

Science, Technology, and Society

Students in Science, Technology, and Society learn a risk/benefit decision-making strategy for assessing technology and its effect on society. They learn to ask pertinent questions, obtain evidence, and use it as a basis for decision-making. The nature of scientific inquiry and the limitations associated with scientific evidence are also a focus of the course. An investigation of a current concern is the focus of each unit studied. For example, while studying the atom and radiation the class may gather information about a proposed power plant or the latest treatment for cancer. Other topics of study are the gene, the computer and privacy, learning, ecology, and the expanding universe. In the fall, students choose either to conduct a scientific investigation to submit to the Virginia Junior Academy of Science statewide competition or to write a research paper on a current issue related to science and society. Political and moral issues in science are discussed. Emphasis is on presenting a challenging, interesting, and relevant course that encourages sound scientific reasoning while studying some basic science concepts at a deeper level than in earlier courses.

I. Topical Outline

1st Quarter

- A. Knowing (*Science Matters*, Ch. 1)
- B. The Road to Discovery (*Big Ideas*, Ch. 1)
- C. The Method of Science (*Big Ideas*, Ch. 7)
- D. Doing Research, Validity of Sources
- E. STS or VJAS Projects begin
- F. Benefit/Risk Analysis (*Big Ideas*, Ch. 8)

2nd Quarter

- A. The Brain and Learning (*Awakenings [movie]*, *Brain Facts [Society for Neuroscience]*)
- B. STS or VJAS Projects end
- C. Energy & Society (*Science Matters*, Ch. 2)
- D. Electromagnetism (*Science Matters*, part of Ch. 3)
- E. The Atom (*Science Matters*, Ch. 4)

3rd Quarter

- A. Nuclear & Particle Physics (*Science Matters*, Ch. 5, 8 & 9)
- B. Numbers in Science
- C. Integrity and the Scientific Community (*Miss Evers Boys [movie]*, *Something the Lord Made [movie]*)
- D. The Cosmos & Astronomy's Big Bang (*Science Matters*, Ch. 11 & *Big Ideas*, Ch. 4)
- E. Relativity (*Science Matters*, Ch. 12)

4th Quarter

- A. Ecosystems (*Science Matters*, Ch. 18)
- B. Earth Cycles (*Science Matters*, Ch. 14)
- C. The Code of Life (*Science Matters*, Ch. 16, *Boys from Brazil [movie]*)

II. Principal Learning Objectives

A. Cognitive

1. To understand the risk/benefit decision-making strategy for assessing technology and its effect on society.
2. To understand the limitations associated with scientific evidence.
3. To understand the nature of scientific inquiry in order to participate in formulating effective policies.
4. To understand how we learn and remember information, the difference between intelligence and knowledge, and how study strategies can aid retention of information.
5. To understand the following basic science concepts as stated in Science Matters: Achieving Scientific Literacy, Hazen and Trefil, Doubleday, 1992:
 - a. Energy is conserved and always goes from more useful to less useful forms. (Laws of Thermodynamics).
 - b. Electricity and magnetism are two aspects of the same force. (Electromagnetism).
 - c. Everything is made of atoms. (Atomic Theory).
 - d. Nuclear energy comes from the conversion of mass. (Nuclear Theory, $e=mc^2$).
 - e. The universe was born at a specific time in the past, and it has been expanding ever since. (Big Bang Theory).
 - f. Every observer sees the same laws of nature. (Theory of Relativity).
 - g. All life is connected. (Oceanography and Ecology)
 - h. All life is based on the same genetic code. (Genetics).

B. Skills

1. To be able to apply scientific information in personal decision-making.
2. To be able to read and analyze newspaper and magazine articles and cartoons on science.
3. To be able to engage in scientifically informed discussion of a contemporary issue.
4. To be able to use an ethical framework in order to make decisions regarding the use of new technology.
5. To be able to locate valid scientific information when needed and read and interpret graphs displaying scientific information.
6. To be able to find articles on current issues in science, summarize key points from them, and to analyze science-related cartoons.
7. To use the risk/benefit decision-making strategy both for personal decision making as well as assessment of technology and its effect on society.
8. To be able to use computer search terms (Internet search engines) to find information needed for research.
9. To be able to determine how reliable a source of information is.

C. Affective

1. To desire to be informed about our technological society, to understand the science behind it, and to become a knowledgeable member of its decision-making populace.
2. To realize that most of the technological advances taken for granted are merely applications of basic science principles.
3. To become more aware and appreciate the contributions of science to daily living.
4. To accept a personal responsibility for part of the learning process—completion of homework, article summaries, class discussions.

III. Specific Materials

A. Text and Supplementary Reading

1. The Five Biggest Ideas In Science. Wynn & Wiggins. John Wiley and Sons, Inc. 1997.
2. Science Matters Achieving Scientific Literacy. Hazen and Trefil, Doubleday, 1991.
3. Articles from the science research file, library and the Internet.
4. Brain Facts. Society for Neuroscience.

B. Audio-visual Aids

1. Videos
 - a. Catastrophe
 - b. Pieces of Mind
 - c. Miss Evers' Boys
 - d. Boys from Brazil
 - e. Awakenings
 - f. Something the Lord Made
 - g. An Inconvenient Truth
2. Computer Software
 - a. Microsoft Office
 - b. Internet Explorer (or other web browsers)

IV. Techniques

- A. Lecture and note-taking.
- B. Class discussion rising from lecture, reading, or experiences in and out of the classroom.
- C. Observations and demonstrations.
- D. Field trips.
- E. Newspaper, library and Internet research.
- F. Research, Cartoon Analyses, Article Summaries.
- G. Use of television, newspaper, magazines and Internet to keep up with current events and issues.

V. Evaluation System

- A. Nine Weeks Grade Determined By
 - 70% Tests and other Special Projects
 - 30% Homework
- B. Final Semester Grades Determined By
 - 75% Nine Weeks Average
 - 25% Exam (Seniors who have not exceeded the 10% absence limit and who have a "B" or better for semester II can opt out of taking the second semester exam.)
- C. Year End Grade
 - Average of Semester I and Semester II
- D. Late work or work that must be redone cannot receive an "A." Major projects must be turned in at the beginning of class the day they are due unless specifically told otherwise. Projects turned in later in the day lose one letter grade. Major projects lose an additional letter grade for each day they are late.