

# Climate Change: A Theme to Teach Across the Science Disciplines

## Sunshine State Standards & Benchmarks that Help Students Understand Climate Change

### K-2

Earth Systems and Patterns	Compare and describe changing patterns in nature that repeat themselves, such as weather conditions including temperature and precipitation, day to day and season to season. SC.2.E.7.1
Earth Systems and Patterns	Investigate by observing and measuring, that the Sun's energy directly and indirectly warms the water, land, and air. SC.2.E.7.2
Earth Systems and Patterns	Investigate, observe and describe how water left in an open container disappears (evaporates), but water in a closed container does not disappear (evaporate). SC.2.E.7.3
Earth Systems and Patterns	Investigate that air is all around us and that moving air is wind. SC.2.E.7.4
Earth Systems and Patterns	State the importance of preparing for severe weather, lightning, and other weather related events. SC.2.E.7.5

### Grades 3 – 5

Earth in Space and Time	Identify the Sun as a star that emits energy; some of it in the form of light. SC.3.E.5.2
Earth Structures	Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost. SC.3.E.6.1
Interdependence	Describe how animals and plants respond to changing seasons. SC.3.L.17.1
Interdependence	Recognize that plants use energy from the Sun, air, and water to make their own food. SC.3.L.17.2
Practice of Science	Recognize the importance of communication among scientists. SC.3.N.1.4
Practice of Science	Recognize that scientists question, discuss, and check each others' evidence and explanations. SC.3.N.1.5
Practice of Science	Infer based on observation. SC.3.N.1.6
Practice of Science	Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena. SC.3.N.1.7
Theories, Laws, Hypotheses, and Models	Recognize that words in science can have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence. SC.3.N.3.1
Theories, Laws, Hypotheses, and Models	Recognize that scientists use models to help understand and explain how things work. SC.3.N.3.2
Changes in Matter	Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation. SC.3.P.9.1

Forms of Energy	Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical. SC.3.P.10.1
Forms of Energy	Recognize that energy has the ability to cause motion or create change. SC.3.P.10.2
Forms of Energy	Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another. SC.3.P.10.3
Forms of Energy	Demonstrate that light can be reflected, refracted, and absorbed. SC.3.P.10.4
Energy Transfer and Transformations	Investigate, observe, and explain that things that give off light often also give off heat. SC.3.P.11.1
Earth in Space and Time	Recognize that Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day. SC.4.E.5.3
Earth in Space and Time	Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected. SC.4.E.5.4
Interdependence	Compare the seasonal changes in Florida plants and animals to those in other regions of the country. SC.4.L.17.1
Interdependence	Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them. SC.4.L.17.2
Interdependence	Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers. SC.4.L.17.3
Interdependence	Recognize ways plants and animals, including humans, can impact the environment. SC.4.L.17.4
Practice of Science	Explain that science does not always follow a rigidly defined method (“the scientific method”) but that science does involve the use of observations and empirical evidence. SC.4.N.1.3
Practice of Science	Attempt reasonable answers to scientific questions and cite evidence in support. SC.4.N.1.4
Practice of Science	Recognize and explain that scientists base their explanations on evidence. SC.4.N.1.7
Forms of Energy	Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion. SC.4.P.10.1
Forms of Energy	Investigate and describe that energy has the ability to cause motion or create change. SC.4.P.10.2
Forms of Energy	Describe how moving water and air are sources of energy and can be used to move things. SC.4.P.10.4
Energy Transfer and Transformations	Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature. SC.4.P.11.1
Earth Systems and Patterns	Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and forth from one state to another. SC.5.E.7.1
Earth Systems and Patterns	Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth’s water reservoirs via evaporation and precipitation processes. SC.5.E.7.2
Practice of Science	Recognize and explain the difference between personal opinion/interpretation and verified observation. SC.5.N.1.6
Practice of Science	Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence. SC.5.N.2.1
Practice of Science	Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others. SC.5.N.2.2
Matter	Investigate and describe that many physical and chemical changes are affected by temperature. SC.5.P.9.1

Forms of Energy	Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical. SC.5.P.10.1
Forms of Energy	Investigate and explain that energy has the ability to cause motion or create change. SC.5.P.10.2
Earth Systems and Patterns	Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and forth from one state to another. SC.5.E.7.1
Earth Systems and Patterns	Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes. SC.5.E.7.2
Earth Systems and Patterns	Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time. SC.5.E.7.3
Earth Systems and Patterns	Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time. SC.5.E.7.4
Earth Systems and Patterns	Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains. SC.5.E.7.5
Earth Systems and Patterns	Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water. SC.5.E.7.6
Earth Systems and Patterns	Design a family preparedness plan for natural disasters and identify the reasons for having such a plan. SC.5.E.7.7
Diversity and Evolution of Living Organisms	Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations. SC.5.L.15.1
Interdependence	Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics. SC.5.L.17.1

### Grades 6 – 8

Earth Systems and Patterns	Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system. SC.6.E.7.1
Earth Systems and Patterns	Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate. SC.6.E.7.2
Earth Systems and Patterns	Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation. SC.6.E.7.3
Earth Systems and Patterns	Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere. SC.6.E.7.4
Earth Systems and Patterns	Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land. SC.6.E.7.5
Earth Systems and Patterns	Differentiate between weather and climate. SC.6.E.7.6
Earth Systems and Patterns	Investigate how natural disasters have affected human life in Florida. SC.6.E.7.7
Earth Systems and Patterns	Describe ways human beings protect themselves from hazardous weather and sun exposure. SC.6.E.7.8

Earth Systems and Patterns	Describe how the composition and structure of the atmosphere protects life and insulates the planet. SC.6.E.7.9
Practice of Science	Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. SC.6.N.1.1
Practice of Science	Explain why scientific investigations should be replicable. SC.6.N.1.2
Earth Structures	Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water. SC.7.E.6.6
Diversity and Evolution of Living Organisms	Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species. SC.7.L.15.3
Practice of Science	Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics. SC.7.N.1.5
Practice of Science	Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based. SC.7.N.1.6
Practice of Science	Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community. SC.7.N.1.7
Practice of Science	Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered. SC.7.N.2.1
Forms of Energy	Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. SC.7.P.10.1
Forms of Energy	Observe and explain that light can be reflected, refracted, and/or absorbed. SC.7.P.10.2
Forms of Energy	Recognize that light waves, sound waves, and other waves move at different speeds in different materials. SC.7.P.10.3
Energy Transfer and Transformations	Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state. SC.7.P.11.1
Energy Transfer and Transformations	Investigate and describe the transformation of energy from one form to another. SC.7.P.11.2
Energy Transfer and Transformations	Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another. SC.7.P.11.3
Energy Transfer and Transformations	Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature. SC.7.P.11.4
Earth in Space and Time	Explain the impact of objects in space on each other including: <ol style="list-style-type: none"> <li>1. the Sun on the Earth including seasons and gravitational attraction</li> <li>2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body. SC.8.E.5.9</li> </ol>
Matter and Energy Transformations	Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen. SC.8.L.18.1
Matter and Energy Transformations	Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide. SC.8.L.18.2

Matter and Energy Transformations	Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment. SC.8.L.18.3
Practice of Science	Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence. SC.8.N.1.6
Practice of Science	Distinguish between scientific and pseudoscientific ideas. SC.8.N.2.1
Practice of Science	Discuss what characterizes science and its methods. SC.8.N.2.2
Practice of Science	Select models useful in relating the results of their own investigations. SC.8.N.3.1
Practice of Science	Explain why theories may be modified but are rarely discarded. SC.8.N.3.2
Practice of Science	Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels. SC.8.N.4.1
Changes in Matter	Investigate and describe how temperature influences chemical changes. SC.8.P.9.3

### Grades 9-12

Practice of Science	Recognize that the strength and usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative explanations to explain the data presented. SC.912.N.1.3:
The Role of Theories, Laws, Hypotheses, and Models	Describe the role consensus plays in the historical development of a theory in one of the disciplines of science. SC.912.N.3.2:
Science and Society	Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. SC.912.N.4.1
Science and Society	Weigh the merits of alternative strategies for solving ad specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. SC.912.N.4.2
Matter	Describe the properties of the carbon atom that make the diversity of carbon compounds possible. SC.912.P.8.12
Energy	Relate temperature to the average molecular kinetic energy. SC.912.P.10.5
Energy	Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. SC.912.P.10.4:
Interdependence	Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. SC.912.L.17.10
Interdependence	Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. SC.912.L.17.11

Interdependence	Discuss the large-scale environmental impact results from human activity, including waste spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. SC.912.L.17.16
Interdependence	Describe changes in ecosystems resulting from seasonal variations, climate change and succession. SC.912.L.17.4
Matter and Energy Transformation	Explain the interrelated nature of photosynthesis and cellular respiration. SC.912.L.18.9
Earth in Space and Time	Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly developed observational tools. SC.912.E.5.8
Earth Structures	Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies. SC.912.E.6.6
Earth Systems and Patterns	Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon. SC.912.E.7.1
Earth Systems and Patterns	Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator. SC.912.E.7.2
Earth Structures	Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. SC.912.E.7.3