

## Science Benchmark Clarification, Instruction, and Assessment

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**Strand II:** Reflect on the Nature, Adequacy, and Connections Across Scientific Knowledge

**Content Standard 1:** All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; how science is related to other ways of knowing; how science and technology affect our society; and how people of diverse cultures have contributed to and influenced developments in science. (Reflecting on Scientific Knowledge)

### **Benchmark**

Justify plans or explanations on a theoretical or empirical basis. (SCI.II.1.HS.1)

### **Benchmark Clarification**

Students will learn to recognize weaknesses in arguments that are presented as scientific. Arguments may depend on:

- intermingled fact and opinion
- small or incorrect data sampling
- conclusions not supported by evidence
- failure to consider alternative hypotheses
- reliance on celebrity rather than evidence
- failure to consider limitations of available evidence or scientific knowledge

Empirical: Supported by data

Theoretical: Explanation based on accepted scientific processes and reasoning

### **Key Concepts (voc.)/Tools**

Aspects of logical argument, including:

- Evidence
- Fact
- Opinion
- Assumptions
- Claims
- Conclusions
- Observations.

### **Real-World Context**

Any in the sections on Using Scientific Knowledge

**Resources:** <http://mtn.merit.edu/mcf/SCI.II.1.HS.1.html>

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### **Benchmark**

Describe some general limitations of scientific knowledge. (SCI.II.1.HS.2)

### **Benchmark Clarification**

Students learning science will recognize the human origins of scientific knowledge, the particular rules and values of scientific communities, and the strengths and limitations of scientific and technological knowledge. Understanding the nature and limitations of scientific knowledge is essential if students are to use it effectively in making decisions.

### **Key Concepts (voc.)/Tools**

Understanding the general limits of science and scientific knowledge as constantly developing human enterprises; recognizing that arguments can have emotive, economic, and political dimensions as well as scientific

### **Real-World Context**

Any in the sections on Using Scientific Knowledge

### **Resources:**

<http://mtn.merit.edu/mcf/SCI.II.1.HS.2.html>

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### **Benchmark**

Show how common themes of science, mathematics, and technology apply in real-world contexts. (SCI.II.1.HS.3)

### **Benchmark Clarification**

Students will show how history, art, mathematics, science, philosophy and technology are inter-related in real world situations.

### **Key Concepts (voc.)/Tools**

Thematic ideas: systems/subsystems, feedback, models, mathematical constancy, scale, conservation, structure, function, adaptation.

### **Real-World Context**

Any in the sections on Using Scientific Knowledge

### **Resources:**

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### **Benchmark**

Discuss the historical development of key scientific concepts and principles. (SCI.II.1.HS.4)

### **Benchmark Clarification**

Students will investigate and discuss the history behind key scientific concepts and principles including people, places and events.

### **Key Concepts (voc.)/Tools**

Historical, political, social, and economic factors influencing the development of science.

"Discussing the Earth from the Center of the Universe, Uniting the Heavens and Earth, Relating Matter & Energy and Time & Space, Extending Time, Moving the Continents, Understanding Fire, Splitting the Atom, Explaining the Diversity of Life, Discovering Germs, Harnessing Power"  
(Benchmarks for Science Literacy, AAAS)

### **Real-World Context**

Historical development of key scientific theories.

### **Resources:**

<http://mtn.merit.edu/mcf/SCI.II.1.HS.4.html>

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### **Benchmark**

Explain the social and economic advantages and risks of new technology. (SCI.II.1.HS.5)

### **Benchmark Clarification**

Students will evaluate the relationship between the benefits that technology can provide and the risks that it presents.

### **Key Concepts (voc.)/Tools**

Cost-benefit analysis.

See [SCLIV.1.HS.1](#) (link) Household and agricultural materials

See [SCI.V.1.HS.4](#) (link) Resource Use

See [SCI.III.5.HS.6](#) (link) Effects of urban development and agriculture on ecosystems

See [SCI.V.3.HS.4](#) (link) Air Pollution

See [SCI.V.2.HS.2](#) (link) Water Pollution

### **Real-World Context**

Issues related to new technologies, including health-care, transportation, communications, manufacturing, information, and media.

### **Resources:**

<http://mtn.merit.edu/mcf/SCI.II.1.HS.5.html>

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### **Benchmark**

Develop an awareness of and sensitivity to the natural world. (SCI.II.1.HS.6)

### **Benchmark Clarification**

Students will:

- Identify the components of the natural world surrounding them
- Assess how they interact with the natural world, not just the man-made world

### **Key Concepts (voc.)/Tools**

Appreciation of the balance of nature and the effects organisms have on each other including the effects humans have on the natural world.

### **Real-World Context**

Any in the sections on Using Scientific Knowledge appropriate for high school

### **Resources:**

<http://mtn.merit.edu/mcf/SCI.II.1.HS.6.html>

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**Benchmark**

Describe the historical, political, and social factors affecting the developments in science.  
(SCI.II.1.HS.7)

**Benchmark Clarification**

Students will recognize that the development of scientific knowledge has historically been affected by political, social and economic factors. Students will examine the historical origins of science and make connections between science and other ways of knowing.

**Key Concepts (voc.)/Tools**

Historical, political, social, and economic factors influencing the development of science.

**Real-World Context**

An example might be the development of the sun-centered model of the solar system and political pressures on Galileo; the development of Darwin's theory of evolution by natural selection.

**Resources:**

<http://mtn.merit.edu/mcf/SCI.II.1.HS.7.html>