Earth/Space Science

Notes from the Framework

The science framework is built on the notion of learning as a developmental progression so student outcomes that students are expected to learn are spread out from K to 12 integrating knowledge with scientific practices. What students are expected to learn is broken out into grade band endpoints for grades 2, 5, 8, and 12.

The committee’s efforts have been strongly influenced by several recent efforts in the ESS community that have codified the essential sets of information in several fields. These projects include the *Earth Science Literacy Principles: The* *Big Ideas and Supporting Concepts of Earth Science* [1], *Ocean Literacy: The*

*Essential Principles of Ocean Science K-12* [2], *Atmospheric Science Literacy: Essential Principles and Fundamental Concepts of Atmospheric Science* [3], and *Climate Literacy: The Essential Principles of Climate Sciences* [4].

**Core Ideas in ESS**

Physics and Modeling concepts are highlighted

Core Idea ESS1 **Earth’s Place in the Universe**

*What is the universe, and what is Earth’s place in it?*

ESS1.A: THE UNIVERSE AND ITS STARS

*What is the universe, and what goes on in stars?*

*By the end of grade 8****.*** Patterns of the apparent motion of the sun, the moon, and

stars in the sky can be observed, described, predicted, and explained with models.

ESS1.B: EARTH AND THE SOLAR SYSTEM

*What are the predictable patterns caused by Earth’s movement in the solar*

*system?*

ESS1.C: THE HISTORY OF PLANET EARTH

*How do people reconstruct and date events in Earth’s planetary history?*

*By the end of grade 12.**Radioactive decay lifetimes and isotopic content in*

*rocks provide a way of dating rock formations and thereby fixing the scale of*

*geological time.*

Core Idea ESS2 **Earth’s Systems**

*How and why is Earth constantly changing?*

ESS2.A: EARTH MATERIALS AND SYSTEMS

How do Earth’s major systems interact?

By the end of grade 8.All Earth processes are the result of energy flowing and

matter cycling within and among the planet’s systems.

ESS2.B: PLATE TECTONICS AND LARGE-SCALE SYSTEM INTERACTIONS

*Why do the continents move, and what causes earthquakes and volcanoes?*

ESS2.C: THE ROLES OF WATER IN EARTH’S SURFACE PROCESSES

*How do the properties and movements of water shape Earth’s surface and affect*

*its systems?*

*By the end of grade 12*.The abundance of liquid water on Earth’s surface and

its unique combination of physical and chemical properties are central to the

planet’s dynamics. These properties include water’s exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.

ESS2.D: WEATHER AND CLIMATE

*What regulates weather and climate?*

By the end of grade 8 - Greenhouse gases in the atmosphere absorb and retain the energy

radiated from land and ocean surfaces, thereby regulating Earth’s average surface

temperature and keeping it habitable.

*By the end of grade 12*. The foundation for Earth’s global climate system is the

electromagnetic radiation from the sun as well as its reflection, absorption, storage,

and redistribution among the atmosphere, ocean, and land systems and this

energy’s reradiation into space.

Global climate models incorporate scientists’ best knowledge of physical and

chemical processes and of the interactions of relevant systems.

ESS2.E: BIOGEOLOGY

*How do living organisms alter Earth’s processes and structures*?

Idea ESS3 **Earth and Human Activity**

*How do Earth’s surface processes and human activities affect each other?*

ESS3.A: NATURAL RESOURCES

*How do humans depend on Earth’s resources?*

ESS3.B: NATURAL HAZARDS

*How do natural hazards affect individuals and societies?*

*ESS3.C: HUMAN IMPACTS ON EARTH SYSTEMS*

*How do humans change the planet?*

*ESS3.D: GLOBAL CLIMATE CHANGE*

*How do people model and predict the effects of human activities on Earth’s climate?*

Resources:

1. Earth Science Literacy Initiative. (2010). *Earth Science Literacy Principles: The Big*

*Ideas and Supporting Concepts of Earth Science*. Arlington, VA: National Science

Foundation. Available: http://www.earthscienceliteracy.org/es\_literacy\_6may10\_.pdf

[June 2011].

2. National Geographic Society. (2006). *Ocean Literacy: The Essential Principles of*

*Ocean Science K-12*. Washington, DC: Author. Available: http://www.coexploration.

org/oceanliteracy/documents/OceanLitChart.pdf [June 2011].

3. University Corporation for Atmospheric Research. (2008). *Atmospheric Science*

*Literacy: Essential Principles and Fundamental Concepts of Atmospheric Science.*

Boulder, CO: Author. Available: http://eo.ucar.edu/asl/pdfs/ASLbrochureFINAL.pdf

[June 2011].

4. U.S. Global Change Research Program/Climate Change Science Program. (2009).

*Climate Literacy: The Essential Principles of Climate Sciences*. Washington, DC:

Author. Available: http://downloads.climatescience.gov/Literacy/Climate%20

Literacy%20Booklet%20Low-Res.pdf [June 2011].