THROW AWAY YOUR OLD ENVIRONMENTAL EDUCATION TRUNKS AND SURF INTO THE FUTURE

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Abstract

Traveling Environmental Education (EE) trunks have been one method used for improving environmental literacy; especially in rural areas where nature centers and museums are absent. In this absence, traveling trunks provide a set of tangible tools for students focusing on problems as well as developing potential solutions for addressing environmental issues. While EE trunks have been successful in providing teachers with resources and tools, significant increases in shipping costs, labor and storage costs, as well as disappearing federal agency funding, have prompted some agencies to seek alternative methods for providing educational services. Over the years, school teachers have become increasingly dependant on the Internet as a source of information. Determined to change how EE interfaces with the public, River Park North (RPN), a nature center located in Greenville, NC, collaborated with East Carolina University researchers to develop online EE lesson plans. A curriculum on Pond Ecosystems was developed to offer teachers a set of activities that their students could engage in prior to visiting the nature center. Lesson plans were evaluated by a pool of local educators prior to implementation. RPN managers believe that the more attainable EE information is for students prior to visiting the center, a higher EE literacy will be achieved and students will arrive at RPN asking informed questions.

1.0 Introduction

Recognizing increasing threats to human health and environmental quality, the United States Congress passed the National Environmental Education Act of 1990 to increase environmental literacy. The Act came in response to an increasing awareness of international environmental problems such as global warming and declining species diversity, all of which influence human health and environmental sustainability. Traveling Environmental Education (EE) trunks have been one method used for improving environmental literacy; especially in rural areas where nature centers and museums are absent. In this absence, traveling trunks provide a set of tangible tools for students to focus on problems as well as developing potential solutions for addressing environmental issues. While trunks have been successful in providing teachers with EE resources and tools, significant increases in shipping costs, labor and storage costs, as well as disappearing federal agency funding, have prompted some agencies to seek alternative methods for providing educational services. With the increasing availability and use of computers in schools, students and teachers are becoming increasingly dependant on the Internet as a source of information.

Determined to change how EE interfaces with the general public and elementary schools in eastern North Carolina, River Park North (RPN), a nature center located in Greenville, NC, has been collaborating with East Carolina University researchers to develop online EE lesson plans to be made available from a RPN website. The EE curriculum was developed to offer teachers a set of activities that their students could engage in prior to visiting the nature center. If EE is a primary tool to inform students about the environment, and to empower them to ask good questions, then it may be equally important to engage in investigations about a nature center prior to visiting the site. If educators make EE easily attainable and understandable in the form of specific lesson plans for addressing environmental and social concerns, students will have easier access to this information, be able to conduct background investigations, and ask informed questions when they arrive.

2.0 Environmental Education

EE is a method for creating: (1) awareness; (2) knowledge; (3) attitudes; (4) skills; and (5) participation towards environmental sustainability. The basis for EE is

teaching individuals to become aware and knowledgeable of environmental issues that will awaken their sensitivity towards environmental stewardship. Increased awareness, knowledge, and sensitivity lead to the development of concern and motivational attitudes to participate in solving environmental issues (Iso-Ahola 1980). Identification of and attempts to solve environmental issues are often demonstrated through skills learned from an EE professional. Finally, advocates for the environment are prompted to create opportunities for individuals who wish to be actively involved.

An early definition, appearing in the first issue of Environmental Education (Stapp 1969) has served as a basis for many subsequent efforts. Environmental education is generally focused on "producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution" (p 54). A number of evolving and expanding definitions have appeared since that time. In 1996, the U.S. EPA's Office of Environmental Education provided the following definition: Environmental education enhances critical-thinking, problem-solving, and effective decision-making skills. It also teaches individuals to weight various sides of an environmental issue to make informed and responsible decisions. Environmental education does not advocate a particular viewpoint or course of action (Federal Register, Tuesday, December 10, 1996, p. 65106).

Agreement concerning the definition of environmental education has not been reached. The Tbilisi Declaration, a document generated from the 1977 intergovernmental conference on environmental education, defines the objective of knowledge as, "helping individuals and social groups gain a variety of experiences with the total environment and to acquire a basic understanding of the environment, its associated problems and humanity's critical responsible presence and role in it" (Unesco 1968). Attitudes are described as any enduring complex of descriptive and evaluative propositions which an individual generates, consciously or otherwise, about select attributes of a given situation, and which predisposes that individual to feel about and/or respond to that situation in a given fashion (Ajzen & Fishbein 1980; Fishbein & Ajzen 1975; Hines 1985; Marcinkowski 1989).

According to Marcinkowski (1989) beliefs are defined as, "descriptive propositions which represent personal recommendations about some more desirable state of affairs or some condition (e.g., about physical conditions, other's beliefs and values)" (p. 58). Hungerford and Peyton (1976) offer a definition of "an environmentally literate citizenry that is both competent to take action on critical environmental issues and willing to take that action" (p. 11). Responsible environmental behavior (REB) has been presented as "activities that have been suggested as ways people can help solve environmental problems" (Van Liere & Dunlap 1981, p. 662). Maloney and Ward (1973) defined REB in terms of what commitments people do make. In a broad context, Sia (1985) and Hines (1985) argued that REB is equivalent to other terms appearing in the literature such as pro-ecological behavior, pro-environmental behavior, environmental action and environmental problem-solving.

Recognizing increased threats to human health and environmental quality, the United States Congress passed the National Environmental Education Act of 1990 (NEEA) to increase environmental literacy. This Act was a response to an increasing awareness of international environmental problems such as global warming and declines in species diversity; all of which influence human health and environmental sustainability. In addition to these threats, as noted in the Act, insufficient funding for educational resources and training for learning relationships between the natural and built environment, environmental problems and their origins, and skills to address environmental literacy implemented were all very problematic.

The NEEA first established the Office of Environmental Education within the Environmental Protection Agency (EPA), which became responsible for awarding grants to develop environmental curricula and training teachers; supporting fellowships to encourage the pursuit of environmental professions; awarding those contributing

to the betterment of the environment; and sponsoring workshops and conferences. By implementing these actions, the agency became the leader in advancing both environmental awareness and provider of education materials.

3.0 EE "Traveling Trunks"

EE traveling trunks are sturdy boxes typically 36 x 21 x 21 inches with nearly 16,000 cubic inches of storage space that are sealed and shipped around the nation. Trunks were some of the first forms of tangible tools for providing information to students regarding the natural world. The trunks presented components varying by theme - containing theme based (Wolves, Threatened & Endangered species, Butter flies etc.) items such as: lesson plans tied to educational standards, educational books, videos, audio cassettes, posters, puppets, puzzles, activity materials, and various specimens. They were first introduced to rural teachers who lacked environmental education resources with necessary materials for giving lessons in the classroom (Interview: Anita Maxwell, April 24, 2005). Trunks became very successful based on their ability to reach these rural communities where little resources were available for traveling to environmental education centers. For those who could not visit such centers, trunks brought a piece of the natural world into the classroom along with "hands-on" learning experiences.

Agencies currently practicing this method of distributing EE materials in trunks are mainly at the Federal level, due to the high cost of creation, maintenance, and shipping (EPA 2005). Some of the more renowned federal agencies who circulate traveling trunks are the National Park Service, Environmental Protection Agency, U.S. Fish & Wildlife Service, and the USDA Forest Service. Most agencies ship the trunks to schools and other organizations free of charge, leaving recipients responsible for shipping them back, which can cost $30 - $50. Additional issues surrounding traveling trunks are maintenance and shipping costs, component replacement, sanitation hazards, the lack of personal contact with an EE professional, and the arduous task of moving 40-50 lb. trunks. With overall funding reductions, agencies are searching for alternative methods for distributing EE materials and resources. Providing web-based education to students is one way to accomplish EE goals.

4.0 Pond Ecosystem Curriculum for River Park North addresses the following themes:

-Amphibians & Reptiles	-Birds of Prey
-Snakes	-Aquatic Mammals
-Migratory Waterfowl	-Cavity Nesters
-Threatened and Endangered Species	-Beavers
-Birds of Eastern Swamps	-Wetland Ecology
-Historical Tar River	-Hurricane Floyd
-Pond Life	-Somebody's Trash
-Animal Adaptations	-Trees of Eastern Swamps
-Leaf Printing	-Nest Identification
-Poisonous vs. Nonpoisonous Species	-Animal Signs
-Benefits of Swamps	-Spiders
-Littering	-Leave No Trace
-Carrying Capacity	-Reduce, Reuse, Recycle
-Owls in the Food Chain	

4.1 Sample of Lesson Plan

Owls in the Food Chain (Grades 5-8)

Rationale:

Each animal species plays an important role in the food chain by transferring energy from one organism to another while maintaining balance and diversity of species within an ecosystem. This lesson plan discusses the role of the owl in the food chain.

Objectives/Intended Learning Outcomes:

- Students will learn about the owl's role in the food chain as a predator
- Students will learn about the owl's lifecycle
- Students will learn about the owl's breeding habits
- Students will learn where owls nest
- Students will learn about the owl's physiology and the significance body parts
- Students will learn what nocturnal and diurnal means and what kinds of animals fall within each category

- Students will learn the theory behind the owl's ability to see in the dark
- Students will learn about the owl's eating habits and digestion
- Students will learn about the owl's predators

Materials:

- owl pellets
- construction paper
- pencils or crayons
- glue
- small animal bone chart
- tooth picks

Background:

A food chain is a food pathway that links different species in a community. In a food chain, energy and nutrients are passed from one organism to another in order to keep an ecosystem diverse and balanced. There are more than 200 species of owls in the world living in many different ecosystems who share common physiological traits, but each having its own form of camouflage for adapting to their environment. The lifecycle of all owls are similar; once a male owl is a year old it begins a quest to find a hunting area to claim. Owls typically find an area within close proximity of their birth, but they are also known for traveling long distances for a sustainable hunting area. Once an owl reaches the age of two and has claimed an area for hunting, it begins to search for a mate. He will start making a noise that sounds like whoo-whoo... who-who; which he repeats over and over until he gets a response from a female owl, who responds in a higher pitched "whoo." Both the male and female "whoo" back and forth for several weeks until their "whoos" are synchronized. This form of communication continues for a while as they get closer and closer to one another until they finally meet. Once in close contact, both hop around tree branches, communicating through screeches. The male owl then makes a gesture by catching prey and offering it to the female. Once the female accepts the meal, the male himself, and his hunting area, they begin to search for a nest together. The final decision about which nest is acceptable is made by the female. Owls inhabit nests on tree limbs, trees that have been hollowed, nests on the ground, or in rock cavities; all of which have been constructed by some other animal. Occasionally, the female will make some improvements to the nest and once they settled in and the climate is right (usually after February) they begin to breed. First, the male catches some food for the female and offers it to her as a gift.

Next, they begin to court by hopping around tree limbs while making grunting noises. They nuzzle for a while until the male hops on the female's back and inseminates the female. The number of eggs laid by the female depends on the specie of owl. Small owls can lay up to seven eggs while large owls lay between two and three. After laying the eggs, the female incubates them by sitting on them usually for about 21-35 days. During this time, the male catches food for her and protects the nest from predators looking to attack the nest for the eggs. Baby owls are born naked, and usually have enough feathers to keep them warm by the time they are 2 weeks old. Once all of their feathers have grown in they begin to venture out of the nest exploring their new environment, usually hopping around tree limbs near the nest until they finally make it to the ground. Depending on the breed, owls begin to fly between eight and ten weeks old; small owls fly sooner than large owls. Once the owls have grown in enough feathers, they start flapping their wings to build up the strength to fly. The next phase of their development is learning how to hunt prey, beginning with insects. While they are learning to hunt, their parents continue to feed them larger prey as well; usually through the first winter.

The owl's role in the food chain is that of a predator, a carnivore that preys on smaller animals by catching and killing them. Most predators are larger that their prey; they have special adaptations to help them find and catch their food including enhanced vision and hearing, keen sense of smell, and strong physiques for rapid movement. As predators, owls control the populations of small rodents such as, but not limited to: rats, rabbits, insects, mice, frogs, fish, salamanders, and other birds. They feed during night hours, usually after dark because they are nocturnal. Nocturnal animals (e.g., owls, raccoons, opossums) come out at night because they can see in the dark, while diurnal animals (e.g., humans, deer,) are out during the day when they have enough light to see. One theory about how owls developed the ability to see

in the dark is that they were forced to adapt to an era of darkness which began at the end of the Mesozoic era and continued through the Cenozoic era. Their eyes change shape from day and night. During hours of light their eye balls are round in shape, while during night hours, their eye balls change to a tubular shape so they can see in further in the dark. Their eyes are protected by an upper, lower, and a translucent eyelid. The translucent eyelid moistens and protects the eye when exposed. Owls see in 3-D, which enables them to see objects that are both close and far away so they can navigate around things in their path without crashing into them. The owl has developed such good vision that they can see a mouse from two hundred yards away. This ability combined with a neck that allows them to rotate their heads 270 degrees provides them with an extreme range of vision. In the event of extreme darkness, owls rely on hearing to lead them to prey.

Feathers surrounding the owl's eyes are shaped like funnels, which direct sound into their ears like a satellite receiving signals from outer space. The owl's beak is shaped like a hook so they can grip prey and they have a tremendous amount of biting pressure, which allows them to kill their prey once caught. The claws of an owl are also sharp, and long so they can get a good grip on whatever they try to catch. Owls have feathers with comb like edges designed to muffle flapping noises so prey cannot hear them coming. All of these physical characteristics allow them to hunt, catch, and eat their prey. Owls have a different method for eating than we do, they don't chew, they swallow prey whole. Special chemicals in their stomach breakdown the food and retain their nutritional value, but they can't pass what they have eaten because it isn't broken down enough. Instead of passing whatever they have eaten as most species do, owls spit out the bones and fur of their prey. Their digestion system is build so they can do this without choking. The stomach compacts the food, balling it up, so it won't get stuck in their throat. This process produces a "pellet", which can be examined to determine what the owl had eaten.

The main predator of owls is humans. Owls are shot, trapped, hit by cars because they are blinded by headlights, electrocuted by power lines, poisoned by pesticides, and starved because of clear cutting which results in loss of habitat. Goshawks and gangs of crows are some of the predators who try to eat owl eggs. There are many species of owls protected by the Threatened and Endangered Species Act of 1973 as a result of their dwindling numbers.

Procedure:

1. Anticipatory Sets
   a. The lesson can be administered to a group following a discussion on the food chain and food web. It will allow participants to dive deeper into these topics by teaching them about a well known predator and its food chain.
2. Introduction
   a. Teacher
      i. Explain to the students that they will be learning one of the most important processes of living species. Ask them what they know about the food chain and why it is important to sustaining a balanced ecosystem. This will help students to think about the topic and to allow them to vocalize what they have learned from similar lessons.
3. Body of Lesson:
   a. Teacher
      i. Begin by opening the PowerPoint presentation on owls and describe the body parts which allow them to hunt, catch, and eat their food (e.g., feathers, talons, beaks, and eyes). Ask them what they remember about the significance of each body part. Talk about how they communicate, where they nest, and who their predators are.
      ii. Next, show the food chain diagram with the owl and describe it eats (i.e., rats, rabbits, insects, mice, frogs, fish, salamanders, and other birds). Point the size difference between the owl (big) and what it eats (small).
      iii. Pass out construction paper and crayons and let them be creative by drawing the food chain with the owl as the predator.
      iv. Pass out copies of a chart depicting small animal bones and describe each of the bones in their bodies. After they have looked them

over, break them into groups of three or four and give them a pellet that has been moistened with some water and tooth picks. Have them "pick" through the contents and ask them to identify the body parts. Next, tell them to see if they can put together a full skeleton, glue the bones that they find to a piece of construction paper and have them identify the animal that was eaten by the owl. Finally, let them describe what they found with to their classmates. This activity is also available online; refer to Virtual Pellet Dissection link.

4. Closure
   a. Start some group discussions about what they had learned and experience by participating in this lesson. Ask them:
      i. What is the food chain and food web?
      ii. Where does the owl fit in the food chain?
      iii. What does the owl eat?
      iv. What is significant about the owl's
         1. eyes
         2. beak
         3. feathers
         4. claws
         5. ears
      v. What is the theory that explains how owls can see in the dark?
      vi. Where does the owl live?
      vii. What are nocturnal and diurnal animal species?
      viii. How does the owl eat its food and how does it dispose of its waste?
      ix. How do owls communicate with on another?
      x. Ask them how they felt about picking through the pellets to hear "yucky." Finally, let them know that this is the process of only one animal species and that there are many others to discover.
5. Special Considerations
   a. Make sure the discussions remain focused on the lesson, don't allow them to stray too far from the topic. Also, make sure that everyone who wants to say something is able to by keeping responses brief. This activity should be done in a classroom, where participants have plenty of table space to work. If you plan on using real pellets, make sure they are not eaten by the students and make sure they wash their hands afterwards.
6. Assessment/Evaluation
   a. Assessment and evaluation of learned materials should be verified through feedback from students once questions are asked after the lesson and activity. Students could be given a homework project where the assignment is to create a web chain with their choice of predator at the top. This assignment could be handed in for a grade or presented to the rest of the class at a later date.

4.2 The following NC Environmental Education Standards that are met with this lesson:

Competency Goal 2: 2.06; Competency Goal 3: 3.01, 3.05; Competency Goal 4: 4.01, 4.03, 4.05; Competency Goal 5: 5.01, 5.03, 5.05

4.3 Links to further exploration:

Virtual Owl Pellet Dissection - http://www.kidwings.com/owlpellets/barnowl/index.htm

www.Owlpages.com - Regurgitation Show

http://owlpages.com/physiology/gho_pellet.html - Online Food Chain Activity http://www.domtar.com/arbre/english/biodiv/section3/jeu3a.html

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5.0 Methods

River Park north was devastated by Hurricane Floyd and the subsequent flooding in 1999, where the low lying area was located near major rivers and tributaries were nearly all washed away. The park borders the Tar River, which feeds 45 acres of water used for fishing and boating, and is also home to the Walter L. Stasavich

Science & Nature Center. Every year the park floods from an influx of upstream water entering the park through a tributary, which is circulated among four large ponds. Hurricane rains from two major storms saturated soils in the region leaving it no where to go but up. The Tar River rose 24 feet above flood stage following Hurricane Floyd, destroying the center in 1999 (Daily Reflector 1999).

With the reopening of the Walter L. Stasavich Science & Nature Center less than 1 year away, park administrators began to assess how they could improve the delivery of environmental education. The park coordinator, a graduate from the Recreation & Leisure Studies Department at East Carolina University, expressed the need to create a more diverse spectrum of programs while organizing materials for delivering environmental education. ECU researchers discussed creating "Traveling Trunks" with various themes for staff to take with them to schools deliver programs. The idea quickly transformed into creating storage space within the facility to organize the newly developed lessons and required materials due to expenses accompanying trunks and outreach programs. River Park North staff had a new vision; that vision was to ultimately reduce the amount of resources used for outreach programs while continuing to expand it ability to teach students in the region about the natural world; and especially, Pond Ecology at RPN.

6.0 Results/Conclusions

During the fall academic school year of 2005, teachers and students will be able to begin accessing the web-based EE curriculum on Pond Ecosystems. The program will continue to be monitoring and upgraded as both students and teachers provide feedback on the EE curriculum based program administered through RPN. As technology and students' appetite continues to move toward an expanding plethora of online resources, it can be expected that offering EE information online like the ones presented by RPN has the potential to be very successful.

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