

Chapter Entry Information

Title of Case Study	Science Literacy: Power, Peril, and Promise
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Case Study Title:

Science Literacy: Power, Peril, and Promise

Article Information:

Please provide the information requested below for the four to five USA TODAY articles (from the printed newspaper) you've selected which were published between January 1 and November 1, 2011, focusing on a news topics relating to the Phi Theta Kappa Honors Study Topic, *The Democratization of Information: Power, Peril, and Promise*.

Are vitamin supplements healthful — or harmful?

Nanci Hellmich
October 12, 2011
Life
3D

Mammography: 'Imperfect' science

Liz Szabo
October 10, 2011
Life
4D

Sure, you got your toddler vaccinated — but what about your teenager?

Liz Szabo
August 9, 2011
Life
4D

Read the labels, because 'all drugs have side effects'

Mary Brophy Marcus
August 4, 2011
Life
5D

Farmers growing more genetically engineered crops

Elizabeth Weise
February 23, 2011
Money
3B

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Summary Statement:

The literacy skills needed to lead fulfilling and responsible lives in our technological society include language, math, and science. Science literacy is essential for personal and civic decision-making. Science is neither belief nor philosophy: Science (*scientia*) means to know. Science explains phenomena using evidence. The National Academy of Sciences states that science education should emphasize logical problem solving and use of evidence that can be confirmed by others.

Everyday we must use science to separate the pseudoscience of myriad myths and half-truths from fact. Since Edward Jenner's first vaccine, diseases such as diphtheria, polio, and measles, which were assumed to be a part of life, are rarely seen. Yet, myths about vaccine safety abound. Science literacy gives us the power to differentiate correlation and causation. For example, some knowledge of genetics is needed to discredit the oft-repeated falsity that dietary sugar causes diabetes.

Science holds a unique position in its ability to unite society's diversity. While we hold differing views of politics, theology, and art, we agree that science enables an objective, value-free common ground. For example, learning the Germ Theory of Disease led to universal agreement that hand washing reduces the spread of infection.

We need to acquire and evaluate science-related information to make important decisions on a variety of issues, from global warming to personal nutrition. It's easy to believe advertisements that promise a pill will reduce body fat. Recent ephedra-related deaths demonstrate the need to understand the necessity of exercise and a healthy diet for weight loss.

Following Benjamin Franklin's first study of static electricity, scientists have learned how to use electricity, which allows refrigeration and information transmission. Now, citizens must decide what fuels can be used to generate electricity to meet our increasing energy demands. The high-yield crops and agricultural practices developed in the 1940s dramatically increased the amount of available food thus avoiding famines and making urban living available to more people. The 21st century challenges us again to increase agricultural productivity to meet the food security needs for seven billion people.

Two scientific discoveries of the 20th century illustrate that we cannot escape the significance of science in society. The peril of Enrico Fermi's discovery of nuclear fission is the devastating destruction it can unleash. However, countries see that nuclear weapons give them power to control the actions of other countries. The promise of nuclear fission is inexpensive non-polluting electricity concomitant with the peril of radioactive waste and radiation leaks. Paul Berg's first genetic engineering experiment led to the power of improved foods to feed the world's population, the promise to cure debilitating diseases such as sickle-cell anemia, and the perils of dangerous gene products in foods and altering evolution.

Science education, like language and math education, cannot be optional. The power of science literacy is an informed citizenry to determine the uses of and controls on these technologies. The promise of science literacy is a society where well-educated adults bring scientific thinking to bear on issues that affect them as citizens.

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Discussion Questions:

1. With which of the following statements do you agree? Give reasons for your answer.
 - a. Science is a luxury in which we can't afford to invest.
 - b. Science is more essential for our quality of life than it has ever been.

2. You see an advertisement that shows beautiful people with clear skin who claim that a specific skin care product is proven to reduce acne. These people said they used the product.
 - a. Is their testimony itself strong enough evidence for you to act? Why or why not?
 - b. What kind of scientific evidence would convince you to buy this product?

3. During the latter half of the 19th century, scientists concluded that the female skull and anatomy were evidence of women's "natural" and lesser role in society. How can our values affect science? How does science affect our values?

4. Copernicus, Kepler, and Galileo were in conflict with religious doctrine because they published their evidence to support heliocentrism—that the Earth revolves around the sun. The commonly held idea at the time was that the Earth was the center of the universe. Use this example to discuss whether science is a belief?

5. The following are common assumptions made by people. Which ones do you agree with? Which ones do you disagree with? Provide your reasons.
 - a. One individual's actions don't count.
 - b. Conservation of natural resources is sacrifice.
 - c. Environmental protection is bad for the economy.
 - d. Technology can solve all problems.
 - e. People are separate from nature.
 - f. The natural world is here to serve people.

Future Implications:

The peril of science illiteracy is a nation that falls behind economically and in status. The United States experienced this 50 years ago. After the Soviets launched Sputnik, the world's first satellite, the United States began investing in science education, which led us to the moon and numerous tools including cordless appliances, smoke detectors, and UV-blocking sunglasses.

Energy use is increasing worldwide as countries strive to improve health standards and their economic status. Consequently, sustainable energy sources need to be developed. The peril of science illiteracy is climate change and natural resource depletion.

Individuals need to choose foods and medical treatments wisely in the face of a plethora of fad diets and self-proclaimed miracle cures. Whether trying to lose weight or maintain health, individuals must evaluate nutritional information. The peril of science illiteracy is a citizenry that is unhealthy and obese.

We are expected to uphold a democracy; therefore we all need to be informed voters. Science education provides opportunities to understand relationships between concepts and disparate pieces of information and to decision-making skills. The promise of science education is an informed citizenry that can help solve the many world problems and improve the quality of life for all people.

Additional Resources:

Alberts, B. "A World That Banks on Science." National Academy of Sciences Annual Meeting, April 19, 2004. <<http://www.nasonline.org/site/DocServer/2004address.pdf>>

Hazen, R. M. and J. Trefil. *Science Matters: Achieving Scientific Literacy*. New York: Anchor Books, 2009.

Gapminder. A non-profit museum of facts to promote critical thinking and an understanding of the world. <http://www.gapminder.org/>

Lula Da Silva, L. "Brazil's Option for Science Education." *Scientific American* 298(2): 33. February, 2008.

Sagan, C. *The Demon-Haunted World: Science as a Candle in the Dark*. New York: Ballantine Books, 1997.

Suplee, C. *The New Everyday Science Explained: From the Big Bang to the Human Genome...and Everything in Between*. Washington, D. C., National Geographic, 2004.

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