the content area. The reading passage is a Top Ten list by the International Society for Stem Cell Research intended to educate the

general public about the myths and realities of stem cell treatments.

[Metastasis Stem Cells in Blood of Breast Cancer Patients Discovered:](#)

This informational text resource is intended to support reading in the content area.

Science Daily posted a summary of a research study originally published in Germany about how metastasis stem cells were found in the blood of breast cancer patients.

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.

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.