A Focus on Wetland Ecology for Elementary Grade Science

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INTRODUCTION

Wetlands are an important topic for Houston grade students to study in order to understand natural ecology. Wetlands provide habitats for native plants and animals. Wetlands are valuable because they assimilate nutrients, and stabilize sediment (Bohlen). The city of Houston is built over a vast area that would have historically supported extensive wetlands. Wetlands are essential components of the hydrological system and play a key role in preventing neighborhood flooding. Wetlands have a variety of names, such as marshlands, bogs, wet meadows, potholes, and playas.

Our school is an inner city school with a natural habitat enabling students to observe marshland ecosystems without leaving the campus. It is ecologically feasible to create a wetland on campus (Leck 310). Schools can easily manage this type of outdoor living classroom, for it is simple project which students and parents alike can participate in.

Many other schools in the Houston Independent School District are now in the process of building similar natural habitats for field laboratory curriculum. The habitats enable teachers to conduct outside laboratory activities within the schoolyard.

The habitat on the campus is now an important educational asset. The habitat offers opportunities for students and parents to observe and understand nature. The observation of nature by students is a fundamental teaching approach in the study of ecology. The habitat allows a hands-on approach to learning that enhances science education through inquiry. The process of introducing students to nature by observation improves their content mastery skills that they could apply to other subject areas, such as mathematics or reading.

OBJECTIVES

The understanding of plants and animals in an ecosystem is a current strand in the Texas essential knowledge skills set. The main objectives of the unit are: to describe environmental changes in which some organisms would thrive, become ill, or perish (SCI.3.2.06); to observe and identify observations of organism with similar needs that compete with one another for resources such as oxygen, water, food or space (SCI.3.2.04); and to analyze information using scientific instruments and tools for lab activities (SCI.5.1.13).

Students exposed to these basic objectives will develop a sense of wonder. This wonder about nature is the basic component for all scientific discoveries. Teachers should instill this attitude though hands-on science. Science is a way of thinking. Students and teachers all over the world can make a connection to the environment in which they live. By observing the environment, either alone or in groups, one can recognize and begin to understand how organism live or perish. The factors that affect their ability to survive could be as common as pollution, global warming, or species overpopulation. The habitat provides observational opportunities for the study of nature by science students. The students can share their discoveries with classmates, and then apply these skills at home. The skills they can learn from studying ecology include water conservation, recycling, and pollution reduction.

The lesson plans in this unit suggest teaching methods to use to facilitate science curriculum and instruction. One method is to teach science is with a constructivist structure. Students will scaffold scientific thoughts and actions. Students introduced to constructive learning methods understand on a higher cognitive level by supporting their beliefs through synthesizing and analyzing information.

Students will enhance their thinking by planning and implementing descriptions and observations and simple controlled investigations (HISD SCI.5.1.03). The students will attempt to explain natural phenomena using mathematics. Newton's laws are based on natural observations which he proved mathematically. Perhaps the apple falling from the tree provides only an elementary introduction to gravity; however, students can begin with this kind of example from everyday life and move on to understand complicated concepts.

Students have the chance for this discovery the moment they observe their natural surroundings. These surroundings are in the schoolyard right in the habitat. The students will demonstrate their evolving comprehension of these concepts by constructing graphs and tables or charts using data from scientific tools and instruments (HISD 5.1.07). Understanding science in this manner guides students in creating portfolios from what they have seen and observed. By observing nature students will learn to identify an ecosystem (HISD SCI.3.2.03). Cognitive development begins when this connection is made. This component of drawing inferences in science is the same for other content areas like mathematics. Students will be able to relate patterns and cycles revealed in nature to their everyday lives. The students will then expound on how the ways they adapt to the environment are also related to other organisms adapting similarly in the natural world. The students will realize that we are all part of this universe. We share commodities, such as water, food, air, and space, with all living organisms.

The students will learn to identify adaptive characteristics of species that improve their survival, and to compare these characteristics to those of other organisms (HISD SCI.5.2.09). The students will come to the realization that those organisms that fail to adapt will perish.

The students will understand that this cycle for survival is applicable to their lives. They realize that we are also are trying to survive in a harsh environment. We also play a part in the overall scheme within a food web that is dependent on the actions a species may make for survival or extinction. Students will gain an understanding of food chains and food webs (HISD SCI.3.2.05). The students will realize that they too are part of a food web and that what we do as people to the environment also has consequences for the ecology of animals and plants that share the earth with us.

The effect man has on the environment is catastrophic. As the world's population expands, we clear land that once was forest or marshlands, and turn it into suburban districts with housing, commerce, industry, and pavement. Historically, generation after generation has had little regard for the local environment. Man has destroyed much of the environment in the service of human progress. The level of pollution, the health of the ecosystems, and the chemistry of the water and soil are changing. Plants and animals that were once plentiful and abundant are now on the endangered species list.

The teacher will guide and instruct students to think about solutions to restore the ecology of damaged wetland ecosystems. This focus on wetland plants will prompt students to realize the importance of studying wetlands. The relevance of wetlands water retention properties by wetland soils and the prevention of erosion by wetland plants are significant factors in wetland ecology (Dalrymple 1015).

This process of correcting and restoring the environment from its present state starts with projects like Wetland restorations, Arbor Day, and Green Day. Students must understand

properties of soil, its capacity to retain water, and the ability it has to support life if any projects are to be successful (HISD SCI.4.4.01).

The wetlands have gained new attention in recent years. Wetlands provide important ecosystem functions and values, such as wildlife habitats, water filtration and flood protection (Houlahan *et al.*79). Water moves very slowly through a wetland. The filtration process recycles water and nutrients back into the ecosystem. Another function is flood protection and soil retention. Soil retention by the plant roots helps reduce the overflow of water.

The destruction of wetlands for housing population expansion was catastrophic when hurricanes destroyed local coastlines. Wetlands could provide a buffer in these zones of flooding. Students that are strongly motivated by this unit may become the future scientists that will one day find solutions to our present environmental issues and concerns.

Teachers need to prepare students to face society's problems through the use of science. Even though science does not always answer the questions we face, it does provide a framework or process to apply knowledge skills for problem resolution. Science education is an instrument to provide the student with skill sets needed in our society to turn short term solutions into long term feasible goals. The student will learn to use a variety of tools and methods to conduct science inquiry and analyze information to explain direct and indirect evidence (HISD SCI.5.1.05). These methods are a part of the process to solve global environmental concerns.

These science objectives first appear to be without forethought. The wording is simple and seems to clearly define a science concept in a limited sense. However, the meaning and implications they bring to students leads to a prudent attitude toward nature. In nature there is a universal harmony and balance of life and death, and each part is an interconnecting element that contributes to the whole. Science education is fundamental to this understanding of nature and ecology.

RATIONALE

This unit focuses on the ecology of wetlands for elementary grade levels. Students learn through discovery. The knowledge is gained from experiences in nature, such as investigation and observations. Hands-on lab activities from natural habitats are more exciting for students than learning from books. This is a minds-on approach to science learning. Students will come to the understanding that nature is all around us. The students will realize that by observing and studying a living plant they gain more knowledge from the actual experience.

Students like to go outside and study nature because it is fun and exciting. It provides them an opportunity to practice hands-on inquiry. The natural setting of on-campus habitats imparts students with a sense of wonderment. The students communicate what they discover with one another. They can then debate and explore new ideas from their observations in a process that offers them a chance to express their viewpoints. Students seem to learn more and achieve greater academic success by understanding complicated science concepts from a visual perspective.

Wetlands provide diverse science learning on ecology. The environment of the natural habitats and the interaction of species dependent on each other for survival and reproduction create a living laboratory for students to study. Wetland habitats are accessible for students locally. The convenient location to wetlands in the area makes the investigation more relevant to teach than a rainforest or tundra. Many schools have limited funds to budget field trips. Teachers have access to wetlands on the school grounds where they can conduct outside laboratory activities without the expense and logistical complications of off-campus field trips.

Schools need to develop scientists for the future, and should start with the children of today. Schools should have science educational goals to improve student achievement and

understanding. The introduction of these goals should start as early as kindergarten. The science curriculum and instructional programs should have a scope and sequence plan that integrates the natural curiosity of children and the knowledge of teachers. The science program incorporates extended learning centers in every classroom. Science equity occurs when every child has the opportunity to experience the excitement and joy from the discovery of a caterpillar or a tadpole in the school's habitat.

This unit will discuss elementary grade science from an ecological perspective using wetlands as forum for science content and application. The students will gain an understanding of life science objectives by identifying and describing characteristics of plants as living things. This goal is accomplished by having students observe in a natural ecological setting the habitats of organisms within a natural ecosystem. Habitats on school grounds provide a direct connection with the natural environment and allow a close up study of ecology. The observations of habitats and plant life will motivate students to further study ecology later in life for scientific solutions to our world's environmental concerns and issues.

Teachers can extend the learning centers by utilizing the habitat in multitude of instructional formats. The study of ecology is an aspect of science that has been overlooked in elementary schooling. The reason is that teachers who are overwhelmed by the high stakes testing have a tendency to concentrate on other subjects instead of science. Teachers need to realize that amalgamating science content in math or reading synthesizes learning and promotes academic success for students.

Teachers can introduce literature that has ecology or plant life related themes. The studying of plant life introduces the concepts of the food chain and of plant adaptations to the environment. Teachers can expand these themes to include social studies. Literature that students could read could include histories discussing times when society changed the environment for its survival or to accommodate population expansion. Students will realize that this change in the environment and the competition for vital commodities resulted in some plants perishing. Having students read stories about the environment only enhances learning. They will realize that plants play an important part in our lives. By reading about science in literature, students will come to appreciate the world around them and the consequences of man's actions.

The intent of this unit is for teachers to recognize these components and teach these basic science objectives to enable future students to find solutions to the world's environmental issues. Teaching these concepts to elementary children in science will foster a respect for the environment and the ecology of wetlands. Students will come to understand that people globally compete for the same resources as plants and animals.

The most obvious environments that are in danger today are the wetlands. Man has created environmental problems in nature with construction, building of roads, clearing land for housing, and polluting the air and water from industry. Many wetlands are drained and filled for housing and industry. Only through education and restoration projects will wetlands be recognized as a valued asset to the community.

This unit has the rationale for teachers to achieve these concepts for student understanding through life science instructional plans, lab activities, and supplemental lessons.

UNIT BACKGROUND: WETLAND HABITATS

This unit has in each lesson an instructional plan for teachers to achieve the goals of understanding life science through observation, analyzation of data information, collecting and comparing plant physical properties, and recording experiences in science journals**.** The series of life science lesson plans on plants may take four days to complete**.**

The first activity for lesson one and two is a field trip to Brays Bayou Mason Park to collect and identify plant populations. The plant identification lab exercise is conducted using digital cameras, or collecting specimens in small containers. The second activity for lesson three and four is to collect water and soil samples from the wetland park. This activity will compare and contrast the water and soil samples. The field lab assignments will be structured so students will include their observations, experiments, and discoveries in their science journals for presentations.

Students will be able to focus on ecology from the viewpoint of a wetland habitat.

The analysis of plants within an ecosystem enables students to compare and contrast living organisms, creating a visual learning experience. Learning from observation is an essential element for student academic success. Natural observation is a learning skill teachers must introduce to students to understand natural phenomena. The students will realize that wetland plants are different from other plants due to these physical characteristics. Learning observation skills will enable students to explain plants from a scientific perspective. These skills develop from describing and recording physical properties of plants.

The unit will aid teachers to teach science concepts. These concepts are the ecology of wetland plant habitats, the impact on wetland plant life, and plant adaptation to a watery environment. Students will apply these observations for science investigation. The recording of this data information is essential for scientific inquiry. This hands-on approach creates science inquiry out of the classroom.

The students will use scientific methodologies to collect and analyze data. The students will use scientific tools or instruments to classify plants and their parts. The student will learn to process and identify plants. The students will describe major factors that shape wetland environments using data collected on field trips. Some of these factors are nutrients recycling, water retention, and man's influence on wetlands.

The objectives in lesson one represent a strand in the Texas essential knowledge scope and sequence for elementary grade science. Lesson one's instructional format lays out this scientific objective. Lesson one introduces vocabulary that is essential to the understanding of wetland ecology and environments. The lesson collaborates with other content areas using technology. Teachers should encourage technology skills in students by researching plant classifications and plant functions. This information gathered on plant specimens from computer research will lead to a greater understanding of plant adaptation to the environment. Student assessment is determined by the classification from pictures and the fabrication of three dimensional plant models. This lesson will make students more aware of classifying and identifying plants.

Lesson one suggests a Montessori approach to teaching science. Teachers should challenge students in designing classification systems as well as understanding the importance of the plants' adaptive features. Teachers must measure academic performance by having students build arguments, defend their positions, construct models, and resolve problems. The plant activity in lesson one will develop higher student cognitive levels and understanding. Teachers can expand student learning by having a flexible lesson cycle that allows for students to think independently.

Lesson two proposes inquiry in the classroom. The skills needed for inquiry based learning start with a hands-on approach. The teacher must introduce cooperative learning skills like sharing, contributing ideals, and discussing or developing theories. The lesson has activities that demonstrate application of concept objectives. The lesson on plant adaptation and food chains is well designed for students to become inquisitive learners. The instructional format is plant adaptation. Students will understand that wetland plants have adapted to the environment by being submerged under water for lengths of time. Students will observe these plants and their

special niche in the habitat. The students will record and illustrate these plants in their journals for later investigation and an ecology presentation.

The development of small groups not only encourages independent study but also teaches students to work collectively through the food web activity. These wetland plants also play an important function of the food web. The plants are a source of food for many wetland animals. Students realize the importance of the food chain as they work out how each animal is dependent on the other as a source for food energy. The teacher becomes a facilitator as the students explore the activity for themselves.

Lesson two encourages an experiential education by having students build a mural with pictures from wetland habitats depicting a food web. Experiential education is the process of actively engaging students in an experience that will have real consequences. Students will make discoveries and experiment with knowledge themselves instead of hearing or reading about the experiences of others. Students also reflect on their experiences, thus developing new skills, new attitudes, and new theories or ways of thinking (Kraft *et al.* 210). The teacher can then model the demonstration by removing an organism from the food web and prompting the students to think cognitively about the consequence. This activity develops students' thinking by inferring through cause and effect. Student discussion could scaffold higher learning to local and global environment issues. These issues would be environmental concerns with pollution, environmental restoration, and the destruction of natural habitats for man's usage.

The objective in lesson three is to understand the soil properties of wetland habitats. The lesson focuses on personal strategies students may use to understand new information. The lesson is designed for teachers to identify what needs to be learned. The specific science concepts developed in this unit are tied to the instructional objectives. Teachers need to have the students practice the skills required by the objectives, yet allow for students to sequence their inquiries for greater understanding of content. This approach to learning gives students an opportunity to scaffold previous knowledge through a variety of learning modalities.

The activities for lesson three include collecting soil samples from the wetland habitat. The soil will be placed in graduated cylinders for analysis of soil particles. The students will document the physical characteristics of each soil sample. The students will measure the height of bands of silt, sand, and clay-sized particles. The measurements from the samples will be charted and graphed. The students will take pictures of their graduated cylinders for documentation. They will then write the results of each experiment in their science journals for their presentations.

Group activity, or model centered instruction, enables students to learn problem solving by collaboration and teamwork. The students learn problem solving by focusing on the physical properties of the soil. The soil activity problems should be aligned for active student learning. The teacher should give support by encouraging students to design dynamic investigations for problem solving.

Lesson four objectives deal with water from the wetland habitat. Teachers should apply a learning strategy that incorporates intellectual skills and cognitive strategies. The teacher should create expectancy in the students for problem solving. The schoolyard water activity compared to the wetland habitats offers students a chance to practice problem resolution. The hands-on lab activity with the water samples qualify this aspect of student learning.

Students will recall prior learning methods used in the soil activities in lesson three to present new information for lesson four water activities. The teacher will provide learning guidance and feedback.

Master lesson planning would consist of covering components of wetland ecology. These components are observation of natural ecological settings, collecting and analyzing data from

wetland habitats, and discoveries written in science journals. Rubrics, glossary, charts, expository text, and worksheets are located in the appendix for grading purposes.

Cattails (Photo by M.G. Elwood at Braes Bayou Wetlands Mason Park, Houston Texas 2007)

LESSON ONE: WETLAND ECOLOGY WETLAND PLANT HABITATS

Life Sciences Grade 5

Estimated lesson cycle: 45 minutes

Objectives

Students will learn to identify an ecosystem (SCI.3.2.03). Students will predict adaptive characteristics by organism in an ecosystem (SCI 5.2.11).

Elicit Prior Knowledge

The students will make a chart listing different physical characteristics of plants, such as leaves, roots, stems, and flowers. The students will write in their journals the significant functions of each plant part.

Notes

The concept is best demonstrated by having students observe natural ecological settings like a marshland habitat. Students will collect data from their school's habitat or from a local marshland field trip for comparison.

Engage

Have the students review a slideshow of wetland plants. A good website for biomes is http://www.enchantedlearning.com.

Introduction

Plants in a habitat are major components comprising a wetland ecosystem. A marshland plant to hold and show students is a good focal point.

Purpose

Students will understand that wetland ecology and plant habitats are important components in life sciences.

Concept Development

The role of plants in a community and their adaptive features.

Key questions

- *What is an ecosystem?*
- *What is ecology and why study it?*
- *What plants are in a wetland environment?*

Student Practice

The student lab teams will identify and label all photographed wetland plants collected. Students will realize plants can live in a variety of environments. The students will research plant roles and functions and find images of wetland plants on the computer.

Note: Computer time should be allowed for student's access to websites for wetland plant pictures for identification. The science journals should include: three journal entries describing research activities, students' personal reflections on their experiences, observations, and discoveries. The students will present a report from their science journals.

Guided Questions

What are some of the physical adaptations of wetland plants?

How do these physical adaptations help wetland plants survive?

Why do these wetland plants live in a watery environment, as opposed to a forest?

Assessment

The K-W-L-H teaching technique is a good method to help students activate prior knowledge. This technique is a group instruction activity developed by Donna Ogle (1986). KWLH serves as a model for active thinking during reading.

K - Stands for helping students recall *knowing* about the subject.

W - Stands for helping students determine *what* to learn.

L - Stands for helping students identify what is *learned*.

H - Stands for *how* we can learn more.

The students will complete an observation chart from data information from science journals. Venn diagrams will help students compare and contrast plant samples. Graphs and charts will help students explain plant samples physical properties and characterizes from measurements. Rubrics for grading are in the appendix.

Evaluation

Review the student's journal for completed reports, as well as computer research printed reports on wetland habitats. The evaluation follows a standard writing rubric. The rubrics are in the appendix.

Closure

The lab teams will present to the class a multimedia presentation using computer technology. The presentation could consist of slideshows, CD formats, or Photoshop galleries. The mural will illustrate major components necessary for the ecosystem to function. Students' portfolios should include an explanation of the role and function of wetland plants. All graphs and charts with plant measurements, such as geometric shapes, heights, size, or other attributes, should be labeled and incorporated into the presentation.

Materials

Wetland plant samples or pictures, containers, traditional and electronic resources, such as books, magazines, pamphlets, newspaper articles, CD-ROM reference software, Internet access, and computer stations.

***Web sites*:**

This site of Ramsar Wetland in Iran for teacher resources.

http://www.ramsar.org/

This site has information on wetland habitat for teacher resources. http://epa.gov/owow/wetlands

This site has information on wetland maintenance for teacher resources. http://www.wetlandcare.com.au/wca_home.asp

***Vocabulary*:** See glossary in appendix.

Keywords: *Ecology, Ecosystems and Habitats*

Ecology: The relationships between individual organisms and between organisms and their environment.

Ecosystem: A function of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size – a log, pond, field, forest, or the earth's biosphere – but always functions as a whole.

Habitats: The natural conditions and environment, for example, forest, desert, or wetlands, in which a plant or animal lives.

Suggested Reading:

Box Turtle at Long Pond, William T. George

Come Out, Muskrats, Jim Arnosky

Lab Activity:

1. Have the students look up images of marshland animals and plants from the computer web sites. One excellent website is: http://www.enchantedlearning.com/biomes/marsh/freshwater.shtml.
2. After printing out the images of these animals and plants, have the students paste them to 3x5 note cards. Then have the students write a short essay on the roles and function of each animal or plant to the back of the note cards. Later, they can use the pictures to create an ecology hand book.
3. The ecology hand book should have charts or Venn diagrams labeling or detailing the physical characteristics that differentiate the wetland plants from the school yard plants.

LESSON TWO: WETLAND ECOLOGY WETLAND PLANT ADAPATION FOR SURVIVAL

Life Sciences Grade 5

Estimated lesson cycle: 45 minutes

Objectives

The students will learn to compare adaptive characteristics of species that improve their survival. HISD (SCI.5.2.09)

The students will understand and interpret food chains and food webs. HISD (SCI.3.2.05)

Elicit Prior Knowledge

Have students utilize their KWLH charts to list what they know about plant adaptation and how these features aid them to survive.

Notes

Plant adaptation is an alteration or adjustment in structure often hereditary by which a species or individual improves physiologically to survive in a particular environment.

Engage

Have student identify pictures of the structures of leaves, stems, and flowers to contrast submerged wetland plants floating, and emergent structure counterparts.

Introduction

Students will understand the relevance and importance of physical adaptation for living organisms to survive in their environment.

Purpose

Students will recognize the importance of these physical adaptations in wetland plants as an aid in survival.

Concept Development

Plants are composed of various structures that work independently, but for the plant to survive all parts must function as a whole. Plants have a major role in the food chain. Students will understand the difference between a food chain and food web.

Key questions

What are some adaptive characteristics of plants?

How are plants important to the food chain?

Student Practice

Instruct students to complete KWLH charts illustrating adaptations in

leaves, roots, and stems. The students should research images of wetland plants structures. The student will construct three dimensional models detailed in the lab activity.

Guided Questions

- *What are some physical adaptations of wetland plants?*
- *What is the role and function of wetland plants in the food chain, or food web?*

Assessment

The Pre-assessment test will compare and contrast the physical adaptation characteristic of wetland plants to school yard garden plants. The Post-assessment test will ask the students to arrange the note cards with the plant and animal images to form a food web along with TEK's driven questions. Rubrics for grading are in the appendix.

Evaluation

The student's journal is scored by the rubric along with the food chain poster.

Closure

Have the students place and position their note cards on the habitat wall poster. This will visually portray to the difference between a food chain and food webs. Have the students evaluate each others food chain poster portfolios. This will enable students to determine limitations on models, communicate valid conclusions, and critique scientific explanations.

Materials

Poster board, 3x5 foldable note cards, markers, CD-ROM reference software, Internet access, and computer stations.

Web sites

These are good sites for wetland plants and habitats:

http://www.plantations.cornell.edu

http://www.wetlandcare.com.au/wca_home.asp

Vocabulary: See glossary in appendix.

Keywords: ***Biome, Food Web, Food Chain***

Biome: A division of the world's vegetation that corresponds to a particular climate and is characterized by certain types of plants and animals.

Food Web: A food web *extends* the food chain concept from a simple linear pathway to a complex network of interactions.

Food Chain: A hierarchy of different living things, each of which feeds on the one below.

Suggested Readings:

Frogs, Toads, Lizards and Salamanders, Nancy Winslow Parker and Joan Richards Wright

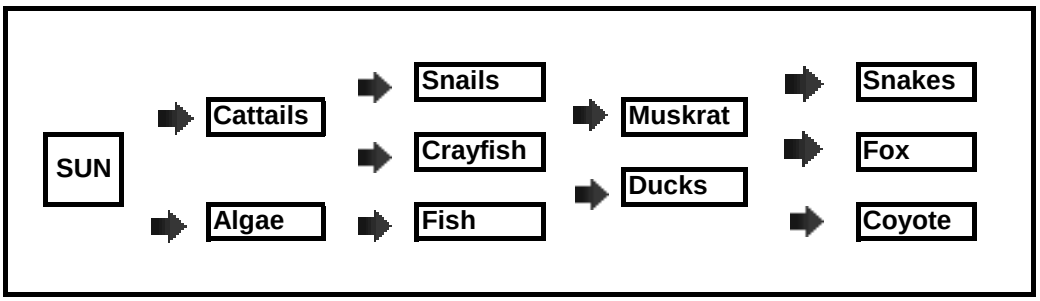
Way Cool Science, C.T. Bristol

Food Chains, Bobby Dalman and Burns Kylie

Lab Activity:

1. Have the students sort through a variety of images of animals and plants from various habitats.
2. Then have the students place the images for wetland animals and plants on simple food web wall posters. This sorting and placing the images on the posters will scaffold ecology learning that certain animals or plants live in wetland habitats depend on each other for survival. Students will understand the importance of each organism within the food web.
3. The finished wall poster will model the food web poster below.
4. Attaching the note card images with Velcro. Then ask the students if one of the organisms is removed from the food web what is the resulting consequence. This activity takes the students into higher cognitive thinking of inferring through cause and effect.

Simple food Web



LESSON THREE: WETLAND ECOLOGY WETLAND ECOLOGY SOIL CONNECTION

Life Sciences Grade 5

Estimated lesson cycle: 45 minutes

Objectives

The student will understand properties of soil including texture, capacity to retain water, and the ability to support life (SCI.4.4.01).

The student will know to use variety of tools and methods to conduct science inquiry and analyze information to explain direct and indirect evidence (SCI.5.1.05).

Elicit Prior Knowledge

Students will observe and analyze the composition of soil samples. Have students utilize their KWLH charts to list what they know about soils and how these qualities support life.

Notes

The concept is demonstrated by having students understand that soil samples are either organic or mineral based. The schoolyard sample soil is usually mineral based. The wetland soil sample is usually organically based. The students will analyze each sample to classify the residue found. The residues of organic soils consist of a high volume of decaying plant material, and a small volume of sand, clay, or small rocks. Mineral soil samples have a large percentage of sand, silt and clay, and a small proportion of organic material. The students will write in their journals the physical characteristics of the samples noting such differences as color, particle size and volume, and moisture content.

Engage

The students will handle the independent soil samples in their hands and note the differences.

Introduction

The students will comprehend that soil has different texture, moisture levels, color, and physical attributes that are measurable for inquiry.

Purpose

Students will understand that different soils support life in different ways by the capacity to retain water and to provide nutrients for plants.

Concept Development

Students will use a variety of instruments to test properties of soils.

Key questions

What are some physical properties describing the soil in hand?

How will we measure the difference between the soil samples?

Student Practice

Instruct student to complete KWLH charts illustrating the physical attributes of soil. The student should research soil to understand soil particle compositions by building a soil layered model inside a jar.

Guided Questions

What are the visual particles seen?

Why did the soil particles form the layers inside the jar?

Assessment

The Pre-assessment test will compare and contrast the physical properties and characteristic of wetland soil to school yard garden soil. The Post-assessment test the students will complete the lab exercise of soil volume measurements, along with TEK's questions on soil composition and soil layers. Rubrics for grading are in the appendix.

Closure

Have the students work together to complete the soil sample experiments. The students will then write in their science journal their discoveries, results, and conclusions including diagrams and chart of soil layers.

Materials

Soil samples from the school yard and soil samples from a marshland habitat, plastic bags or small containers with lids to carry soil samples, soil sample kit, microscopes, hand lens, thermometers, digital cameras, magnets, safety goggles, and safety gloves.

Web site

This is a site for soil composition: http://soil.gsfc.nasa.gov/soilform/weather.htm.

Key Words*: Soil, Humus, Loam*

Soil: the top layer of most of the earth's land surface, consisting of the unconsolidated products of rock erosion and organic decay, along with bacteria and fungi

Humus: a dark brown organic component of soil that is derived from decomposed plant and animal remains

Loam: an easily-worked fertile soil consisting of a mixture of clay, sand, and silt and sometimes also organic matter

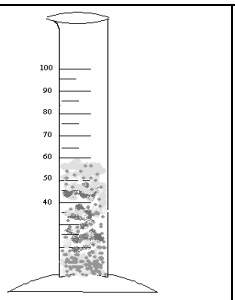
Vocabulary See glossary in appendix.

Suggested Reading

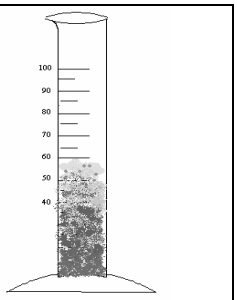
Wetlands: Ecozones, Linda M. Stone

Lab Activity

1. Place the soil into a large graduated cylinder. Then fill the cylinder with water and shake it. The sample soil particles will become suspended in the water. Then set aside for a while. The particles will begin to settle. Gravity will cause the densest particles (gravel and sand) to quickly sink to the bottom. The fine clay particles will be the last to settle. Organic matter will float to the top. Using a metric ruler, it is easy to measure the bands of settlement and classify each layer. Students will be able to measure height of each and individual bands of silt, sand, and clay-sized grains.
2. This will give a total measurement of each proportional soil sample to the whole soil



Suspended Soil Particles



Bands of Soil Settlement

volume. The students will document any presence of mineral deposits by the magnets, and record any temperature changes. The students will take pictures of their graduated cylinders, write results of each experiment, and hypothesis possible landforms where each sample could have been taken. The student's measured data information will be charted and graphed comparing the soil layers. Lab exercise forms are in the appendix.

LESSON FOUR: WETLAND ECOLOGY WETLAND ECOLOGY WATER

Life Sciences Grade 5

Estimated time 45 minutes

Objectives

The students will plan and implement descriptive and simple controlled investigations. HISD (SCI.5.1.03) The students will construct graphs and tables, or charts using data from scientific tools and instruments. HISD (SCI 5.1.07)

Elicit Prior Knowledge

Have students utilize their KWLH charts to list what they know about water properties and how this affects their everyday life.

Notes

Water quality can be measure by several tests. This lesson plan focuses on pH and turbidity. Other tests, such as hardness, salinity, and dissolved oxygen, are an extension lesson for independent student study. Pollution in the water may change the pH and could harm plants or animals.

Engage

The students will investigate the independent water samples from the wetland area from the school yard water sample observing and noting the physical properties (clarity, color, smell, suspended particles) using observations. Students will record the data into their journals.

Introduction

The students will evaluate water composition and the effects it has on supporting life.

Purpose

Water quality testing is a crucial element for preserving safe drinking for the public, as well as the stabilization of healthy communities of organism that live in or near by water.

Concept Development

Students will use controlled investigation of water samples to determine water quality using various field tests. They will then record this data and generate graphs and tables from their measurements.

Key questions

Why is the school yard's water sample visible different from the wetland's sample?

What is the significant of recording this data in charts and graphs?

Student Practice

Instruct student to complete KWLH charts illustrating the visible physical attributes of the two water samples. The student should research water on the computer to understand pH scales and water turbidity.

Guided Questions

Why did the litmus paper change colors?

What causes the water to become opaque?

What are your graphs of the water samples trying to tell us?

Assessment

The Pre-assessment test will compare and contrast the physical properties and characteristic of wetland water samples to the school yard's water sample. The Post-assessment test the students will complete the lab exercise of water volume measurements using graphical data representation. Rubrics for grading are in the appendix.

Closure

The students will take their data tables and create graphic tables using computer technology and graphic design software. The software, Microsoft Excel, has various graphic capabilities.

Materials

Microscopes, small containers, pipettes, graduated cylinders, litmus paper, turbidity meter, flashlights, thermometers, safety aprons, safety goggles, and safety gloves.

Web site

There is a site for water composition at http://ga.water.usgs.gov/edu/characteristics.html for a teacher resource.

Key Words: ***pH Scales, Sediment, Turbidity, Opaque***

Turbidity: opaque and muddy as when particles and sediment are stirred up and suspended in water

Opaque: impervious to light, so that images cannot be seen through it

Sediment: material eroded from preexisting rocks that is transported by water, wind, or ice and deposited in liquid (water) that settles at the bottom after being suspended.

pH scales: the measure of acidity or alkalinity of a solution or substance from 1 to 14. The range is from 0-14, with 7 being neutral (pure water). The acids are less than 7, whereas the bases are greater than 7.

Vocabulary: See glossary in appendix.

Lab Activity

1. Have the students take the two water samples. Place the water samples into clearly marked graduated cylinders. Have student record measurements of temperature of each sample.
2. Then have the students use pipettes to drop water on microscope slides. The students will then record their observations. Student will then test each water samples pH levels using the litmus paper. Have the students record their findings and observation in their science journals. The students will then chart or graph their findings from their data tables in their graphic organizers.
3. The student will then summarize their discoveries the pH scale of water and its effect on organism in their journals. Use the lab forms and rubric in the appendix for grading.

APPENDIX

Supplemental Reading

Bulrush (Scirpus validus Vahl)

(Photo by M.G. Elwood at Braes Bayou Wetlands Mason Park, Houston Texas 2007)

Bulrush is a shoreline plant that provides food in the form of seeds for waterfowl and mammals. One mammal that depends on the plant's seeds for food is the muskrat. Bulrush grows several feet high in **clusters**. The plant has rounded spongy stems, and dangling flowers. The plant can grow several feet in height, and is one of many plants that live in marshlands. One of the adaptations the bulrush plant has is that it reproduces by spreading underground rhizomes. These spreading roots help stabilizes the shoreline.

Questions

1. What is one of the Bulrush plant's adaptations that aids in reproduction?
2. Label the food chain using the Bulrush as a producer.
3. Write a better title for the Bulrush story.
4. What does the word ***clusters*** mean?
5. What is the main idea of the story?

Supplemental Reading

Muskrats

1. Muskrats are large, aquatic mammals that live by lakes, marshes, wetlands, ponds, and riverbanks. These mammals are found in Alaska, Canada, coastal areas of the United States, and also in northern Mexico. Muskrats live in burrows in the ground close to water's edge with an underwater entrance. Muskrats are omnivores; they eat bulrush seeds, other wetland plants, mussels, frogs, crayfish and small turtles. Their primary predators also live in a marshland environment.
2. Muskrats swim very well. Their fur is thick, brown and waterproof. Muskrats have partially webbed feet. Their web feet and waterproof fur is an adaptation that enables the muskrat to swim well. Muskrats also use their tails to ***propel*** themselves through the water. Muskrats weigh about 1700 grams, or approximately 3.7 pounds.
3. The male muskrat marks his territory with a strong musky scent. This scent marks the male's territory. This scent is how the muskrat was named. The females have 2 to 3 liters of 6 to 8 young. People have destroyed many wetland habitats where the muskrat lives. However, muskrats are very resourceful and learned to live in canals or irrigation channels. Muskrats do not make very good pets.

Questions:

1 How has the muskrat adapted to swim in a wetland environment?
2 How was the Muskrat named?
3 In Paragraph 2, what does the word ***propel*** mean?
4 In Paragraph 3, what word could be substituted for habitat?
5 In Paragraph 3, what sentence could be eliminated from the story?
6 What is the main idea of the story?

Appendix forms

Science rubric should integrate these criteria for assessment on written reports.
Scientific Method Process:

1. Ask a Question
2. Do Background Research
3. Construct a Research
4. Test Your Hypothesis by Doing an Experiment
5. Analyze Your Data and Draw a Conclusion
6. Communicate Your Results

Rubric

Points	**Questions**	**Investigation**	**Research**	**Totals**
1				
2				
3				
4				
5				
Points	**Experiment**	**Analyze Data & Conclusion**	**Communication**	**Totals**
1				
2				
3				
4				
5				

Scale: A = 30; B = 24-29; C = 18-23; D = 12-17; Incomplete 1-12.
All processes must be complete, otherwise subtract 5 points.

Lab Form for Volume Measurements

															average
team initials															
length cm															
width cm															
height cm															
volume in cm^3															
volume in mL															
difference cm^3 - mL															

Graphing Form

					Y						
					5						
					4						
					3						
					2						
					1						
-5	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**	**5**	**X**
					-1						
					-2						
					-3						
					-4						
					-5						

Developing assessments is a simple task using the battery of science question banks provided by Study Island (http://studyisland.com). A tutorial software with an interactive program for mathematics problem solving is accessible through Stat Trek's web site (http://stattrek.com).

GLOSSARY

The definitions of vocabulary words were by *Encarta*. (MSN at http://encarta.msn.com/)

Abiotic	Used to describe the physical and chemical aspects of an organism's environment
Acid	Compound, usually water-soluble, that releases hydrogen ions when in solution. An acid reacts with a base to form a salt, has a pH less than 7, and turns blue litmus red. Acids are corrosive and have a sour taste.
Aquatic	A plant or animal that lives or grows in water
Base	A chemical compound having a pH value between 8 and 14 that reacts with acids to form salts
Biome	A division of the world's vegetation that corresponds to a particular climate and is characterized by certain types of plants and animals
Carnivorous	A larger animal that catches and digest animals, such as insects and small invertebrates, or vertebrates
Centimeter	A metric unit of length equal to one hundredth of a meter
Characteristics	A feature or qualities that make somebody or something recognizable

Conclusion	A decision made or an opinion formed after considering the relevant facts or evidence
Consumer	In an ecological community or food chain, an organism that feeds on other organisms or on material derived from them
Compound	Something made by the combination of two or more different things
Deposition	The accumulation of natural materials by a gradual process that has been deposited somewhere else
Ecology	The study of the relationships and interactions between living organisms and their natural or developed environment.
Ecosystem	A functional un-consisting of all the living organisms (plants, animals
Elements	Something that appears to exist because of the way a thing, data, or the
Environment	The natural world, within which people, animals, and plants live
Factors	Something that contributes to or has an influence on the result of something
Food Chain	A hierarchy of different living things, each of which feeds on the one below
Food Web	A food web extends *food chain* concept from a simple linear pathway to a complex network of interactions,
Graphic organizer	An organizer is a visual and graphic representation of information
Graduated cylinder	Tube like object cylinder in shape marked with lines to enable measurement
Habitats	The natural conditions and environment, for example, forest, desert, or wetlands, in which a plant or animal lives
Humus	A dark brown organic component of soil that is derived from decomposed plant and animal remains
Living	Anything that has homeostasis, organization, metabolism, growth, adaptation, reproduction, response to stimuli
Non-living	Dead, inanimate, or no longer used or existing
Loam	An easily-worked fertile soil consisting of a mixture of clay, sand, and silt and sometimes also organic matter
Hypothesis	A tentative explanation for a phenomenon, used as a basis for further investigation
Invertebrates	An animal such as an insect or worm that does not have a backbone
Landforms	A natural physical feature of the earth's surface, for example, a valley, mountain, or plain
Litmus paper	A strip of paper treated with litmus, used to find out if something is an acid or a base
Mammals	A class of warm-blooded vertebrate animals that have, in the female, milk-secreting organs for feeding the young
Marshland	Name given for area large or small that has water saturation near the surface
Mixture	The combining or mixing of different ingredients or elements
Omnivores	An animal that will feed on any kind or many different kinds of food, including both plants and animals
Opaque	Impervious to light, so that images cannot be seen through it
Organism	A living thing such as a plant, animal, or bacterium
pH Scale	The measure of acidity or alkalinity of a solution or substance from 1 to 14. The range from 1 to 7 is an acid, 7 is a neutral, and 8 to 14 is a base.
Physical adaptations	The development of physical and behavioral characteristics it allow organisms to survive and reproduce in their habitats

Pollution	To cause harm to an area of the natural environment, for example, the air, soil, or water, usually by introducing damaging substances such as chemicals or waste products
Population	A population is any entire collection of people, animals, plants
Predator	A carnivorous animal that hunts, kills, and eats other animals in order to survive, or any other organism that behaves in a similar manner
Producer	An organism such as a green plant that manufactures its own food from simple inorganic substances
Rhizomes	A thick underground horizontal stem that produces roots and has shoots
Sample	A sample is a group of units selected from a larger group (the population).
Sediment	Material eroded from preexisting rocks that is transported by water, wind, or ice and is deposited in liquid (water) that settles at the bottom after being suspended
Soil	The top layer of most of the earth's land surface, consisting of the unconsolidated products of rock erosion and organic decay, along with bacteria and fungi
Solution	A substance consisting of two or more substances mixed together and uniformly dispersed, most commonly the result of dissolving a solid, fluid, or gas in a liquid
Species	The organisms belonging to a particular species
Specimens	An organism or one of its parts preserved as a typical example of its classification
Vertebrates	An animal with a segmented spinal column and a well-developed brain
Volume	The size of a three-dimensional space enclosed within or occupied by an object
Wetland	A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife

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