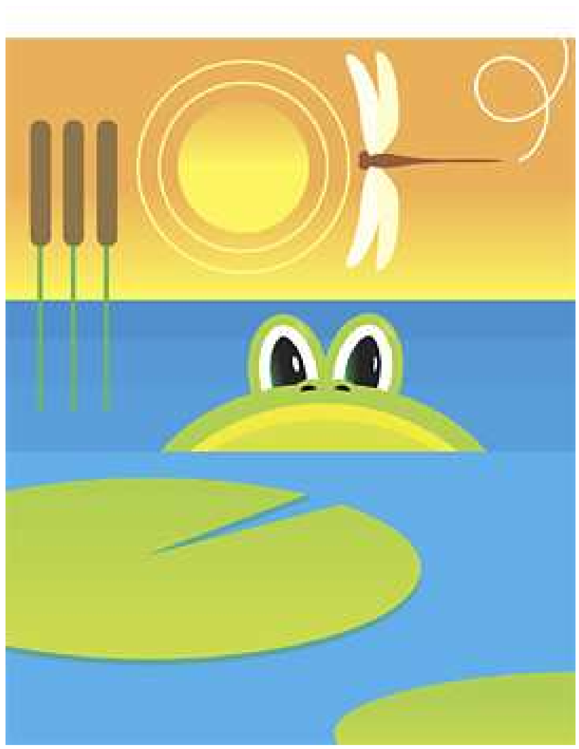
Middle School PLUS

(Performance Learning and Understanding in Science)



Threads in a Web

Middle School Unit

Study of the Flow of Energy Through Food Chains and Webs

CurrTech Integrations

Threads in a Web

Study of the Flow of Energy Through Food Chains and Webs

Teacher's Guide Containing
All Student Materials

Written by

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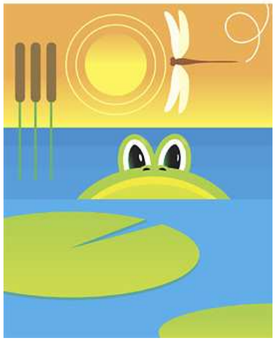

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(Performance Learning and Understanding in Science)

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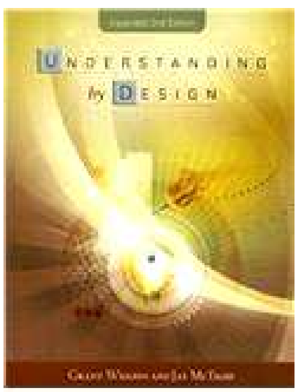
Introduction to Middle School PLUS۞

Middle School PLUS is part of a series of **P**erformance **L**earning and **Un**derstanding in **S**cience. These units represent an innovative approach to the design of curriculum and instructional materials in which there is an effort to create research-based, contemporary, and exemplary materials to teach science. All PLUS units are designed around science standards, as called for in both the National Science Education Standards (NRC, 1996) and the Benchmarks for Scientific Literary (AAAS, 1993). The Middle School PLUS units engage students in stimulating, authentic, and contemporary problem-based life science scenarios involving not only the life sciences, but also including the natural connections among the physical, environmental, and earth/space sciences, technology, and engineering. Drawing from the best in contemporary pedagogy, the Middle School PLUS units provide students with the opportunity to learn age appropriate concepts, skills, processes, and to acquire science attitudes and "habits of mind."

Middle School PLUS and Understanding by Design (UbD)

All units within Middle School PLUS have been designed (backward-planning) using principles of *Understanding by Design* (Wiggins and McTighe, 1998). *Understanding by Design (UbD)* is a well-known curriculum design process used to write units of instruction in a three-stage process –Desired Results, Assessment Evidence, and the Learning Plan. Many state departments of education, colleges and universities, and school systems advocate the use of *Understanding by Design* as a contemporary planning process for teaching and assessing state and national standards.



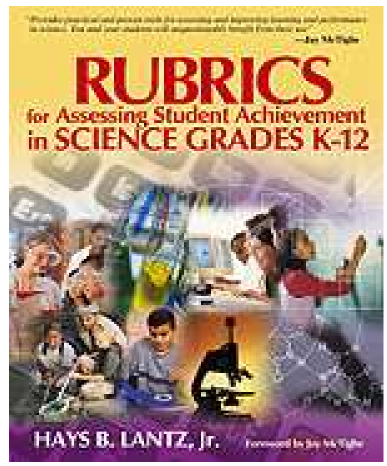
Understanding by Design (UbD) is a research supported framework for improving student achievement through standards-driven curriculum development, instructional design, assessment, and professional development. Developed by internationally recognized educators Grant Wiggins and Jay McTighe and produced by the Association for Supervision and Curriculum Development (ASCD), Understanding by Design is based on the following key tenets:

1. A primary goal of education is the development and deepening of student understanding.
2. Evidence of student understanding is revealed when students apply knowledge and skills within authentic contexts (performance-based).
3. Effective curriculum development reflects a three-stage design process called "backward design." This process helps to avoid the twin problems of "textbook coverage" and "activity-oriented" teaching in which no clear priorities and purposes are apparent.
4. Regular reviews of curriculum and assessment designs, based on design standards, are needed for quality control, to avoid the most common design mistakes and disappointing results. A key part of a teacher's job is ongoing action research for continuous improvement. Student and school performance gains are achieved through regular reviews of results (achievement data *and* student work) followed by targeted adjustments to curriculum and instruction.

5. Teachers provide opportunities for students to **explain, interpret, apply, shift perspective, empathize, and self-assess**. These "six facets" provide conceptual lenses through which students reveal their understanding.
6. Teachers, schools, and districts benefit by "working smarter"—using technology and other approaches to collaboratively design, share, and critique units of study.

Performance-based Teaching, Learning, and Assessing

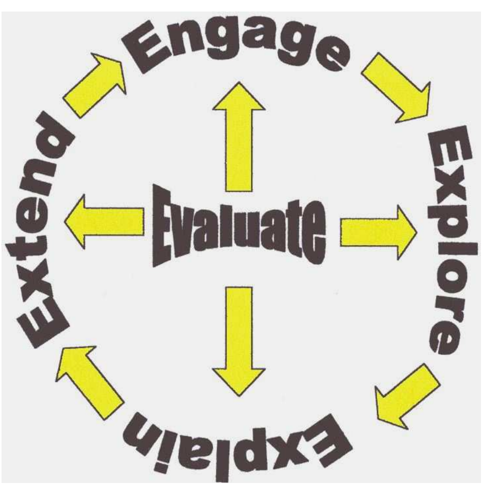
Many authors, among them Reeves (2003), Marzano, Pickering, and McTighe (1993), Lantz (2004), and the Educators in Connecticut's Pomperaug Regional School District 15 (1996), have been proponents of performance-based teaching, learning, and assessing in which students must demonstrate what they know and can do through the completion of meaningful performance tasks. All units within Middle School PLUS present opportunities for students to engage in multiple performance-based tasks and assessments, along with more traditional forms of assessment, such as selected response items.



Formative and summative performance-based activities and assessments have been thoughtfully sequenced and scaffolded to provide ample opportunities for students, teachers, parents, and others to assess student progress. An end of unit summative assessment contains selected and constructed response items.

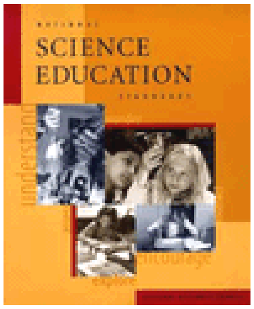
Extensive rubrics are provided for open-ended, performance-based questions and other performances that cannot be scored using typical right or wrong multiple choice items. Each activity within the units is accompanied by scoring tools, including a variety of field-tested and National Science Teachers Association (NSTA) endorsed performance list, holistic, and analytical rubrics (Lantz, 2004).

The Five E Teaching, Learning, and Assessing Cycle

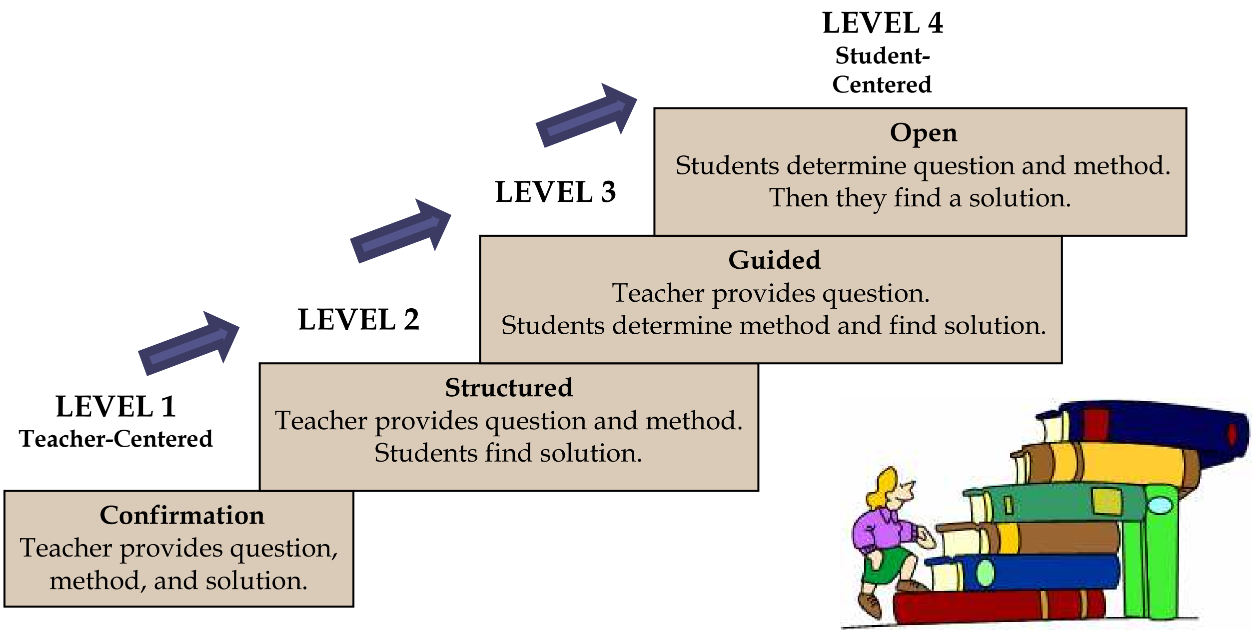


A modified 5E teaching, learning, and assessing cycle, incorporated into all PLUS units, is based upon research findings about how students learn science. These findings indicate that students learn best when they have an opportunity to **engage** in explorations in a hands-on/minds-on environment in which they make and pose **explanations** for their discoveries. **Engagement, Exploration, Explanation, Elaboration, and Evaluation** are the recursive phases of the 5E teaching, learning, and assessing cycle. All Middle School PLUS units contain many explorations, followed by explanations in which students must demonstrate an understanding of the concepts and skills being taught. The 5E cycle or modifications therof are often used in many contemporary science materials and textbooks..

A Standards-Driven Curriculum Using Inquiry



The National Science Education Standards (NRC, 1996), the Benchmarks for Scientific Literary (AAAS, 1993) the National Council of Teachers of Mathematics Standards (NCTM 1989 and 2000), the National Education Technology Standards for Students (ISTE, 1998, 2007)), and the Standards for Technological Literacy (ITEA, 2007) call for teaching, implementing, and assessing student understanding of inquiry throughout the curriculum. As a result, four scaffolded levels of inquiry (illustrated below) are included in most PLUS units, starting with the most structured form -confirmatory inquiry, moving on to structured inquiry, then to guided inquiry, and finally to open inquiry. As students learn the skills and processes, and the content of inquiry, they are challenged by activities that become increasingly more open.



This Teacher's Guide (TG) provides much detail about implementing PLUS units. A listing of the standards used to develop this unit , consisting of the National Science Education Standards (NRC, 1996) and the Benchmarks for Scientific Literary (AAAS, 1993), is provided for the teacher. Enduring understandings, essential questions, unit questions, general implementation hints, background information for the unit, and a detailed learning plan are provided as well.

This Middle School PLUS Teacher' Guide (TG) is available in two digital formats - Microsoft Word and a PDF file. The PDF files are smaller and easier to open and print. PDF files require Acrobat Reader. Changes to the PDF files cannot be made without Adobe Acrobat software; however, changes can be made in the Word documents.

Teacher -Friendly Units

Every effort has been made to design the PLUS units to be as teacher-friendly as possible, whether the teacher is a novice or an expert in teaching science. The novice teacher can pick up the unit and teach it exactly as it was designed and in the process provide a high quality instructional program. Activities are written with much detail, are very descriptive, and are highly structured for both the student and teacher alike. As a result, lesson planning has been greatly enhanced and simplified for the teacher. The expert teacher who knows about additional resources, materials, and instructional techniques can incorporate them into the unit, as everything is provided in a digital format and is easily modified for both present and future use.

Significant portions of the units within Middle School PLUS have been field-tested and reviewed by classroom teachers within the metropolitan Washington, DC and Baltimore areas, with their feedback being used to make final revisions.

General Implementation Hints for Teachers for PLUS Units

What is the philosophical, theoretical, and classroom-proven foundation for the UbD designed PLUS unit? How do I use this foundation for teaching and assessing student progress?

- This unit has been designed using concepts from *Understanding by Design* (Wiggins and McTighe, 1998) and particularly the backward mapping and WHERETO techniques advocated by the authors.
- .This unit has been back-mapped from the National Science Education Standards (NRC, 1996), and the Benchmarks for Scientific Literary, (AAAS, 1993).
- This unit has been designed using a **modified 5E** (**E**ngage, **E**xplore, **E**xplain, **E**laborate, and **E**valuate) teaching, learning, and assessing cycle (Trowbridge, Bybee, and Powell, 2000). The 5E teaching, learning, and assessing cycle within this unit is not linear in design but is recursive. There will be many Explorations coupled with specific Explanations, with fewer Elaborations; therefore, not every E will necessarily be in every lesson. However, every lesson should contain an Engagement and an Evaluation, with other E's "sandwiched" between.
- A typical one-day lesson follows an "**Engage – Other E's – Evaluate"** format using the activities and assessment/evaluation tools within the unit. For closure to each day's lesson, assess (Evaluate) student achievement either through self assessment, peer assessment, or teacher assessment. It is not necessary that the classroom teacher formally assesses and scores each activity.
- Problem-based learning is used to Engage the student in this unit and is then revisited in the Unit Elaboration.
- Two types of Engagement activities are advocated within this unit – a unit Engagement (tells the student where the unit is headed and what is expected of them) and a Daily Lesson Engagement (relates each lesson to the Unit Engagement).
- The unit Engagement is developed using GRASPS (**G**oal, **R**ole, **A**udience, **S**etting, **P**roduct/**P**erformance, and **S**tandards for evaluating student work).

- Each unit contains many lessons (many Explorations and Explanations) and will vary in length, depending upon student progress and their understanding of science concepts and development of skills and processes.

- Begin each lesson within the unit with a Lesson Engagement which would include: review of the work of the previous lesson as it relates to the unit engagement, statement of the objective for the lesson (which includes the assessment of the lesson), pre-assessment of student understanding, and any pre-teaching and modeling which students might need to be successful on the lesson to follow. Some lessons will need more teacher-direction than others.

- Both formative and summative assessments are an integral part of this unit The focus is on collecting evidence, including artifacts and products (Carlson, Humphrey, and Reinhardt, 2003) of student understanding throughout the unit so that **assessment can be used to guide instruction.**

- Examine the performance vocabulary to identify the terms students will need to know in order to complete the tasks (e.g., describe, explain, illustrate, analyze, compare, predict, persuade). Teach students how to respond appropriately to these prompts.

- Teach students to determine the number of separate steps required to complete activities and how to keep track of each step as they work through the activity. Use the CUCC strategy as cues for reading and following directions:

Circle	**Underline**	**Count**	**Check**
◯	______	(1, 2, 3, etc.)	√

Circle the key direction words.
Underline the information that goes with direction word.
Count (1, 2, 3 etc.) by numbering each direction word in order to show the number of steps that need to be completed.
Check and complete each step that has been numbered.

A master copy of CUCC (pages 18-19) is included in this TG that may be copied for student use.

- Share with the students prior to, during, and after the activity any non-task specific assessment/evaluation tools (rubrics and checklists) to identify the characteristics of excellent responses. "Paint the target."

- Use textbooks, audiovisuals, and other expository materials primarily during and after the Explanation phase of each activity. Almost without exception, use these materials only after the Exploration phase.

- Use the units to illustrate the characteristics of performance assessment tasks (e.g., call for thoughtful applications of knowledge in "authentic" contexts and use established criteria to evaluate student products and performances).

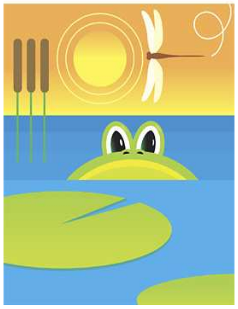
- Use these units as models for planning and developing new UbD units.

- Use lower grade-level (easier) units with students to familiarize them with the requirements of performance-based instruction and assessment. Using lower level units minimizes the content difficulty and allows students to focus on the process.

- Allow students to use the criteria to select examples ("anchors") of student responses that meet and do not meet the criteria.

- Teach students how to use the assessment/evaluation tools to evaluate and revise their own work. Have them work in groups to give each other feedback (peer response) based upon the identified criteria.

- Periodically, impose a reasonable time limit for the student to respond to task activities. This will give students some preparation for the time constraints of state-mandated summative testing/assessment.



Middle School PLUS
(Performance Learning and Understanding in Science)

Unit Overview

Title of Unit: Threads in a Web

Recommended Grade Levels: Middle School (grades 6-8)

Time Frame: Five to six 45-minute class periods

Brief description of unit:

In this inquiry – based unit students conduct a number of investigations that develop an understanding of the transfer of energy from one organism to another through feeding relationships. The student is then asked to bring closure to his/her learning through a series of brief writing activities and a visual display.

Unit Challenge (Performance Task) for Students - The science teachers in your school are having a contest. All science students are being asked to create a design for the bulletin board in the science hallway. The students in each class with the most effective bulletin board proposals will be invited to a pizza party, and the student whose design is judged best in the school will select a team of students to help install his or her design on the bulletin board.

The theme of the bulletin board is "All life on earth is linked, directly or indirectly, by the transfer of energy from its original source." Bulletin boards will be judged on how creatively and effectively they explain this theme, how accurately science concepts are stated, the amount of information used to illustrate and clarify science concepts, and how well the designs work visually.

Enduring Understandings for Unit:

1. Energy flows through food chains and food webs through various trophic (feeding) levels.
2. All energy on Earth for food chains and webs ultimately comes from the sun.
3. Many common foods contain sugar in varying quantities.
4. Producers, consumers, and decomposers are all part of any food chain or web.
5. Consumers may be herbivores, carnivores, or omnivores.

Essential Question(s):

1. Why are food chains and webs of importance on planet Earth?
2. Why is the sun considered the source of all energy on Earth for living organisms?
3. Why is it important to know about food chemistry, including the amounts of sugars in food?
4. What roles do producers, consumers, and decomposers play in food chains and webs?
5. Why are consumers classified as herbivores, carnivores, or omnivores?

Unit Question(s):

1. How much sugar is contained in some common foods?
2. What are food chains?
3. What are food webs?
4. What are the trophic levels in a typical food chain?
5. What are ecosystems?
6. What are herbivores, carnivores, and omnivores?

Threads in a Web– National Standards Addressed in Unit

National Science Education Standards Grades 5-8, (NRC, 1996)

Standard A. As a result of activities in grades 5-8, all students should develop abilities necessary to do scientific inquiry and understandings about scientific inquiry.

Science as Inquiry (8ASI)

Abilities necessary to do scientific inquiry

8ASI1.1 Identify questions that can be answered through scientific investigations. Students should develop the ability to refine and refocus broad and ill-defined questions. An important aspect of this ability consists of students' ability to clarify questions and inquiries and direct them toward objects and phenomena that can be described, explained, or predicted by scientific investigations. Students should develop the ability to identify their questions with scientific ideas, concepts, and quantitative relationships that guide investigation.

8ASI1.2 Design and conduct a scientific investigation. Students should develop general abilities, such as systematic observation, making accurate measurements, and identifying and controlling variables. They should also develop the ability to clarify their ideas that are influencing and guiding the inquiry, and to understand how those ideas compare with current scientific knowledge. Students can learn to formulate questions, design investigations, execute investigations, interpret data, use evidence to generate explanations, propose alternative explanations, and critique explanations and procedures.

8ASI1.3 Use appropriate tools and techniques to gather, analyze, and interpret data. The use of tools and techniques, including mathematics, will be guided by the question asked and the investigations students design. The use of computers for the collection, summary, and display of evidence is part of this standard. Students should be able to access, gather, store, retrieve, and organize data, using hardware and software designed for these purposes.

8ASI1.4 Develop descriptions, explanations, predictions, and models using evidence. Students should base their explanation on what they observed, and as they develop cognitive skills, they should be able to differentiate explanation from description — providing causes for effects and establishing relationships based on evidence and logical argument. This standards requires a subject knowledge base so the students can effectively conduct investigations, because developing explanations establishes connections between the content of science and the contexts within which students develop new knowledge.

8ASI1.5 Think critically and logically to make the relationships between evidence and explanations. Thinking critically about evidence includes deciding what evidence should be used and accounting for anomalous data. Specifically, students should be able to review data from a simple experiment, summarize the data, and form a logical argument about the cause-and-effect relationships in the experiment. Students should begin to state some explanations in terms of the relationship between two or more variables.

8ASI1.6 Recognize and analyze alternative explanations and predictions. Students should develop the ability to listen and to respect the explanations proposed by other students. They should remain open to and acknowledge different ideas and explanations, be able to accept the skepticism of others, and consider alternative explanations.

8ASI1.7 Communicate scientific procedures and explanations. With practice, students should become competent at communicating experimental methods, following instructions, describing observations, summarizing the results of other groups, and telling other students about investigations and explanations.

8ASI1.8 Use mathematics in all aspects of scientific inquiry. Mathematics is essential to asking and answering questions about the natural world. Mathematics can be used to ask questions; to gather, organize, and present data; and to structure convincing explanations.

Understandings about scientific inquiry

8ASI2.3 Mathematics is important in all aspects of scientific inquiry.

8ASI2.4 Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.

8ASI2.5 Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.

8ASI2.6 Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.

Standard C. As a result of activities in grades 5-8, all students should develop an understanding of structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, and diversity and adaptations or organisms.

Life Science (8CLS)

Populations and ecosystems

8CLS4.1 A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.

8CLS4.2 Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some microorganisms are producers — they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.

8CLS4.3 For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

8CLS4.4 The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

Standard E. As a result of activities in grades 5-8, all students should develop abilities of technological design and understandings about science and technology.

Science and Technology (8EST)

Understandings about science and technology

8EST2.1 Scientific inquiry and technological design have similarities and differences. Scientists propose explanations for questions about the natural world, and engineers propose solutions relating to human problems, needs and aspirations. Technological solutions are temporary; technologies exist within nature and so they cannot contravene physical or biological principles; technological solutions have side effects; and technologies cost, carry risks, and provide benefits.

8EST2.2 Many different people in different cultures have made and continue to make contributions to science and technology.

8EST2.3 Science and technology are reciprocal. Science helps drive technology, as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science, because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size and speed. Technology also provides tools for investigations, inquiry, and analysis.

Standard F. As a result of activities in grades 5-8, all students should develop understanding of personal health, populations, resources, and environments, natural hazards, risks and benefits, and science and technology in society.

Science in Personal and Social Perspectives (8FSPSP)

Populations, resources, and environments

8FSPSP2.1 When an area becomes overpopulated, the environment will become degraded due to the increased use of resources.

Standard G. As a result of activities in grades 5-8, all students should develop understanding of science as a human endeavor, nature of science, and history of science.

History and Nature of Science (8GHNS)

Nature of science

8GHNS2.1 Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.

History of science

8GHNS3.1 Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society.

Benchmarks for Scientific Literary (AAAs, 1993)

1. The Nature of Science

B. Scientific Inquiry

By the end of the 8th grade, students should know that

- Scientific investigations usually involve the collection of relevant data, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected data.
- If more than one variable changes at the same time in an experiment, the outcome of the experiment may not be clearly attributable to any one variable. It may not always be possible to prevent outside variables from influencing an investigation (or even to identify all of the variables).

C. The Scientific Enterprise

By the end of the 8th grade, students should know that

- Scientists are employed by colleges and universities, business and industry, hospitals, and many government agencies. Their places of work include offices, classrooms, laboratories, farms, factories, and natural field settings ranging from space to the ocean floor.

- Computers have become invaluable in science, mathematics, and technology because they speed up and extend people's ability to collect, store, compile, and analyze data; prepare research reports; and share data and ideas with investigators all over the world.
- Accurate record-keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society.

The Living Environment

D. Interdependence of Life

By the end of the 8th grade, students should know that

- In all environments, organisms with similar needs may compete with one another for limited resources, including food, space, water, air, and shelter.
- The world contains a wide diversity of physical conditions, which creates a wide variety of environments: freshwater, marine, forest, desert, grassland, mountain, and others. In any particular environment, the growth and survival of organisms depend on the physical conditions.
- Interactions between organisms may be for nourishment, reproduction, or protection and may benefit one of the organisms or both of them. Some species have become so dependent on each other that neither could survive without the other.
- One organism may scavenge or decompose another.
- Given adequate resources and an absence of disease or predators, populations of organisms in ecosystems increase at rapid rates. Finite resources and other factors limit their growth.
- All organisms, both land-based and aquatic, are interconnected by their need for food. This network of interconnections is referred to as a food web. The entire earth can be considered a single global food web, and food webs can also be described for a particular environment. At the base of any food web are organisms that make their own food, followed by the animals that eat them, then the animals that eat those animals, and so forth.

E. Flow of Matter and Energy

By the end of the 8th grade, students should know that

- Plants use the energy from light to make sugars from carbon dioxide and water.

- Organisms that eat plants break down the plant structures to produce the materials
- and energy they need to survive. Then they are consumed by other organisms.
- Over a long time, matter is transferred from one organism to another repeatedly and between organisms and their physical environment. As in all material systems, the total amount of matter remains constant, even though its form and location change.
- Almost all food energy comes originally from sunlight.

11. Common Themes

A. Systems

By the end of the 8th grade, students should know that

- A system can include processes as well as things.
- Thinking about things as systems means looking for how every part relates to others. The output from one part of a system (which can include material, energy, or information) can become the input to other parts. Such feedback can serve to control what goes on in the system as a whole.
- Any system is usually connected to other systems, both internally and externally. Thus a system may be thought of as containing subsystems and as being a sub-system of a larger system.
- Systems are defined by placing boundaries around collections of interrelated things to make them easier to study. Regardless of where the boundaries are placed, a system still interacts with its surrounding environment. Therefore, when studying a system, it is important to keep track of what enters or leaves the system.

12. Habits of Mind

D. Communication Skills

By the end of the 8th grade, students should be able to

- Organize information in simple tables and graphs and identify relationships they reveal.
- Read simple tables and graphs produced by others and describe in words what they show.

- Locate information in reference books, back issues of newspapers and magazines, compact disks, and computer databases.
- Understand oral, written, or visual presentations that incorporate circle charts, bar and line graphs, two-way data tables, diagrams, and symbols.
- Present a brief scientific explanation orally or in writing that includes a claim and the evidence and reasoning that supports the claim.
- Explain a scientific idea to someone else, checking understanding and responding to questions.
- Prepare a visual presentation to aid in explaining procedures or ideas.

Teacher Resources for Implementing Unit

Overview of Activities

Materials:

The listed materials at the beginning of this activity are intended for **groups** of students. Individual students need all of these items only if they choose to work alone.

Teacher Preparation:

Set up the room to have students sit in groups of 3 or 4. Assign roles to each student - Principal Investigator, Materials Manager, etc.

Preparation for Lab:

1. Put 10 mL of water in a graduated cylinder.
2. Dampen a sheet of filter paper. Place the filter paper in the funnel and put the funnel into a the graduated cylinder. Squeeze food you have previously chopped up in a blender through the filter paper until the level of the solution reaches 12 mL.
3. Each group will need enough of each solution to transfer 12 drops to a test tube at least two times.
4. "Clinitest" tablets are available in drug stores near supplies for diabetics. They can be cut in half with a sharp knife.

During the Activity:

"Clinitest" tablets are caustic. They should be picked up with tweezers. Students should protect their eyes with goggles and their clothing with lab aprons.

<u>During the Writing Activity</u>:

Give students the Writing in Science Scoring Tool before they begin writing the final copy. It can be use for peer response.

<u>Time for Activities</u>:

Activity 1 - two 45-minute classes.
Activity 2 - one 45-minute class.
Activities 3 and 4 - two 45-minute classes.

Websites for Teachers and Students

The websites listed below contain much background information on the concepts taught within the unit and are appropriate for both the teacher as well as the students. *However, these websites should always be reviewed by the classroom teacher prior to their use with students.*

http://www.vtaide.com/png/foodchains.htm- an excellent, interactive web site on food chains and food webs. One of the best!

http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm- another excellent, interactive web site on food chains and food webs.

http://www.arcytech.org/java/population/facts_foodchain.html- an excellent website containing many helpful links and definitions of terms.

http://en.wikipedia.org/wiki/Food_chain- a typical Wikipedia site containing many helpful links to definitions and examples.

http://www.gould.edu.au/foodwebs/kids_web.htm- this site allows the user to create various food webs including a marine food web.

http://qldscienceteachers.tripod.com/junior/biology/foodchains.html- this site offers basic to complex information on food chains and webs, as well as biomass pyramids and cycles that exist in the natural world.

http://www.enchantedlearning.com/subjects/foodchain/- this site provides a number of excellent printable food web worksheets that students could use for practice and/or review.

http://www.bcps.org/offices/lis/models/biomes6/index.html- this site is a webquest of the Baltimore county Public Schools, Maryland. Concepts of ecosystem, biotic and abiotic factors, and biomes are covered.

How do I get students to follow and unlock written directions? Use the following CUCC strategy.

CUCC Strategy for Reading and Following Written Directions

Students often have difficulty in "Reading to Perform a Task." The following mnemonic device could be used to assist them in their efforts to analyze fully all the components of a set of directions.

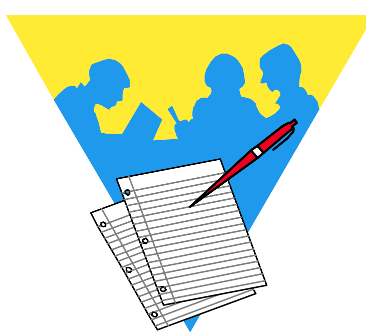
Circle
Underline
Count
Check

Circle the key direction words.

Underline the information that goes with the direction word.

Count (1, 2, 3 etc.) by numbering each direction word in order to show the number of steps that need to be completed.

Check √ and complete each step that has been numbered.



Cues For Reading And Following Directions

Circle

Underline

Count (1, 2, 3, etc.)

Check √

This page could be developed into a transparency or poster for the students to review.

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