



Standard #: SC.912.N.3.5

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Describe the function of models in science, and identify the wide range of models used in science.

General Information

Subject Area: Science

Grade: 912

Body of Knowledge: Nature of Science

Idea: Level 2: Basic Application of Skills & Concepts

Standard: [The Role of Theories, Laws, Hypotheses, and Models](#) - The terms that describe examples of scientific knowledge, for example: "theory," "law," "hypothesis" and "model" have very specific meanings and functions within science.

Date Adopted or Revised: 02/08

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
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)
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)
2001310:	Earth/Space Science (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
2001320:	Earth/Space Science 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)
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))
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))
7920020:	Access Earth/Space Science (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))
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.3.In.3:	Identify ways models are used in the study of science.
SC.912.N.3.Su.3:	Recognize ways models are used in the study of science.
SC.912.N.3.Pa.2:	Recognize a model used in the context of one's own study of science.

Related Resources

Lesson Plans

Name	Description
Gr 9-12. Water Use and Society, Lesson 1: Tragedy of the Commons:	This is a simulation that allows students to explore how the common usage of a potentially renewable resource can lead to its exploitation. Students will complete an activity, a data sheet, an analysis of the data, and discuss how the concept of the 'commons' relates to southern Florida's water resources.
Plant Structures Lab Stations:	This lesson introduces students to a variety of different types of plants and plant structures. Students will work cooperatively in small groups to rotate through a series of varied stations that allow them to explore, identify, and label different parts of several different plants including the parts of a flower, stem and root structures, and vascular tissue. Students will make observations and inferences about the different structures and functions of plant physiology through a hands-on cycle of exploration.
The Monster Mash: A Lesson About Transcription and Translation:	Students will model the process of protein synthesis and then model how those proteins result in phenotypic changes. Students will also be able to explain the function of models in science. Students will explore how variations in DNA sequences produce varying phenotypes. Students will complete transcription and translation of DNA and RNA and then determine phenotypes produced based on amino acid sequences while completing hands on activity. During this lesson, students will create a fictitious organism by rolling a dice to determine which DNA sequence it will receive. Students will then perform transcription and translation. Finally, students will determine the phenotype of the organisms by comparing its amino acid sequence to a key that will be provided. Lastly, students will create a picture of the fictitious organism.
Eukaryotic Cells: The Factories of Life:	Students will be able to identify the main parts of a cell and to describe the basic function of each part. The students will match parts of a cell to parts of a city that have functions that are analogous to each cell part. They will then develop their own analogy and present it to the class. Finally, they will practice their knowledge using a computer-based review game.
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.
Economics and Epidemiology:	In this lesson, students will read an article from the National Science Foundation. The article discusses the rise of pandemic disease outbreaks across the globe and how these outbreaks can affect world economies. The article further describes how economic models were used to assess different strategies on their effectiveness. The strategy of identifying the underlying cause of emerging diseases was considered to be most cost-effective and beneficial long-term. This lesson is designed to support reading in the content area. The lesson plan includes a note-taking guide, a vocabulary handout, text-dependent questions, a writing prompt, answer keys, and a writing rubric.
Finding the Sources of Ebola and other Filoviruses:	In this lesson, students will analyze an informational text from Science Daily that discusses the research conducted by scientists who used machine learning methods to identify bats that were likely to be reservoirs for Ebola and other filoviruses. Scientists mapped out the geographical ranges of these bats and hope to be able to use this information to prevent future outbreaks. This informational text resource is intended 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.
	Students will reflect on prior knowledge, record their understanding of DNA replication based on a 3D computer model,

Something Old, Something New...:	and will then create a model demonstrating the process of DNA replication. Students will investigate where DNA replication occurs in the human body and why it occurs there. Additionally, students will investigate DNA mutations and their potential impact on the organism. Finally, students will summarize what they learned by collaborating with other classmates.
Penguins in Peril:	In this lesson, students will analyze an informational text from National Geographic designed to support reading in the content area. The article discusses research conducted on the status of the Adelie Penguin population in Antarctica and what might happen to this species by the end of the century. Using statistical models, researchers looked at past and current data and used future climate projections to determine the fate of the Adelie's habitat. The lesson plan includes a note-taking guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric.
Termites to the Rescue!:	In this lesson, students will analyze an informational text from the National Science Foundation that discusses how termites in semi-arid ecosystems are preventing the process of desertification in these areas. The article also describes how and why scientific models are being used in this research. This lesson is designed to support reading in the content area. The lesson plan includes a note-taking guide, text-dependent questions, a writing prompt, answer keys, and a writing rubric.
The Effect of Seasonal Variation, Due to Climate Change, on Grasslands:	In this lesson, students will examine how ecosystems change due to seasonal variations as they analyze an informational text explaining the process scientists used to collect data on daily changes in grasslands. Students will learn of the usefulness of this data in creating a model that allowed the scientists to predict how seasonal variation will change the grassland ecosystem. 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.
Keeping Triangles in Balance: Discovering Triangle Centroid is Concurrent Medians:	In this lesson, students identify, analyze, and understand the Triangle Centroid Theorem. Students discover that the centroid is the point of concurrency for the medians of a triangle and recognize its associated usage with the center of gravity or barycenter. This set of instructional materials provides the teacher with hands-on activities using technology as well as paper-and-pencil methods.
Cleaning Up Your Act:	Cleaning Up Your Act Model Eliciting Activity (MEA) provides students with a real world engineering problem in which they must work as a team to design a procedure to select the best material for cleaning up an oil spill. The main focus of this MEA is to recognize the consequences of a catastrophic event, and understand the environmental and economical impact based on data analysis. Students will conduct individual and team investigations in order to arrive at a scientifically sound solution to the problem.
How Do Meteorologists Forecast the Weather?:	This is a lesson that I developed where students learn how meteorologists predict the weather. Students will use surface weather maps, radar, satellite, and weather models from the National Weather Service to assess the current state of the weather and make a prediction.

Perspectives Video: Expert

Name	Description
Why Carbon Dioxide is an Effective Greenhouse Gas:	Dr. Ken Goldsby explains how greenhouse gases trap energy. Download the CPALMS Perspectives video student note taking guide .

Perspectives Video: Professional/Enthusiasts

Name	Description
Asymptotic Behavior in Shark Growth Research:	Fishery Scientist from Florida State University discusses his new research in deep sea sharks and the unusual behavior that is found when the data is graphed. Download the CPALMS Perspectives video student note taking guide .
Modeling the Everglades with Mathematics:	Dr. Tom Van Lent and Rajendra Paudel describe how hydrologic modeling is used to evaluate environmental conditions in the Everglades. Download the CPALMS Perspectives video student note taking guide .
KROS Pacific Ocean Kayak Journey: Training, Simulation, and Modeling:	Complex problems require complex plans and training. Get in shape to get things done. Related Resources: KROS Pacific Ocean Kayak Journey: GPS Data Set[.XLSX] KROS Pacific Ocean Kayak Journey: Path Visualization for Google Earth[.KML] Download the CPALMS Perspectives video student note taking guide .

Teaching Idea

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.

Text Resources

Name	Description
Ebola, Dengue Fever, Lyme Disease: The Growing Economic Cost of Infectious Diseases:	This informational text resource is designed to support reading in the content area. The article discusses the rise of pandemic disease outbreaks across the globe and how these outbreaks can affect world economies. The article further describes how economic models were used to assess different strategies on their effectiveness. The strategy of identifying the underlying cause of the emerging disease was considered to be most cost-effective and beneficial long-term.

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.
Ecologists Identify Potential New Sources of Ebola and Other Filoviruses:	This informational text resource is designed to support reading in the content area. The article discusses the research conducted by scientists who used machine learning methods to identify bats that were likely to be reservoirs for filoviruses. Scientists mapped out the geographical ranges of these bats and hope to be able to use this information to prevent future outbreaks.
Antarctica Could Lose Most of Its Penguins to Climate Change:	This informational text resource is designed to support reading in the content area. The article discusses the research conducted on the status of the Adelie penguin population and what might happen to it by the end of the century. Using statistical models, researchers looked at current data and used future climate projections to determine the status of the Adelie's habitat.
Dirt Mounds Made by Termites in Africa, South America, Asia Could Prevent Spread of Deserts:	This informational text resource is designed to support reading in the content area. The article discusses the impact termite mounds are having on semi-arid ecosystems and the surprising realization that scientists have come to in regards to the effects of these termite mounds. The text also describes the importance of scientific modeling to predict plant growth while having termite mounds present.
In Grasslands, Longer Spring Growing Season Offsets Higher Summer Temperatures:	This informational text resource is designed to support reading in the content area. The article describes the process the researchers use to develop a detailed model of how they predict climate change will occur in the future and what effect this will have on North American grasslands. The author explains how climate change impacts ecosystems while also providing an example of using models in science to predict future events/outcomes.
Iron in Earth's Core Weakens Before Melting:	This informational text resource is intended to support reading in the content area. Researchers have created models that can be used to understand previously unexplained properties of the Earth's core. Previously, we have not been able to explain the behavior of seismic waves traveling through the core. However, a new model suggests that the iron in the core greatly weakens before melting, which slows the waves down.
New Magma Layer Found Deep in Earth's Mantle?:	This informational text is intended to support reading in the content area. The National Geographic article discusses models and theories that shed new light on the structure of Earth's layers, including new evidence to suggest a molten layer of rock trapped deep in the Earth's mantle.

Unit/Lesson Sequence

Name	Description
Modeling for Understanding Natural Selection:	This series of lessons introduces students to evolutionary reasoning and to the explanatory power of the Darwinian model of natural selection. Students read three evolutionary scientists' (Paley, Lamarck and Darwin) original work and compare their thinking, proposed mechanism of evolution, use of evidence, and explanatory power of their theory. They apply the three scientists thinking to another scenario to refine their understanding of the explanations.