

# Earth and Space Science

## [27.170]

In addition to the standards for all science teachers that are set forth in Section 27.140 of this Part, those who specialize in teaching earth and space science shall be required to meet the standards described in this Section.

### STANDARD 1

**The competent earth and space science teacher understands the dynamic geological nature of the Earth and the evidence in its features.**

**Knowledge Indicators** - *The competent earth and space science teacher:*

- 1A. understands the dynamics and processes that shape the surface and interior of the Earth through geologic time.
- 1B. understands the basic rock and mineral types and the processes that form them.
- 1C. understands the scope and scale of geologic time and research technologies that determine and depend upon it.
- 1D. understands the paleontological, paleoclimatological, and paleogeological evidence that shows the evolution of Earth and life on it through geologic time.
- 1E. understands the historical progression in the human understanding of the science and technologies of geology.
- 1F. understands the human economic, social, and environmental dependence on geologic resources.
- 1G. understands the effects of earth processes on human societies through time.

**Performance Indicators** - *The competent earth and space science teacher:*

- 1H. creates and explains interpretive models that correlate various Earth features with the tectonic processes that shape the Earth's surface and interior, accessing the research from various technologies.
- 1I. demonstrates and explains strategies that are used to identify and classify rocks and minerals.
- 1J. develops strategies to explain the scope of geologic time and comparisons to human-time scale observations.
- 1K. demonstrates the use of schematics for the use of various technologies used by geologists.
- 1L. evaluates and cites evidence of scientific theories that explain how life originated from processes that have taken place in the atmosphere, on land, and in the oceans.
- 1M. describes how rock strata and fossils can lead to inferences about depositional environments and climatic conditions in Earth's history.
- 1N. interprets a geologic column to describe the geologic history of a particular area.

### STANDARD 2

**The competent earth and science teacher understands the meteorological nature of the Earth and the dependence of life upon it.**

**Knowledge Indicators** - *The competent earth and space science teacher:*

- 2A. understands the nature of water and its influence upon the shape of the land, atmospheric conditions, and ocean environments.

- 2B. understands the physical and chemical characteristics of and the cyclic interchange of elements and compounds through the lithosphere, hydrosphere, biosphere, and atmosphere.
- 2C. understands the effect of the variables (including humans) of the natural earth systems on weather and climate and the past, current, and future inferences associated with these effects.

**Performance Indicators - *The competent earth and space science teacher:***

- 2D. designs models, using the latest technological data sources, which show evidence of the cyclic interchange of elements and compounds through the Earth's atmospheric, hydrospheric, and lithospheric systems.
- 2E. demonstrates use of the various historic and current technologies and tools associated with data collection and interpretation of meteorologic and climatologic research and predictions.
- 2F. collects/accesses, analyzes and explains daily meteorologic data using various technologies and media.
- 2G. designs models that demonstrate how human activities impact short-term and long-term weather and climate.
- 2H. accesses and analyzes various sources of data that interpret the total water supply of Earth and the projections about the protection and conservation of this resource.

## STANDARD 3

### **The competent earth and space science teacher understands the Earth's place in the solar system and the universe.**

**Knowledge Indicators - *The competent earth and space science teacher:***

- 3A. understands the physical and chemical atmospheric and geologic characteristics and orbital factors of the sun and its planets.
- 3B. understands the characteristics, visibility, appearance, and orbital nature of comets, asteroids, and meteoroids.
- 3C. understands the scientific basis for understanding various atmospheric, solar, and celestial phenomena, such as eclipses, seasons, phases, apparent motion of objects, auroras, etc.
- 3D. understands the various theories of cosmogony, cosmology and the formation of galaxies.
- 3E. understands the scientific and mathematical research that explains stellar evolution, including the types and fates of stars as a function of mass.
- 3F. understands the historical progression of understanding the science of astronomy, the physical laws that govern it, and the technologies that explain it.
- 3G. understands the technologies associated with the understanding of the science of astronomy and the limitations associated with these earth-based technologies.
- 3H. understands the scope and scale of astronomical time and distance.

**Performance Indicators - *The competent earth and space science teacher:***

- 3I. cites evidence from current and historic scientific observations that support or disconfirm various theories of cosmology and cosmogony.
- 3J. demonstrates the technological analysis of star light used to explain the star's chemical composition and motion.
- 3K. analyzes the relative correctness of the various historic models of the solar system.
- 3L. uses and/or explains remote sensing technologies to explain solar, planetary, and galactic research.
- 3M. identifies constellations and their brightest stars for the various seasons, using simple star charts, binoculars, telescopes, and various computer technologies.
- 3N. designs and explains models that demonstrate various celestial and astronomic phenomena.

## STANDARD 4

**The competent earth and space science teacher understands the fundamental earth-sky-human relationships through time.**

**Knowledge Indicators** - *The competent earth and space science teacher:*

- 4A. understands the historical technologies used to determine distance and time and their direct impact on civilization and progress.
- 4B. understands the relationship between latitude and the positions/motion of celestial objects.
- 4C. understands the scientific laws and applications that interplay for orbital, sub-orbital and space flight and exploration.
- 4D. understands the historical progression of exploration that has led to planetary and space research.

**Performance Indicators** - *The competent earth and space science teacher:*

- 4E. demonstrates the use of various simple technologies and observations used historically to determine solar and seasonal time and locations, both during the day and at night.
- 4F. constructs models that explain the requirements for orbital and sub-orbital flight.
- 4G. designs flow charts that show the historic progression of space flight and exploration.
- 4H. analyzes the international cooperation and competition associated with space flight, research, and the anticipated economic possibilities of resulting products.
- 4I. compares and contrasts cultural/historic interpretations of astronomical phenomena.