TITLE
Using Nanoscience to Improve Science Literacy

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GRADE LEVELS
This lesson is appropriate for grades 9-12.

CURRICULUM STANDARDS
College Readiness Standards
Science: Interpretation of Data, Scientific Investigation, Evaluation of Models, Inferences, and Experimental Results

Reading: Main Ideas/Authors Approach, Supporting Details

OVERVIEW
Scientists consistently worry that the public just doesn't know enough about science, and that this general lack of public understanding carries with it dreadful consequences, jeopardizing everything from government financing of research to social progress. The common assumption is that greater science knowledge enables individuals to sort through the misinformation, "bad" science, and extraordinary claims that emerge during political disputes over science and technology. It is believed that greater science literacy would ensure that the public makes "proper" judgments about science.

LEARNING OBJECTIVES
Students will be able to:

- Differentiate key words in a reading passage
- Paraphrase paragraphs in a reading passage into single sentences
- Outline important topics in a reading passage
- Read for comprehension passages starting from the less complex to scientific journals over the course of a school year
- Demonstrate comprehension by scoring above 70% on tests covering key passage material without notes

PREREQUISITE KNOWLEDGE
This is an introductory unit. No prior knowledge or experience is necessary.

VOCABULARY
Key Words
Paraphrase
Outline

MENU OF ACTIVITIES
1. Key Words
2. Paraphrasing
3. Outlining

Activity # 1

TITLE
Key Words

OVERVIEW
This activity directs the student in determining the key words that guide the organizational structure and content focus of the written text.

CLASS TIME REQUIRED
1 - 40 minute period

MATERIALS
A science passage from a newspaper, magazine, science magazine or scientific journal

INSTRUCTIONS
Students will work individually in skimming a reading passage to determine key words that are the focus of the passage and also any words in which the meaning is not well understood.

ASSESSMENT
- Students will be able to define a list of words from the passage
- Review the outline activity later in the unit and determine if any key topic words are missing from the initial list of key words

Activity # 2
Paraphrasing

OVERVIEW
This activity directs students to paraphrase what they have read, accounting for the vocabulary words and concepts that are important to the excerpt. Students can compare their paraphrasings to see if they put the vocabulary words and concepts into their own words without leaving out essential information.

Class time required

1 - 40 minute period

CLASS TIME REQUIRED
MATERIALS
A science passage from a newspaper, magazine, science magazine or scientific journal

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INSTRUCTIONS
Students will work individually or small groups to paraphrase paragraphs into single sentences while incorporating key words and concepts.

ASSESSMENT

Students Activity # 3

TITLE
Outlining

OVERVIEW
The key to both outlining and summarizing is being able to distinguish between the main ideas and the supporting ideas and examples. The main ideas form the backbone, the strand that holds the various parts and pieces of the text together.

CLASS TIME REQUIRED
1 - 40 minute period

MATERIALS
A science passage from a newspaper, magazine, science magazine or scientific journal

INSTRUCTIONS
Students will organize their key words and paraphrasing into main ideas and supporting ideas either individually or in small groups

ASSESSMENT

- Determine if any key topic words or main ideas from the paraphrasing activity are missing

GRAPHING OVERVIEW

Graphs can summarize very complex information or relationship very effectively. Although graphs are explicitly taught in mathematics classrooms as an end in themselves, many subject areas such as science or social studies utilize graphs to represent and interpret relationships. So being able to interpret or construct graphical representations is a crucial skill for every student whether they want to pursue science or mathematics related careers. However, many researchers detected that many students lack graphing skills.

Brasell and Rowe (1993) studied high school physics students' graphing skills and they concluded that "[students] do not understand the fundamental properties and functions of graphs in representing relationships among variables… Their facility with graphs was generally superficial, grounded on a few, simplistic algorithms such as plotting data points" (p. 69). Janvier was one of the first mathematics educators to mention the problems that students have in interpreting graphs (Bell & Janvier, 1981; Janvier, 1981). Mostly he argues how global meanings of graphs and interpreting graphs are left out in mathematics classrooms, while reading data and constructing and reading certain points on graphs are emphasized. *(Özgün-Koca* August 2001)

TIME
Year Long Integrated into existing curriculum

MATERIALS
Real World Data (Tables, Graphs, Charts, etc)

PROCEDURE
Beginning of Year:
Provide students with real world data and to be able to select a single piece of data (numerical or

nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables; a food web diagram)
To have students identify basic features of a table, graph, or diagram
(e.g., headings, units of measurement, axis labels)

By end of Year:
Compare or combine data from two or more complex data presentations Analyze given information when presented with
new, complex information

Sources:
New Scientist
http://newscientist.com

Science Daily
http://www.sciencedaily.com/

Science Digest
http://www.sciencedigest.org/

Science Week
http://www.scienceweek.com/

Science News
http://sciencenews.org

Scientific American
http://www.sciam.com/

Popular Science Magazine
http://www.popsci.com/

Seed Magazine: Science is Culture
http://www.seedmagazine.com/

Union of Concerned Scientists
http://www.ucsusa.org/

Annenberg Learner
http://www.learner.org/exhibits/dailymath/getpicture.html

US Census Bureau
http://www.census.gov/

EdHelper

http://www.edhelper.com

Rubistar
http://rubistar.4teachers.org/index.php

Özgün-Koca **The Graphing Skills of Students in Mathematics and Science Education**
August 2001