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Section 8: How Children Learn

This section provides educators with information about educational theories and objectives and how these apply to a unit of study on the West Eugene Wetlands.

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Matching Science Processes and Content With Children’s Cognitive Development, Grades K-9

Science is more than learning facts about the physical and natural worlds.
Scientists do things that help them discover and understand how things work.

| Grade Level | Science Processes | Description of Content |
|-------------|---|--|
| K-3 | <ol style="list-style-type: none"> 1. Observing: gathering information about the world by looking, touching, smelling, hearing, or tasting. 2. Communicating: telling others about something you know, usually through speaking, writing, drawing, or graphing. 3. Comparing: thinking about the qualities of objects by focusing on their similarities and differences. 4. Ordering: arranging things in sequence of occurrence along a continuum, such as small to large or rough to smooth. 5. Categorizing: grouping and classifying things according to common traits. | Focuses on one-word descriptions and discrete ideas. |
| 3-6 | <p>1-5 above, plus</p> <ol style="list-style-type: none"> 6. Relating: demonstrating understanding of interactions or of cause-and-effect events. | Focuses on principles, generalizations and/or laws. |
| 6-9 | <p>1-6 above, plus</p> <ol style="list-style-type: none"> 7. Inferring: using knowledge gained through observation to understanding things that are remote and cannot be observed. | Focuses on ideas that are not directly observable. |

Pattern Shapers

The brain looks for patterns in order to understand.

Examples:

Classification: e.g. plants, animals, and minerals;

Needs: food, water, shelter, and space;

Food chains (webs): producers, consumers, and decomposers;

Habitats: homes, cities, and wet prairies;

Comparisons: similarities/differences, now/then, and predator/prey;

Systems: creeks to rivers.



Pattern shapers can give students time to use information again and again in varying settings until information is recallable in a usable form as a behavior or program.

Example, Food Chains:

- Students begin with the construction of a chain;
- They learn about their own and other people's food chains;
- They compare these with food chains found in their school yard and on the field trip;
- They act out food chains and food webs and learn about what happens when food chains are broken; and
- Lastly, they explore ways to help maintain healthy food chains and develop personal and/or group (e.g., school, organization, community) action plans.

Pattern Shapers was adapted from Kid's Eye View of Science

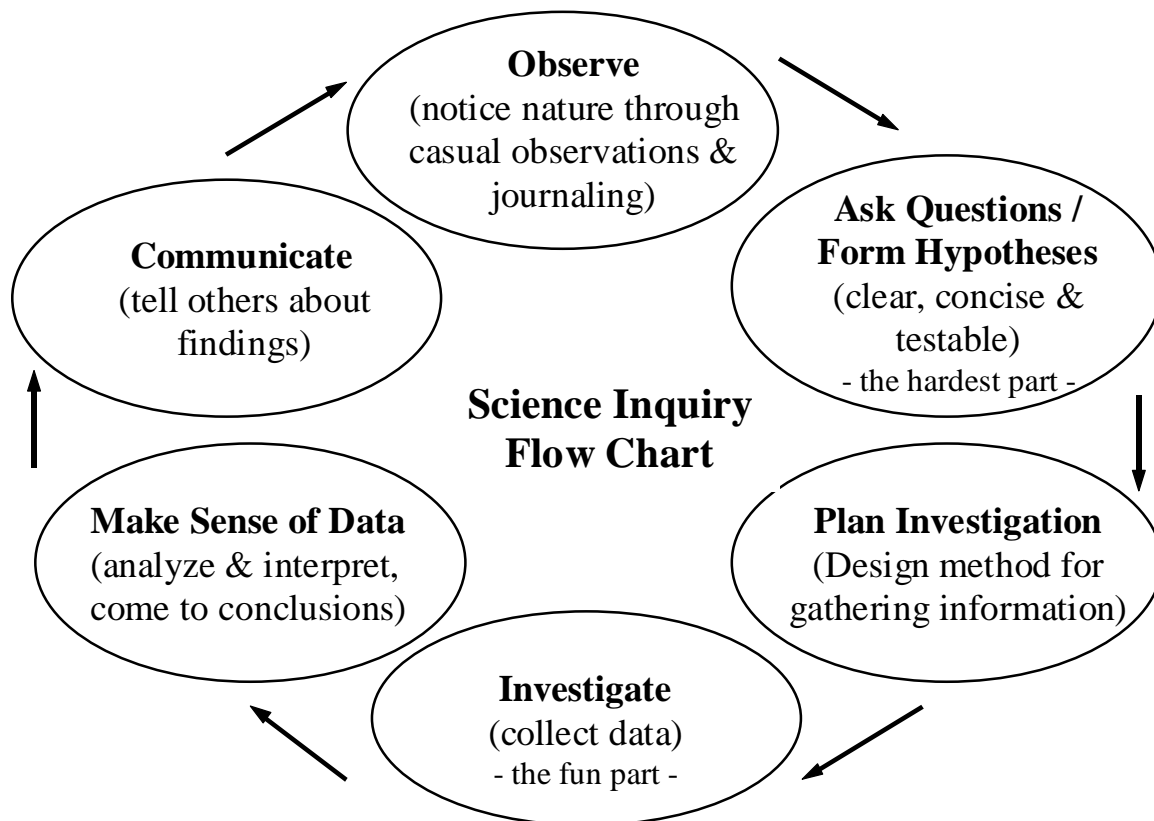
Science Inquiry

Science inquiry is an investigation of how the world works. It is a process for answering questions and solving problems based on observations.

Here is how science inquiry works:

1. Make observations of your surroundings using all your senses. Pay attention to what you see, hear, smell, and feel. Write about or sketch observations in a journal as a way to remember what you have experienced.
2. Ask lots of questions (inquire) about your observations and then focus on the one question or develop one hypothesis that you are most interested in and that you think you will be able to answer. Make sure that it is clear, simple and testable.
3. Plan an investigation. Use your creative and critical thinking skills to come up with a method for collecting data to answer your question or determine whether or not your hypothesis is correct.
4. Conduct the investigation and gather data.
5. Make sense of your data. Analyze and interpret what you found so that you can answer your question or confirm your hypothesis.
6. Communicate! Tell people about your findings.

When you design and conduct your own investigations you gain a better understanding of the world.



What is a hypothesis?

Observations give us answers to questions about the natural world, but they almost always give rise to still more questions. When a scientist wants to know the answer to a very specific question, forming a hypothesis that can be tested is usually the best way to find the answer. A hypothesis is a testable explanation for an observation. See the following examples.

Hypothesis Examples:

- There is more dissolved oxygen in the river than in the wetland.
- The bigger the diameter, the older the tree.
- Plants that are herbs prefer slightly acidic soil.
- There is more wildlife activity near water in the forest.
- A higher diversity of macroinvertebrates live in slow moving water.
- Ground beetles are predators.

The Triune Brain: Three Brains in One

Sensory inputs are processed first through the **brain stem (reptilian brain)** where survival responses are first filtered for immediate reaction if danger exists. If danger does not exist, the input information then rapidly flows through the collection of structures called the **limbic system**. This system among other things filters and frames one's emotional response to the stimuli. A person has to experience love and caring to learn. When people feel belonging and inclusion the input of information can move to the **cerebral cortex**. This is where the cognitive learning takes place and where a rational response is generated and an output action is set in motion. The cerebral cortex is where powerful learning takes place.

Dr. Paul Maclean, National Institute for Mental Health, Washington, DC

How the Brain Learns:

- Intelligence is a function of experience.
- It is a pattern-seeking device.
- Most information is embedded in programs.

Human Brain and Human Learning.

Key Elements of a Brain Compatible Outdoor Classroom

“Being There” Experience

- Absence of threat
- Meaningful content
- Choices
- Adequate time
- Enriched environment
- Collaboration
- Immediate feedback
- Mastery/application (extension of pre- and post-classroom activities)

Kid's Eye View of Science.

Theme Building

Program Theme: West Eugene Wetlands Exploration

A study of the West Eugene Wetlands habitats and watersheds.

Organizing Concept: Habitat and Interrelationships

Natural systems and human actions are interactive and interdependent.

Rationale

The theme promotes the study of the watershed connection to the West Eugene wetland habitats and the WEW partnership objectives to enhancing and preserving significant wildlife habitat and protecting endangered and threatened species.



Components

West Eugene Wetlands Exploration Field Trip

Instructional strategies are based upon: 1. physically being in the real world environment (field trip); 2. hands-on real things (plants and animals and their wetland habitats); 3. hands-on representational items (simulation activities); and 4. second hand – pictorial representation, written word (pictures, slide shows, stories about wetland habitats).

Pre- and Post-Field Trip Classroom Activities from the West Eugene Wetlands Educators' Guide

Instructional strategies are based upon: physically being in the real world environment (school yard habitat); 2. hands-on real things; 3. hands-on representational items; 4. second hand – pictorial representation, written word (e.g., pictures, videos, stories about wetland habitats and human impacts; and 5. action projects.

Key Points

- West Eugene wetlands and their watershed are connected to each other in many ways.
- West Eugene wetlands organisms have developed complex adaptations and interrelationships.
- Humans are involved in the management and conservation of natural resources.
- Humans can improve their relationship with the environment through their actions and behavior.

Inquiries

Field trip activities and pre- and post-field trip classroom activities

Students need to be given time to use information again and again in varying settings until information is recallable in a usable form as a behavior or program. Through instructional strategies students learn about natural systems, their place in these natural systems and how their actions affect these natural systems.

The “Constructivist” View of Learning Theory

The learner does not passively assimilate information and knowledge, but actively constructs new knowledge from previous experience, data, and information. This new knowledge can be transferred to application in a new context and thereby demonstrates understanding of the concept, information, and skills that were taught. In the constructivist view, a learner builds new knowledge on existing cognitive frameworks. If a student masters the basic natural history of the West Eugene Wetlands and its watersheds through studying its interrelationships, he or she is more likely to see the connection between his or her actions and the health of the West Eugene wetlands and watershed.

The West Eugene Wetlands education program can provide opportunities for educators to guide their students toward new discovery and scientific understanding; this can lead to the development of critical thinking and creative problem solving skills.

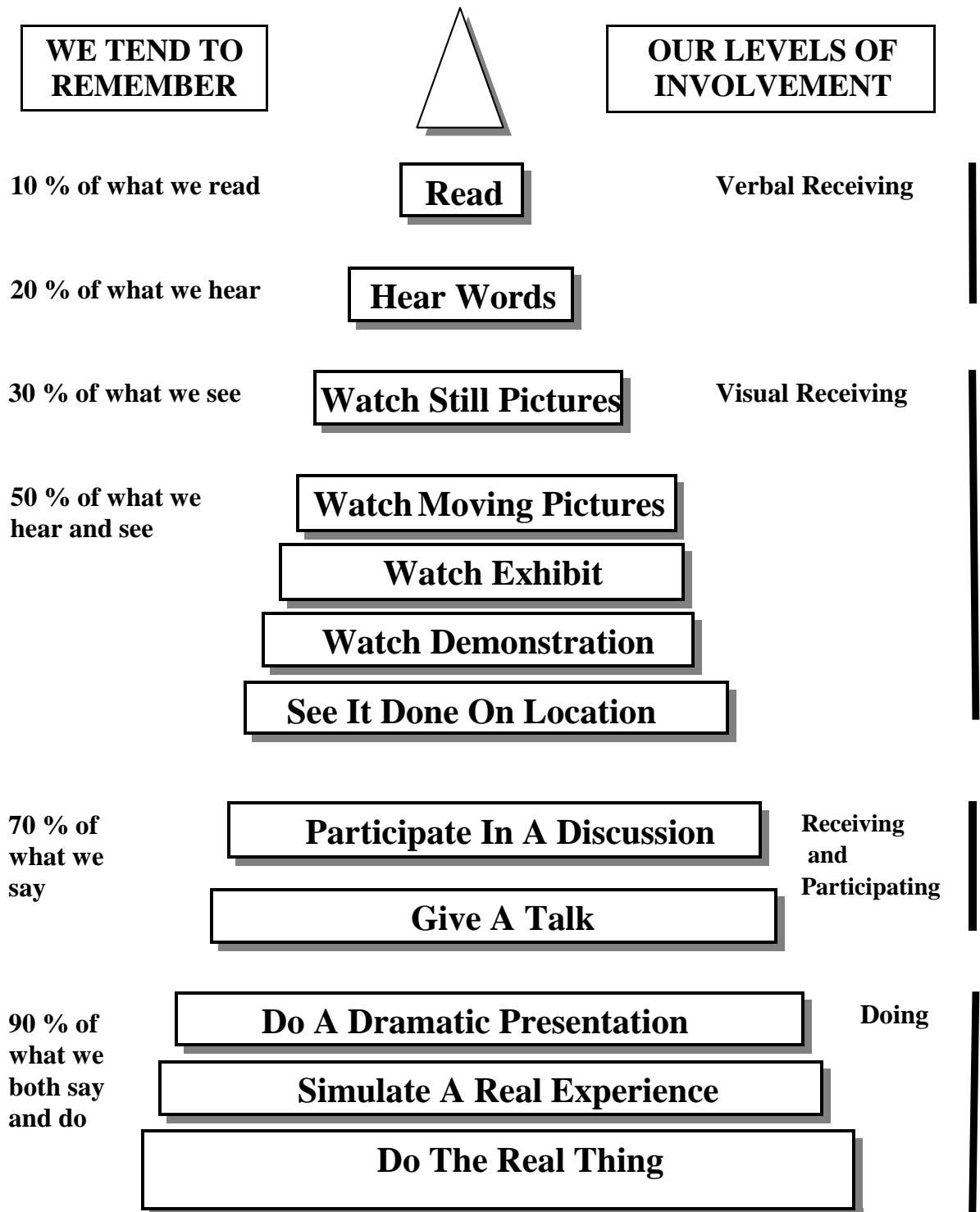
A few “Truisms” about learning from Bill Hammond, Director of Curriculum and Environmental Education, Lee School District, Fort Meyers, Florida.

1. People are best empowered to effective action based on a celebration experience rather than a lament or scare perspective.
2. First hand experience is critical to the impact of the learning experience.
3. You cannot assume a student understands anything you have taught unless she or he can demonstrate application mastery in a context other than the one she or he was taught in.
4. The more one experiences and knows about wildlife the more they will skillfully observe, increase knowledge and understanding and hold positive value interests in wildlife.
5. The more one knows about wildlife and associated ecological principles the more one is likely to view their own life decisions from this cognitive framework or perspective.

Ways Environment-Based Education Can Benefit Educational Practices

- Establishes relevancy between school and kids' lives.
- Real life experiences
- Hands-on learning engages multiple intelligences
- Interaction with nature is conducive to scientific inquiry
- Flow of lesson concepts in activities builds to conceptual understanding
- Teaches critical thinking
- Student centered learning
- Cooperative learning
- Applies concepts taught in math, language art, science, and history/social science

EXPERIENCE AND LEARNING



Multicultural Education

Connecting with Environmental Education

Environmental and multicultural education are compatible efforts united by mutual interests and shared perspectives. Both are primarily interested in human interaction; environmental education examines the human-nature relationship, whereas multicultural education probes the human-human relationship. Each discipline views a student's actions as being embedded within a cultural context, a context that mediates his or her attitudes and behaviors.

Increasingly, both environmental and multicultural educators are advocating a problem-posing and problem-solving approach to take students beyond the fear of diversity and difference. Through the use of such an approach, each hopes (1) to enable students to critique our society's habits regarding diversity and (2) to examine how life choices can be changed so as to achieve a more caring, connected, and respectful way of living.

Provide opportunities for students to develop:

- Self-awareness
- A means of pursuing their own interests regarding the topic of study, in a manner consistent with their own learning style.
- Ways of coming to know the topic of study through learning styles that are less familiar to them.
- Interpersonal and group communication skills around the topic of study.
- An understanding of the meaning of 'culture.'
- An understanding that everyone embodies a culture.
- An appreciation for different perspectives and how that diversity provides a richer, more complex pool of ideas concerning the topic of study.
- A sense of community within the classroom; that is, creating a place where students feel comfortable, yet engaged, and where different points of view can be expressed.
- Familiarity with a variety of ethnic and cultural communities' experiences with and contribution to, the topic being studied.



Adapted from Project Learning Tree: Environmental Education Activity Guide.