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Use of crafts, games, and children's literature to enhance environmental education

Amy Helene Shamansky

USE OF CRAFTS, GAMES, AND CHILDREN'S LITERATURE TO ENHANCE ENVIRONMENTAL EDUCATION

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Education: Environmental Education

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ABSTRACT

This guide was created for classroom and nature center educators who want ideas for teaching children, grades K-5, about the environment. It is a compilation of my teaching experience in an outdoor summer camp. The guide contains background information, crafts, outdoor games, and children's literature for the following topics: reptiles; bugs, bats, and birds; water ecosystems; and mammals. The interactive nature of the experiences through crafts and games provided in the guide offer children a hands-on approach to learning, a developmentally appropriate way of teaching children.

Students participating in the activities will gain valuable outdoor experiences, an important component in any environmental education program. Children's literature is integrated to enhance the outdoor experiences and to create follow-up activities for the craft projects and games. The integrative nature of the guide with different curricular areas will enable educators to create or supplement any environmental education program.

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I would like to thank my friends and family for being so supportive of my endeavor. They have cheered me on every step of the way and have always believed in me. A special thanks to Jack, who never complained once about the amount of time I had to spend on my degree work. Another special thanks to Dr. Stoner for encouraging me to become a part of this environmental education program. I have learned so much and will carry it with me wherever I go. Thank you for your inspiration and guidance.

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INTRODUCTION

A summer nature teaching experience at a local nature center provided effective ways for teaching children, ages 3-12, about the surrounding environment. Children were engaged in hands-on craft projects and outdoor games that encouraged their learning about the animals and habitats in the local area. This project is a compilation of the background knowledge about the local wildlife as well as selected craft projects and outdoor games used at the nature center. Creating the guide was intended to document the crafts which were not in written form as well as organize the games which were interspersed with other reading material, making them hard to locate. The background knowledge was included to enhance the teaching of the crafts and games. A children's literature component was added to aid educators, primarily classroom teachers, in linking nature crafts and games to reading.

The topic areas covered in the project came from the five weeks of nature camp. The areas include: reptiles; birds, bats, and bugs; water ecosystems; and mammals. The focus on these topics allows learning about the local environment. Whether children are engaging in experiences at a local nature center or in their classroom at school, the out-of-doors where they live provides the most tangible

learning material. Choosing topics that are relevant to a child's everyday experience can enable educators to create meaningful, hands-on, active participation that is engaging for students. Learning in this manner is highly effective.

The purpose for creating the guide is to offer educators either a basis for starting an environmental education program or a supplement to an existing program. The activities and experiences the children engage in through crafts and outdoor games help build an awareness and appreciation of the environment. This is an important goal in environmental education.

A "Fostering a Love of Nature Index" developed by Wilson (1993) supports the purposes of the project. The following is Wilson's paraphrased list: involve children in frequent nature-related learning experiences that are pleasant and memorable; allow children to be actively involved in their learning experiences; share and do versus teach; have a variety of both indoor and outdoor nature-related activities paying attention to the social context; use pronature children's literature; be a role-model; and continue working toward personal understanding and appreciation of the natural world. Wilson encouraged teachers to provide nature-related children's literature, art, and music. These provide children with an outlet for original and creative sharing and expression of feelings through different forms of art.

This project is also supported by the Science Framework for California Public Schools Kindergarten Through Grade Twelve (California Department of Education, 1990) which requires teaching children about living things in all elementary grade levels. Physical education, visual and performing arts, and reading are also requirements in the elementary curriculum. The background information, literature resources, and activities provided in this project meet requirements in the California State Frameworks while allowing teachers to foster a love of nature in their students.

Review of the Literature

The following review of the literature begins with an overview of the background and goals of environmental education. Then, information is presented regarding the implications of outdoor education, constructivism, and developmentalism in relationship to environmental education. Lastly, environmental education and its connections to various California State Frameworks are presented.

Environmental Education

Environmental education became a widely recognized movement in the 1960s due to increased concern for environmental quality. The decline in the quality of the environment led to a fear of the deterioration of the quality of human life. This environmental concern became more widespread after the publication of Rachel Carson's Silent Spring in 1962. From that time to the present, the federal government and several states have passed laws requiring environmental education to become part of a general education program (Disinger, 1993). One example is California Education Code 8702 which stated:

> The legislature finds and declares that an educational program is needed which is designed to build necessary attitudes of stewardship toward the maintenance of the quality of our common environment and to enable all citizens to use wisely, and not destructively, the resources at

> their disposal. (in Stoner, Clymire, & Helgeson, 1989, p. I.6)

In order to understand the relationship of environmental education to the general education curriculum, a definition of its goals is appropriate. The California Outdoor School Curriculum Guide gave the following goal of environmental education:

> Environmental education programs aim at producing citizens who understand and appreciate their relationship to the environment, while also developing their critical thinking skills and commitment to constructive actions. While applying easy-to-understand ecological concepts, students develop holistic understanding, respect, appreciation, and concern for the natural, human, and cultural aspects of planet Earth. (Stoner, Clymire, & Helgeson, 1989, p. I.5)

Another definition of environmental education cited from Stapp et al.(1969) stated:

> Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward their solution. (p. 30)

Both definitions reflect similar goals for environmental education. The first definition was included to show the aim at affecting a person not only into positive action, but creating a holistic quality of appreciation and aesthetic awareness.

Hungerford and Volk (1990) stated, "The ultimate aim of education is shaping human behavior" (p. 8). Environmental education plays a key role in developing citizenship behavior. The next issue is in finding what way a person's behavior can be most affected toward change. Traditional thinking in environmental education has been that behavior is changeable when people are made more knowledgeable. This suggests a linear model whereby knowledge creates awareness/attitudes and awareness/attitudes creates action. Research now shows that instruction must go beyond knowledge (and a linear approach) for behavior to change. "Students must be given the opportunity to develop the sense of "ownership" and "empowerment" so that they are fully invested in an environmental sense and prompted to become responsible, active citizens" (Hungerford & Volk, 1990, p. 17). This approach is further supported by the ideas of Cohen and Trostle (1990). They believe that promoting ecological awareness and behavior directed toward conservation and preservation of our limited, natural resources is a common issue for adults as well as children. They believe that ecologically inspired activities and projects can enhance children's acquisition of knowledge and awareness of ecological issues. They specifically refer to creative play, fantasy, problem solving, and discovery learning. "Experiences designed to foster children's awareness of

important ecological issues must be developmentally appropriate, occur across real settings, and involve the child's active exploration" (p. 304).

Outdoor Education

One of the real settings is found in the out-of-doors. Outdoor education is an approach for teaching environmental education rather than an educational goal or a content area (Wilke, 1993). The outdoors is an appropriate place to stimulate active, discovery learning. Lloyd B. Sharp, known as the father of outdoor education, said, "Teach outdoors what is best taught outdoors, and indoors what is most appropriate there" (Disinger, p. 26). In the California Outdoor School Curriculum Guide (Stoner, Clymire, & Helgeson, 1989) it is stated that, "Outdoor education is the important facet of environmental education that allows children a unique, firsthand learning opportunity in the outdoors" (p. I.6).

Earl C. Kelley (1972) believed that much awareness toward the environment was lost after World War I when areas became urbanized. Outdoor education is a way to give urban children the contact with nature that was lost from urbanization. It is a way for children to regain the awareness of their interdependence with the environment that urbanization depleted (Stoner, Clymire & Helgeson, 1989).

Outdoor education can be a change agent. Miller (1972) believed that outdoor education can change people, process, and program. In changing people, outdoor education is effective because it takes place in real life situations. The opportunity to build better relationships between people of diverse races, backgrounds, and experiences is created by the nature of the outdoors to establish connectedness of all people to the Earth. Outdoor education changes the educational process by providing teaching experiences that are oriented towards hands-on, discovery, problem solving type learning. Finally, outdoor education changes program by revealing meaningless versus real-life learning experiences. It also changes the rigid scheduling followed by traditional programs.

A study conducted by Dresner and Gill (1994) revealed some other factors that were important in effecting positive attitudes and action in children. The setting for the study was a summer nature camp. The study showed that students who actively participated in the program improved in their comfort with the outdoors and increased their self-esteem, which in turn created more concern and motivation for helping the environment. Dresner and Gill stated,

> The increase in their feelings of interest in and curiosity about nature was correlated with an increase in naturalist life skills. Their increased interest in and curiosity about nature was correlated with an increase in

> self-esteem, and the increase in self-esteem was correlated with action taking. (p. 40)

Constructivism

In all of the research presented thus far, a key element has been active participation. Cohen and Trostle (1990) stated that active participation is important in facilitating scientific and ecologically based learning in young children. Acquisition of knowledge alone has not affected change in students toward action in the environment. Students who are fully engaged in their learning, taking ownership, and actively participating in discovering knowledge show more success in the outcomes of their learning. This type of learning is known as constructivism. Constructivism has become a popular approach in teaching. Scholars are always looking for the most effective ways to teach students. At this point, taking a closer look at constructivism and how children learn is appropriate.

Constructivism is an approach to teaching that supports experience-based activities while it encompasses multiple perspectives or interpretations of reality and knowledge contsruction. Constructivism claims that reality is more in the mind of the learner and that how the learner constructs reality is based on experience (Clements & Battista, 1990). This would explain and support individualistic

interpretations made by the engaged learner. Jonassen (1991) said,

> As objectivistic designers, we may intend to mapa particular reality onto learners, but they ultimately interpret our messages in the context of their own experiences and knowledge and construct their own meaning relative to their needs, backgrounds, and interests. (p. 29)

Jonassen further stated that by following constructivist recommendations, we need to help learners construct meaningful and conceptually functional representations of the external world. The best approaches for doing this will be discussed later. First, a look at objectivism, the opposition to constructivism, is appropriate.

Objectivism holds a different belief about reality and learning than constructivism. In the traditional style of learning, objectivism says that there exists reliable knowledge about the world, and the goal, as a learner, is to gain this knowledge. Educators are to transmit the knowledge. Objectivism assumes that every learner gains the same understanding from what is being transmitted. Meaning isn't gained from experience, but relayed from the teacher with the expectation that the learner will understand the preexisting reality. In other words, students are told about the world, interpretations are made by the teacher, and then they are expected to replicate the content and structure in their thinking (Clements & Battista, 1990).

Teachers are being provided curriculum, frameworks, and inservices to encourage the use of constructivism in their classroom as opposed to objectivism. The Elementary Grades Task Force Report called It's Elementary, developed by the California Department of Education (1992), provided further support for constructivism, as follows.

> The years from kindergarten through grade six are a time of uninhibited wonder, enthusiasm for learning, and breathtakingly rapid growth. The social, emotional, physical, and intellectual identities children construct for themselves during this period go a long way toward determining the subsequent trajectories of their lives. (p. xi)

The report goes on to explain that traditional curriculum in grade school focused on skills practice that increased in complexity with each grade level. For example, in the traditional curriculum, the teacher fills the empty minds of the children with knowledge. This can be defined as objectivism. In contrast, constructivism is based on cognitive research which says that children are naturally like scientists who need to make sense of the world. Children can begin to use sophisticated thinking processes early and only learn when they have the opportunity to "actively incorporate what they are studying into their own experiences, concepts, and understandings of how the world works" (p. xiv). This can be defined as constructivism.

A major problem in elementary education in the past, identified in It's Elementary, has been a narrow focus on specific skills. An example is memorizing the parts of a flower. Thought provoking content that is part of a child's experience, feelings, or interest is often excluded. A result of this emphasis on rote learning has created students who are bored and passive. The report continued to state that according to recent studies, mental drop-out for underachieving children begins around fourth grade. The first recommendation made was:

> Make a rich, meaning-centered, thinking curriculum the centerpiece of instruction for all students in all subject areas in the elementary grades. (p. 22)

Environmental education can provide a meaning-centered curriculum which fits the type of education that is being requested by the California Department of Education. Klein and Merritt (1994) stated that components of constructivism are often present in existing environmental education curricula. An example given is Project Learning Tree, a K-12 curriculum on trees and forests. This guide offers activities that are student-centered and provide real life problems and productive group interaction. Couple these components along with authentic assessment, and all four essential elements of a constructivist lesson are present.

Developmentalism

While discussing constructivism, it is important to discuss developmentalism. Developmentalism says that it is important to fit the curriculum to a child's stage of development instead of fitting the child to the curriculum. The argument for this is that teaching curriculum other than developmentally is ineffective or even detrimental to the child's development. Teaching developmentally forces the teacher to pay attention to the ways humans learn and grow. Thus, it is essential to understand children's abilities and capabilities in order to provide worthwhile activities (Uhrmacher, 1990).

Kantrowitz and Wingert (1989) provided further support for developmentalism. In the Kantrowitz and Wingert article, Dr. Perry Dyke of the California State Board of Education stated, "We've got to have the teachers and the staff reach children at whatever level they may be at. That takes very sophisticated teaching" (p. 8). In another example from the same article, the principals and teachers in South Brunswick, New Jersey at Greenbrook School believe young children, grades kindergarten through third, learn best through active, hands-on teaching methods such as games and dramatic play. The varying rates of development in this age bracket need to be allowed for. This type of teaching means the program is designed to fit the child instead of making

the child fit the program. This is what is considered developmentally appropriate. The article further stated that major educational organizations such as the National Association for the Education of Young Children and the National Association of State Boards of Education have endorsed similar plans for revamping K-3 to follow constructivist, developmentally appropriate curriculum plans.

Environmental curriculum allows children to be out of their desks, moving, playing, and learning all the while. The effectiveness of the developmentally appropriate aspect of environmental education is supported by the research of Kantrowitz and Wingert (1989). They explained that children are engaged in play for hours which is their way of learning and making sense of the world. Capitalizing on this natural inclination to learn through play is the most effective way to teach young children. It meets their needs. Kantrowitz and Wingert (1989) further suggested that children are not developmentally ready to be forced behind a desk for long periods of time until they are at least 10 or 11 years old. Environmental education will allow the freedom of movement children need.

California State Frameworks

Because environmental education is an integrated approach, taking a look at the California State Frameworks in visual and performing arts, physical education, reading, and

science can reveal where environmental education can be used to meet grade level requirements in these areas. Environmental education does not have to be limited to these four areas, but for the scope of this project, these are the primary areas.

In the foreword of the Science Framework for California Public Schools Kindergarten Through Grade Twelve (1990), Bill Honig, former State Superintendent of Public Instruction, wrote that science education needs to have students actively engaging in learning about the natural and technological world they live in. Students need to grapple with the ideas of science, enjoy learning science, and develop an interest in and responsibility for protecting the environment. This is very similar to the goal for environmental education. Honig also stated, "The expectation that students be active learners is favored throughout the curriculum..." (p. vii) He further added that applying the five senses to the learning of science is the most demonstrable of active learning. He believed active learning to be more that hands-on laboratory experiences. Active reading, listening, discourse, and using new technologies are all part of active learning. The common link for active learning is students making new associations between new and old ideas regularly.

Science is now being taught with a focus on themes. The six themes developed in the Science Framework for California

Public Schools Kindergarten Through Grade Twelve are (1)energy; (2)evolution; (3)patterns of change; (4)scale and structure; (5)stability; and (6)systems and interactions. The themes support science as a philosophical discipline rather than a collection of facts (California Department of Education, 1990). Project Learning Tree, published by the American Forest Foundation, 1994, is an environmental education curriculum guide that offers activities in the afore mentioned themes. The guide is structured in themes similarly to the framework.

Physical education is another curriculum area that can be met through environmental education. It's Elementary (California Department of Education, 1992) provided some statistics concerning children and physical education. Children are not as fit as they were in the past. Statistics show a 50% increase between 1936 and 1980 in obese children. The percentage of severely overweight children in California is 40% greater than the national average.

This shows a greater need for physical education in elementary grades. The Physical Education Framework for California Public Schools K-12 (1994) stated that the most important aspect of physical education is the direct bearing it has on children's physical, mental, and social well-being. A physically fit child will more likely become a healthy adult who is motivated to stay healthy.

A direct link has been shown between physical education and academic learning. Academic motivation, alertness, and success have been positively correlated to a healthy, physically active child. The link in younger children is between active play, physical agility, and coordination, and academic success. Older children need physical activity for a healthy self-concept and the ability to take on new challenges (California Department of Education, 1994).

Physical education promotes social skills and cooperation that are important parts of school success. Three goals of physical education are (1)movement skills and movement knowledge; (2)self-image and personal development; and (3)social development. "The most basic element of the student's learning experience in physical education is learning how to move." (California Department of Education, 1994, p. 17). When guiding children to develop motor skills, the framework requested that children: move with variety, learn effective and efficient movement according to their needs, understand fundamentals of movement, appreciate aesthetics and creative movement, enjoy what they are doing, and be able to select activities to reach a high level of fitness. Environmental curriculum contains activities which encourage this type of physical development.

The next curriculum area to discuss is art and aesthetics. According to the Visual and Performing Arts Framework (1989) for California, children's education needs to take every aspect of their humanity into account. Thus, the arts are an integral part of the core curriculum and a way of seeing, feeling, thinking, and being. The arts are a way of expressing which is vital for any human.

The Visual and Performing Arts Framework went on to emphasize that, "Dance, drama/theatre, music, and the visual arts are disciplines with aesthetic, perceptual, creative, and intellectual dimensions" (p. 2). These disciplines aid students in their ability to create, experience, analyze, and reorganize which encourages intuitive, emotional, and verbal responding. The arts create a balanced program for the whole child and allow self-discovery, self-expression, self-discipline, motivation, creative thinking. Also, the arts can contribute to a positive self-image (California Department of Education, 1989).

The Visual and Performing Arts Framework (1989) continued to report that educators are seeing how important it is to have an integrated, multisensory curriculum that enhances the whole person. Due to differing modes of learning in children as well as differences in cultural background and experience, the arts contribute importantly to integrating the learning process in the following ways:

developing multisensory avenues of perception, enhancing the development of vital, fully functioning individuals and their unique properties, and promoting both individual as well as group development.

Looking at the development of perception leads into discussing the importance of developing aesthetic awareness and appreciation. This is an important aspect of environmental education. The Visual and Performing Arts Framework (1989) stated that art experiences increase perception. The heightened awareness of light, color, sound and movement creates an aesthetic dimension to an ordinary experience. Perception also enhances imagination and creativity. The Wisconsin Department of Public Instruction (n.d.) concluded that children need on-going discovery to see creatively. For example, by looking for colors and forms of objects around them, student's visual perception will deepen and expand over time. The skills of visual perception help students interpret what they see in nature and then communicate those interpretations creatively.

Developing an aesthetic appreciation is a way students can take ownership of their experiences, which can create motivation to act positively toward the environment. Some of the internal outcomes of "multi-sensory awareness experiences" include a change in values, knowledge, and attitudes. The external outcomes include expressions in the

form of visual arts, music, creative movement or dance, creative writing, perception, or social action (Aesthetics and Environmental Education, n.d.). In this way, incorporating arts into the curriculum can help meet the goals of environmental education.

Reading is the last curriculum area to be broached in connection with environmental education. The Recommended Readings in Literature Kindergarten Through Grade Eight (1988) stated that a literature program is an essential part of any reading program. Also,

> Literature will provide experiences that are ordinarily inaccessible to students, broaden their knowledge of the world and its people, and improve reading skills, such as decoding and comprehension. Literature is one of the basics and should be taught in all curricular areas. (p.xii)

O'Brien and Stoner (1987) suggested that environmental education provides "an excellent opportunity for integrating wide reading into the content area program" (p.14). They further suggested that using children's literature with an environmental theme helps ease the inadequate feelings teachers may have at trying to teach environmental education. Literature not only helps students understand environmental concepts, but it creates interest and appreciation (O'Brien and Stoner, 1987).

> Children enjoy reading and listening to stories. The books often help them to understand and appreciate the

> environment by portraying cause-effect relationships,presenting vivid descriptions and accurate pictures, and providing vicarious experiences. Literature also provides a basis for follow up activities that reinforce and expand upon the book's meaning. (O'Brien and Stoner, 1987, p.15)

In this light, children's literature can help student's achieve the goals of environmental education.

This review of the literature demonstrates that there is much support for the constructivist, developmental approach to teaching. Through a naturally motivating environmental education curriculum, the discovery, active-participation, hands-on learning can be carried out easily. While meeting the preferred learning styles of children in this manner, motivated, creative thinking students are being developed to help take care of the world they live in. Objectives in science, physical education, visual and performing arts, and reading are being met at the same time.

GOALS AND OBJECTIVES

The goal of this project was to develop effective environmental education materials in four topic areas that could be used by teachers, either in a classroom or nature center setting, with students in grades kindergarten through five. The topic areas selected were: reptiles; birds, bats, and bugs; water ecosystems; and mammals. In order to accomplish the goal, the following objectives were met:

1. Generate a list with general background information for each topic.
2. Select/create craft projects that represent each topic.
3. Select/create physical education games that enhance the learning of each topic.
4. Select several children's literature books appropriate to each topic.
5. Field test all crafts and games at the nature center.

DESIGN OF PROJECT

This project was inspired by a five week summer camp at the Louis Robidoux Nature Center in Riverside, California, grades kindergarten through five. Each week of camp had a different topic. The topics were as follows: Week 1-Reptiles; Week 2-Ponds & Puddles; Week 3-Birds, Bats, and Bugs; Week 4-Creek Week; and Week 5-Mammals. When creating the guide, the topics were reduced from five to four by combining the two water weeks and calling them Water Ecosystems.

During staff training sessions conducted by the camp director and the nature center interpreter, liberal amounts of background information from various sources was presented on each topic. The information was given to help the camp teachers become more familiar with each topic. When children were experiencing nature through the avenue of crafts, games, or hikes, any information the teacher felt was appropriate could then be shared with the group. Selected background information on each topic was included in the guide to help environmental educators feel more familiar with the subject matter and more comfortable sharing it with their students.

The nature center had drawers filled with crafts that had been created by staff members over the years. The sources for many of them are unknown. The craft projects

chosen for the guide were all made by students during camp. They were chosen for their popularity with the children.

The outdoor games for each topic were presented to the staff during training sessions. Many of the games could be repeated each week. They came from various sources such as Project WILD (Western Regional Environmental Education Council, 1993), Nature With Children of All Ages (Sisson, 1982), and Sharing Nature With Children (Cornell, 1979). For some, the source is not known.

Children's literature was an added component by the author, intended primarily for use by the classroom teacher, but still appropriate for all teachers. Time did not permit reading literature at the nature center. Therefore, recommended literature was gathered from personal experience outside the nature center.

The resources from the Louis Robidoux Nature Center are provided to the current staff every year for their summer nature camp. This project organizes these, as well as additional resources, for future use by the Louis Robidoux Nature Center, other interested nature centers, and classroom teachers.

IMPLICATIONS FOR EDUCATORS

This activity and resource guide can be used by classroom and nature center educators to teach environmental education in grades kindergarten through five. By using the guide, educators can provide students with nature-related experiences through the avenues of science, visual and performing arts, physical education, and reading. Understanding and appreciation of the natural world will increase, helping students to attain the goals of environmental education. Because the experiences are student-centered and allow for active participation, more effective, developmentally appropriate learning will take place.

All of the games provided in the guide will enable educators to implement an outdoor component to their curriculum. This is an important aspect of any environmental education program. Nature centers provide students with outdoor experiences easily. Classroom teachers, however, may not find the outdoor experiences to be as obvious. The games suggested in the guide will make providing outdoor experiences easier for the classroom teacher. Creating a mixture of indoor and outdoor activities provides a balanced approach for students to discover the world around them.

Giving students experiences provided in the guide will satisfy several of the California State Frameworks. The crafts satisfy objectives in the Visual and Performing Arts Framework (1989). Outdoor games satisfy objectives in the Physical Education Framework for California Public Schools K-12 (1994). Children's literature is a vital component in the Recommended Readings in Literature Kindergarten Through Grade Eight (1988). Lastly, the subject matter presented in all four topic areas is relevant to the requirements stated in the Science Framework for California Public Schools Kindergarten Through Grade Twelve (1990).

Using this guide can enhance any environmental education program through a mixture of indoor and outdoor activities while fulfilling State Framework requirements. Helping students learn about the world around them; motivating them to reach a higher level of awareness and appreciation for the environment are goals of environmental education. This guide is a step toward reaching those goals.

APPENDIX

A Guide to Utilizing Crafts, Games, and Children's Literature for Environmental Education, Grades K-5

Background: Reptiles

Reptiles are poikiothermic creatures. This means that they can control their temperature behaviorly. All reptiles possess scales. Most are oviparous which means they lay eggs. Their eggs are laid on land, in contrast to amphibians which lay their eggs in water. The following lists some basic/interesting facts about each group of reptiles:

TURTLES
- There are more than 200 species of turtles all over the world.
- Some turtles spend most of their life in water such as sea turtles and softshell turtles. Some are semi-aquatic such as bog turtles and wood turtles. Some turtles such as box turtles and tortoises spend their entire life on land.
- All turtles have a shell that covers their body: the carapace, which covers the back; the plastron, which covers all or part of the belly; and the bridge, which connects the carapace and the plastron.
- They lay clusters of eggs either in sand or soil.
- Turtles use their feet and beaks to rip their food. As a whole group, they eat insects, worms, fish, fruit, mushrooms, and other plant material.
- Predatory defense is usually retreating into the shell.

LIZARDS
- There are about 3700 species of lizards.
- Many lizards have moveable eyelids, external ear openings, and four legs with five clawed toes on each foot.
- All lizards produce eggs. Most lay eggs in a pocket they dig in the soil. Some species keep the eggs internal and when the babies hatch they come out live.
- Lizards usually eat whatever they can catch and swallow. Their diet typically varies with the seasons. Depending on the species, their repertoire of food can include insects, spiders, worms, other reptiles, and mammals. Some lizards prefer fruit, flowers, and leaves.
- Predatory defense varies with the species. Some scramble away; some puff up, try to scare the predator, then run; some freeze; some fight; and some can easily have a piece of their tail broken off, getting away while the predator thinks it has caught its meal.

SNAKES
- There are about 2400 species of snakes
- Snakes are missing legs, eyelids, external ear openings, and bladders.
- Their flexibility comes from a spine made up of 100-400 vertebrae which are each attached to a separate pair of ribs.
- Snakes move using muscles attached to the ribs as well as scales to grip the ground.
- Snakes use their tongue to "smell" their environment. They have good close-up vision.
- Reproduction is similar to lizards: most lay eggs; some give live birth, keeping the eggs internal.
- Snakes can "unlock" their jaw and swallow their prey whole. They eat

worms, insects, birds, lizards, other snakes, and mammals, amphibians, and fish. Some snakes use fangs to kill their prey while others constrict or squeeze their prey to death by preventing breathing.
- Predatory defense is either running or fighting. Camaflouge helps with many reptiles.

CROCODILIANS
- The major types of this group include crocodiles, alligators, caimans, and gavials.
- Crocodilians have been around for over 200 million years.
- Eyes and nostrils are set high so they can see and breathe while being submerged.
- Nostrils and ears close when they dive.
- A valve in the back of their mouth allows them to catch prey under water without swallowing water.
- Webbed feet help them walk in mud and sand while their tail helps them propel through the water.
- Eggs are laid either in a pit dug in the ground or in nests of decaying vegetation and mud.
- Depending on age, crocodilians could eat insects, crustaceans, mollusks, fish, amphibians, reptiles, birds, and mammals.

Background: Bugs, Bats, and Birds

Below will list some general information about each of the above mentioned categories. Noting similarities and differences between the three groups could be a useful activity for students.

BUGS (INSECTS!)

- Insects have three main body parts: the head, the thorax, and the abdomen.
- Most have six legs (a few have none).
- There is no internal skeletal structure. Their body has an exoskeleton, a hard outer covering. The exoskeleton has layers that protect the insect from drying out while sheltering it like a raincoat on the outside.
- Insects are the only invertebrates (animals with no backbone) that can fly.
- What an insect eats depends on its mouth parts. They can have chewing mouth parts like a beetle, sucking mouth parts like a moth, piercing/sucking mouth parts like a flea, or sponging/lapping mouth parts like a fly.
- Antennae are used for feeling, smelling, and/or hearing.
- Most insects have simple and compound eyes. Compound eyes are thousands of tiny, close-fitting lenses that help create a mosaic of the world. The simple eyes are thought to be sensitive to light and dark.
- Many insects produce pheromones, a chemical specific to each species that serves as a stimulus for communicating messages to one another. Attracting the opposite sex is one use.

BATS

- There are nearly 1000 different species of bats.
- Bats are the only mammals that have true wings and can fly.
- Their wings are modified arms.
- They can crawl on cave walls, tree branches, or other surfaces as well as walk.
- Bats are divided into two groups, *megabats* and *microbats*. Megabats are larger, have better eyesight, eat fruit, nectar, or pollen, and do not usually hibernate. Microbats are smaller, use hearing rather than eyes to find food, eat mainly insects, and typically hibernate in the winter.
- Many microbats use echolocation to find their food. This is a system of high-pitched sounds made by the bat which bounce off prey or objects in their path.
- Bats are great insect eaters and pollinators. Many people fear them needlessly.

BIRDS

- Birds have specially adapted beaks for the types of food they eat. For example, a hummingbird has a long, thin bill for sucking nectar. A grosbeak has a short, pointed bill for grabbing and breaking seeds.
- Birds have specially adapted feet for different purposes. For example, birds of prey have predatory feet that are thick, curved, and clawed for grabbing and tearing prey. Water birds such as herons and sandpipers have a webbed foot to give them support on the soft sand and mud. Refer to Figure 1 for an illustration.

- Wings on birds have hollow bones for support. They are shaped to allow air flow over the top of the wing and lift from below the wing. This enables the bird to fly.
- Hollow bones in the rest of the body give the creature its light weight.
- Most birds have monocular vision with each eye focusing on a different image. Humans have binocular vision, whereby both eyes focus on the same image. The birds with monocular vision have their eyes located on
the sides of their head. Birds such as birds of prey have their eyes in front like humans.
- Birds use small pebbles, stones, eggshells, and other hard materials that are swallowed and stored in the gizzard to help digest their food.
- Birds are the only animals that have feathers. The two types of feathers are contour and down. Down is closer to the body for warmth while the contour is found on the exterior surface of the bird, on its body, tail, and wings.
- Birds molt or lose their feathers several times a year to replace damaged feathers.
- Owls are nocturnal birds. They never gather in flocks. They catch their prey at night using binocular vision and sound. Their eyesight and ears are excellent. Owl pellets are undigested fur and bones that are coughed up after eating their prey whole.

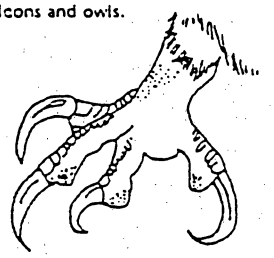
Figure 1

FEET

There are a few foot forms that should be noted, as these also aid different birds in making their different livings.

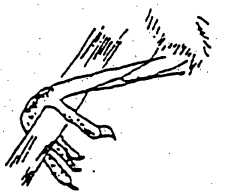
PREDATORY FOOT

A strong foot with thick, curved talons, that is used for grasping prey animals, both aquatic and terrestrial. Birds with this foot include hawks, eagles, falcons and owls.



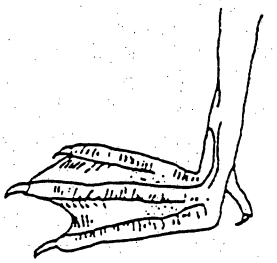
PERCHING FOOT

A foot with three toes in front and one behind. It enables perching birds to sit comfortably on a horizontal support, with the opposite hind toe acting as a thumb. Perching birds include all the chickadees, warblers, finches, thrushes, right through the crow family.



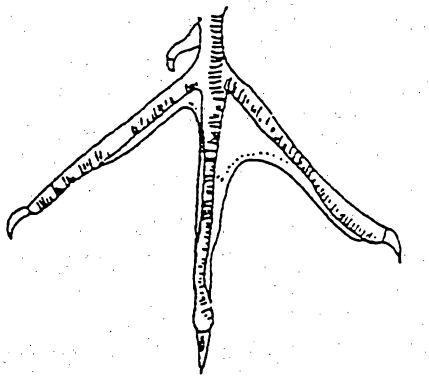
SWIMMING FOOT

This foot has the front three toes webbed and is an excellent swimming organ. It is used by gulls, ducks, geese, swans, loons, etc.



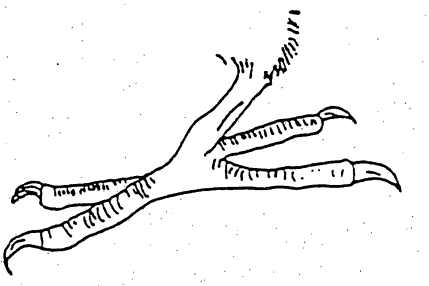
WADING FOOT

A foot that must support the bird on soft mud and sand, this one spreads the weight out on long, slender toes. It is used by such wading birds as herons and sandpipers.



CLIMBING FOOT

This foot has two toes in front, two behind, with sharp claws for clinging to tree bark. It provides excellent grip for birds such as woodpeckers.



Background: Ponds and Creeks

PONDS AND CREEKS

- Water is the source of life in ponds, creeks, and rivers. Because it is polar, able to dissolve many substances, and neither acid or alkaline, it can support life. The dissolved oxygen it contains is a requirement for aquatic animals that do not breathe air.
- Water's density allows organisms to be buoyant. Water's transparency allows animals with eyes to see and sunlight to reach plants for growth.
- The surface tension of the water refers to the strong attraction of water molecules at the surface. This tension allows some animals to walk on the water, while making it difficult for some animals to break through the surface. This tension also allows some animals like diving beetles to carry air bubbles under water as an oxygen supply.
- The most common invertebrates found in ponds are insect larvae and nymphs. Nymphs are the pre-adult stage before becoming a flying insect. Examples are mosquitoes, dragonflies, damselflies, caddis flies, and mayflies. Refer to Figure 2 for an illustration of various invertebrates one might find.
- Water striders use surface tension to glide on the water. They are able to stay on the surface because the tips of their legs are lined with many tiny hairs that repel water. Their claw is also located further back on the leg to avoid breaking through the tension.
- Diving beetles have a sac that they can use to hold air while they dive. It is similar to an oxygen tank a scuba diver would use.
- Dragonfly nymphs are very aggressive and will eat most of the other animals.
- On the underside of rocks, one might see hard, rectangular bulges that look like a conglomeration of rocks. This is the hard "shell" that the caddis fly larvae makes. Also found are planaria. This is a flat worm with a triangular shaped head and two eyespots on top which detect light. They move by laying down a slime trail and gliding over it with cilia.
- The difference between a damselfly and a dragonfly is that a damselfly has unequal size wings and folds them when it lands while a dragonfly has equal sized wings and keeps them open when sitting. Dragonflies tend to be larger.
- Land creatures that are common to pond habitats include great blue herons, egrets, raccoons, ducks, and frogs.

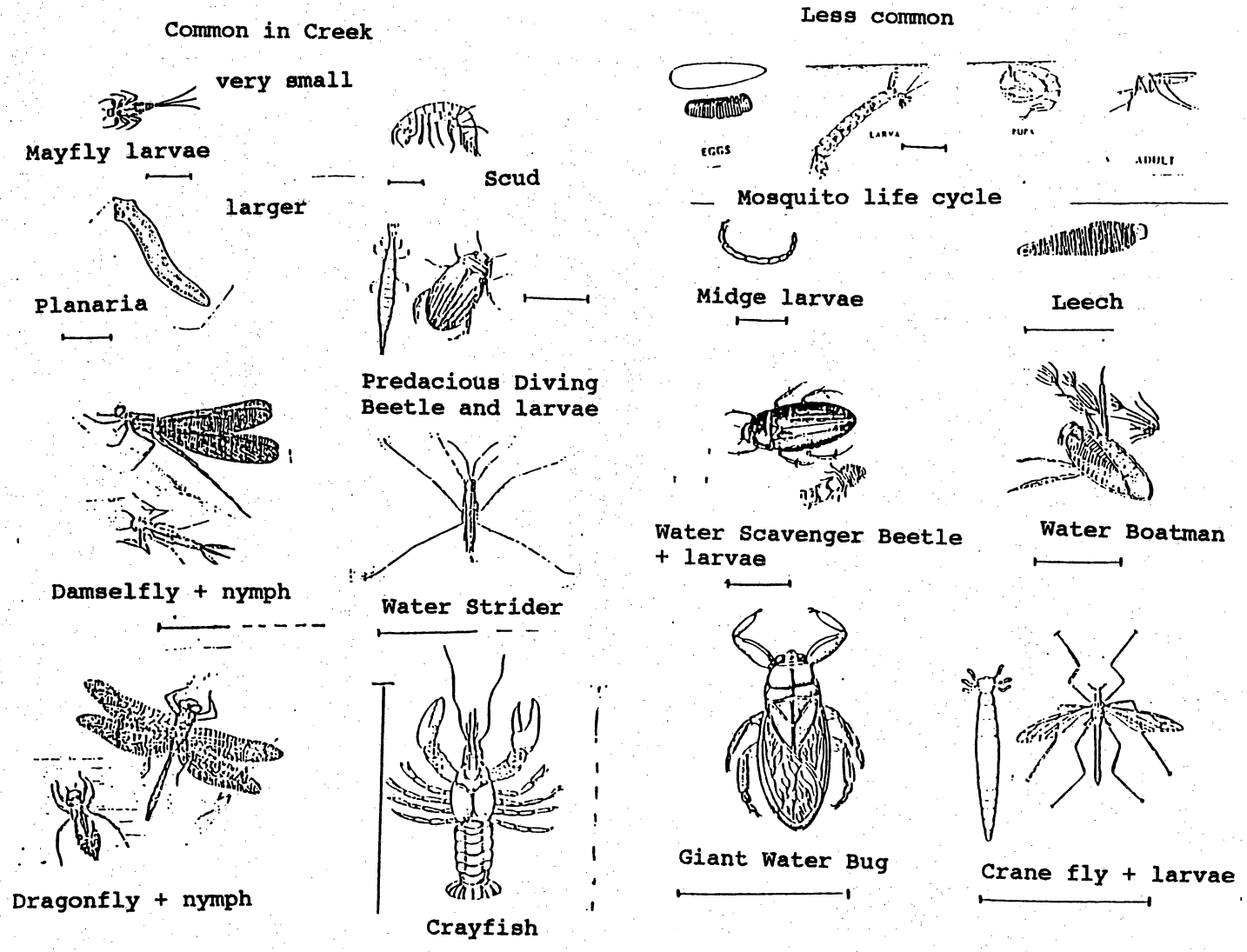

Common in Creek
very small
Mayfly larvae
Scud
larger
Planaria
Predacious Diving Beetle and larvae
Damselfly + nymph
Water Strider
Dragonfly + nymph
Crayfish
Less common
EGGS
LARVA
PUPA
ADULT
Mosquito life cycle
Midge larvae
Leech
Water Scavenger Beetle + larvae
Water Boatman
Giant Water Bug
Crane fly + larvae

Figure 2

Background: Mammals

Mammals possess the following features and characteristics: a vertebrae and cranium (backbone and skull, respectively); active in wide range of temperatures; females nurse young with milk produced in glands in the body; various glands (i.e., mammary, oil, sweat, and scent); hair of various types; teeth; good use of scent for finding food, mates, and shelter; and outer ears. The mammals included in this section are common to the local area. Not all mammals could be represented, so a few of the children's favorites are included.

SKUNKS

- There are four species in North America, but only striped and spotted skunks are wide spread.
- They usually live in dens underground. Some live under buildings, woodpiles, or other dark, hidden places.
- They prefer burrows already dug by another animal.
- Skunks do not hibernate, but they stay in their dens most of the winter and can drop their body temperature slightly.
- Their defense against predators is the musk they spray. They can spray 10-15 feet away. The musk is stored in two sacs under their tail. The sacs have tiny openings where the musk is forced out through muscle contraction. Musk is only sprayed in defense.
- The skunks' black and white markings are a sign to predators of their special defense.

OPOSSUMS

- Opossums are the only marsupial in the United States.
- They have a prehensile tail for balance, transporting leaves, grass, etc. to their burrow, and for using as a loose anchor for climbing. They only hang from their tails for short periods of time.
- They sleep through cold, dry, or hungry periods. This is not hibernation, just inactivity.
- Food is fruit, insects, and small animals.
- They transport young on their back.
- One defense from predators is opening their mouth beyond ninety degrees and keeping it open for up to fifteen minutes. They display their teeth and hiss. If this doesn't scare the attacker, they play dead by going completely limp.
- Sense of smell is acute.
- The brain is one-fifth the size of a cat.

RACCOONS

- Raccoons are found in a wide range of habitats. They prefer hardwood forests near streams.
- They are solitary creatures making a den in a hollow tree or rock crevice.
- They have an acute sense of feeling in their hands. This explains their "washing" behavior when putting their hands in water. Water increases the paws' sensitivity by making the skin more pliable.
- Raccoons hunt at night and use water because they have no salivary glands.
- They eat almost anything. Being primarily carnivores they hunt earthworms, frogs, insects, and crayfish. They will also eat fruits, berries, nuts, and will invade agricultural land.

SQUIRRELS

- There are 230 or more species of squirrels. They include flying squirrels, tree squirrels, and ground squirrels.
- The most common type found in the area are ground squirrels. Their coloration is yellowish-gray with some being lightly spotted or brownish-gray with dark stripes.
- They have small ears and bigger feet than tree squirrels.
- They are active during the day, sitting on their haunches to watch for enemies. Whistling a twitter alarms others of danger.
- Some live in groups and others are solitary. They all dig burrows, living under logs, in hollow trees, among rocks, etc.
- Squirrels in the south are active all year while those in the north hibernate in the winter,
- Their diet consists of seeds, nuts, roots, leaves, bulbs, fungi, insects, birds, eggs, and carrion. They can hoard food in cheek pouches.

COYOTES

- Coyotes belong with the dog and wolf families.
- They have been extending their range in all directions. As a decrease in wolves has taken place, the coyote has been able to expand.
- They eat rabbits, mice, other small rodents, insects, birds, and fish. They have been accused of killing livestock, but they mainly carrion-feed larger animals.
- It is common to hear them singing at night in groups. The reason for this is still being studied.

RABBITS

- Rabbits live in grassland and open woodlands.
- They live in burrows close together.
- They are nocturnal.
- Their diet consists of grass, bark, and vegetable crops.
- Rapid breeding is common.
- Camaflouge and stillness are the only defenses available.
- Enemies are birds of prey, members of the weasel family, and rats.
- A hind leg thumping is used to alert other rabbits of danger.
- Hares belong in the same order as rabbits, but a different family. They differ from rabbits in a few ways; they usually live in open spaces and run zig zag patterns to escape predators. Rabbits usually scamper into their burrow. Hares are born with hair and their eyes open. This is referred to as precocial. Rabbits are born blind, hairless, and helpless. This is referred to as altricial.

Lizard on a Stick

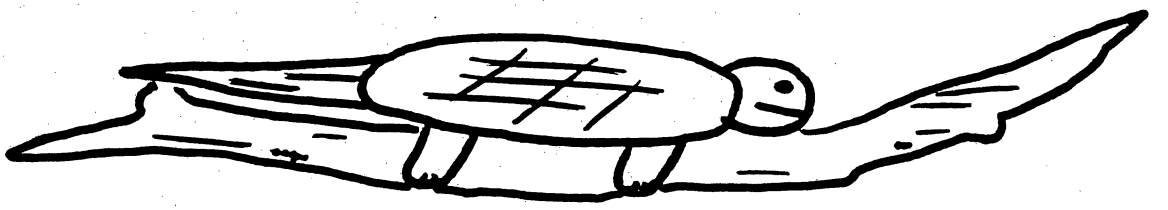
Background: This activity is a great visual for students who don't see lizards where they live. Cold-bloodedness and sunbathing can be discussed using the craft as a prompt and visual.

Grade Level: K-5

Materials per student: 1/2 stick of clay (any color), stick or twig collected from outdoors, toothpick

Preparation: none (clay may be already divided into body parts for younger students)

Procedure: Give each student half of a stick of clay. Tell students to take half of the clay to make a body. Show them how to roll the clay in-between their palms to form an oval shape. If it is coming out too round, show them how to flatten it slightly by pressing it out from the middle. When the desired shape is formed, have students take half of remaining clay to make a head and tail. The head can be made in the same fashion as the body, but keeping the form circular instead of oval. Attach the head to either side of the body. Blend just a little of the clay from the neck and body together either with a finger or toothpick to keep parts attached. The tail can be made by rolling a "hotdog" or "snake" with the clay. Attach like the head. The remaining clay can make four feet. Feet are small ovals like the body. A toothpick can be used to add details to any part of the lizard. On completion, put the lizard on a stick. Bend the legs around the stick until the lizard is holding freely.



Turtle Hat

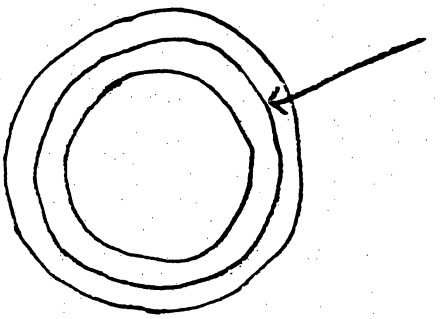
Grade Level: K-5

Materials per student: dinner size Chinet plate, Chinet bowl, green and brown paint, five 2" x 2" green construction paper squares, two 4" x 2" green construction paper rectangles, one 2" x 2" pink construction paper square, two 10mm moving eyes, two 1' long pieces of yarn, scissors, glue

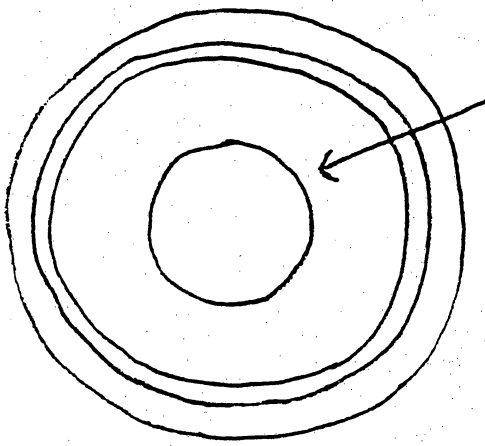
Materials for teacher: hole punch, exacto knife

Preparation: For K-3, pre-cut hats using following directions: Take a Chinet bowl and cut the rim of the bowl off. Use this bowl as a tracer. Place the tracer in the center of a Chinet dinner plate. Trace around the bowl. Using an exacto knife cut out the hole. Turn the plate upside down and slide an uncut bowl up through the hole from the bottom side of the plate. (Refer to drawing). Glue the bowl in place. Punch a hole with a hole punch on opposite sides of the dinner plate to be used as string attachments to hold the finished hat in place. Variation: For younger students, K-1, the plate can be omitted and the uncut bowl used by itself. Punch a hole on opposite sides of the bowl for the string.

Procedure: Have students paint the bowl portion of the hat green or brown. Using the color not used for the body, have students add spots to create the scales. The plate portion of the hat can be painted any color desired. Some ideas are green for grass, blue for water, camaflouge for underbrush, etc. Let dry for several hours. After the hat is dry, give each student yarn to tie on each side. Adding the feet, head, tail, and tongue can be simplified for kindergarten students by pre-cutting the exact shapes. Cutting for grades 1-6 can be part of instruction. Have each student round two adjoining corners on four of the 2" x 2" green squares to be used as feet. Glue in place. The last 2" x 2" green square turns into a tail by creating a triangle. This can be done by cutting two adjacent corners to a point. Glue in place. To create the head and mouth, round all four corners on one 2" x 4" rectangle. Fold both 2" x 4" rectangles in half. With both pieces still folded, glue the rounded piece on top of the other keeping the folded side toward the back. The opened side will stay in front for a mouth. Round two adjoining corners of the pink construction paper square. (This may need to be down-sized to fit inside the mouth). Opening the rounded rectangle, glue the pink tongue inside. Glue the bottom of the entire unit to the hat where the head belongs. The finished product should have an entire head that can move freely from the hat as well as a mouth that opens. Last, glue on two 10 mm eyes to the top of the head.

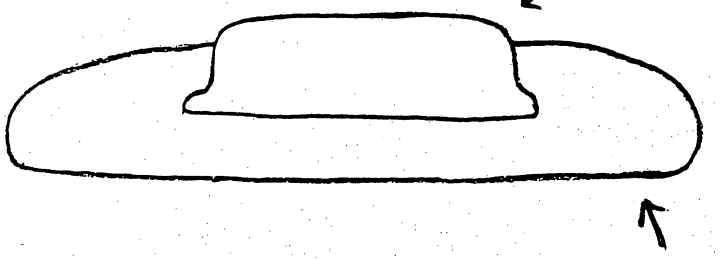


Cut rim of bowl
to second ridge.
Use as a tracer.

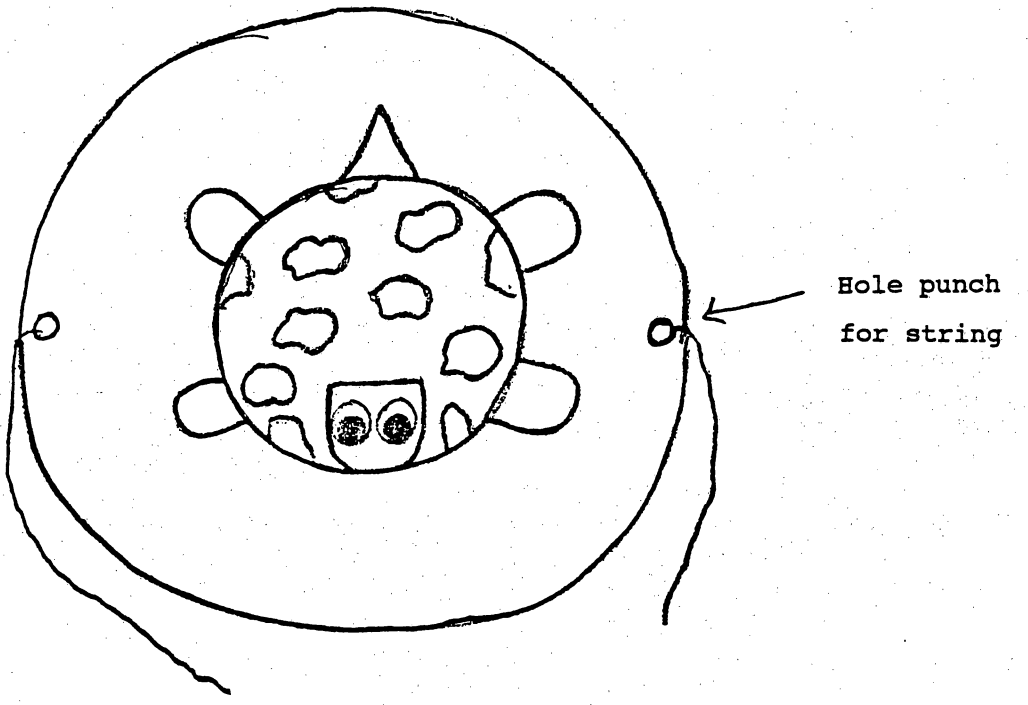


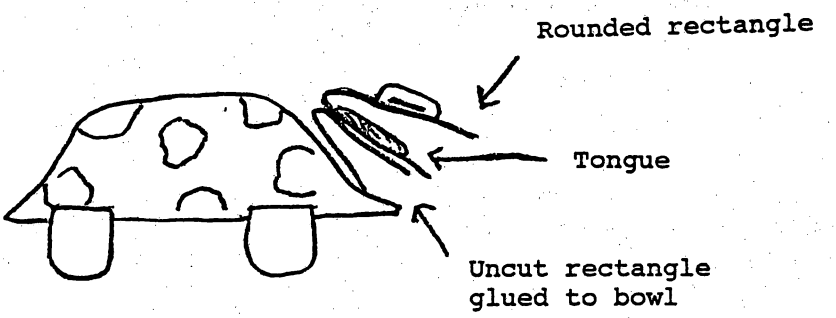
Center bowl in middle
of dinner plate. Trace
around rim. Use exacto
knife and cut out hole.

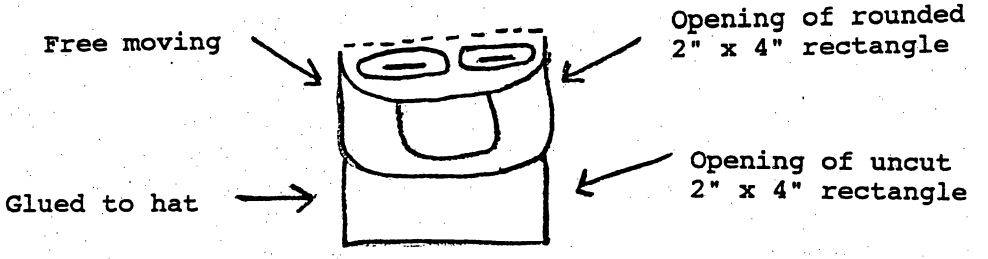
Slip bowl through hole
so bottom becomes top of hat.



Dinner plate should be
upside-down.


Hole punch
for string


Rounded rectangle
Tongue
Uncut rectangle
glued to bowl


Free moving
Opening of rounded
2" x 4" rectangle
Opening of uncut
2" x 4" rectangle
Glued to hat

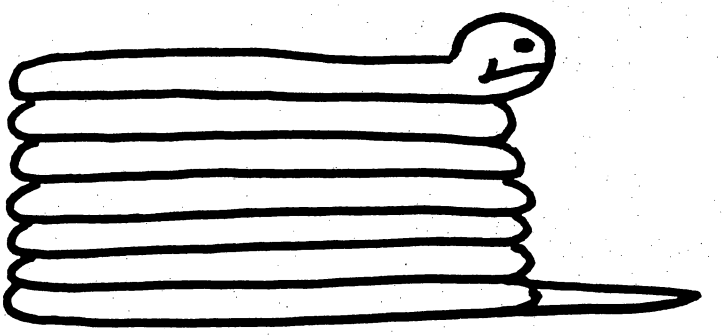
Snake Coil Pot

Grade Level: 1-5

Materials per student: Modeling clay (2 sticks minimum), toothpick

Preparation: none

Procedure: Have students roll a small section of clay between their palms to make a ball. Flatten the ball into a pancake that is the diameter desired for the pot. More or less clay may be needed here. Taking another small section for a coil, roll clay between palms into a "snake" or a "hot dog" shape. Make the coil long enough to go around the edge of the circular bottom previously made. Continue to add coils on top of each other until the desired height is reached or almost all the clay is used up. Make sure that each coil is being held together on each end by using a toothpick or fingers to blend the clay together. On the last coil, have enough clay left to bulge one end into a head. Use a small piece of clay to attach on the bottom coil as a tail. The tail can be shaped in an oval form with a pinched end to create the tip of the tail. Let dry overnight. If a kiln or oven is available, bake the pots. Note: Some clay doesn't dry well. It may be desirable to investigate this before purchasing clay.



Reptile Picture Frames

Grade Level: K-5

Materials per student: one 5-1/2" x 7" piece of Fun Foam (purchased at a craft store), one 1/2" strip of magnet, one 5-1/2" x 7" piece of tag board for backing, a 3-1/2" x 5" picture either taken at school or brought from home, one 3" x 3" piece of Fun Foam in a different color from the frame, a snake tracer, a lizard tracer

Materials for teacher: tag board to reproduce tracers of snake and lizard for students (if teaching older students), exacto knife, three different colored sheets of 11-1/2" x 17-1/2" Fun Foam (each sheet will produce four frames with enough left over to use for the creatures), puff paint (optional)

Preparation: Using an exacto knife, cut a rectangle of Fun Foam making the outside edges 5-1/2" x 7". Measure in from the outside edges 1-1/2" on each side. Cut inside rectangle out. Save inside for creatures or another art project. For older students, make a tracer of the snake and lizard, found at the end of this lesson, on tag board or unused file folders. For younger students, pre-cut the snakes and lizards. Make sure that the creatures are a different color from the frame. Cut backing.

Procedure: Handout a frame to each student. Have each student center their picture under the frame and glue it around the edges only. Glue picture and frame to the backing. While glue is drying, handout either the pre-cut lizards and snakes, or the tracers and foam pieces. When creatures are ready for gluing, have each student arrange their snake and lizard wherever they choose on their frame (opposite corners looks nice). Next, if desired, add puff paint eyes on each creature and a tongue on the snake. Give each student a strip of magnet. Have them center it on the top, back of the picture backing. Note: To challenge older children, have them measure the correct frame size and cut it with sharp scissors on their own. The cutting will not work as nicely as an exacto knife.

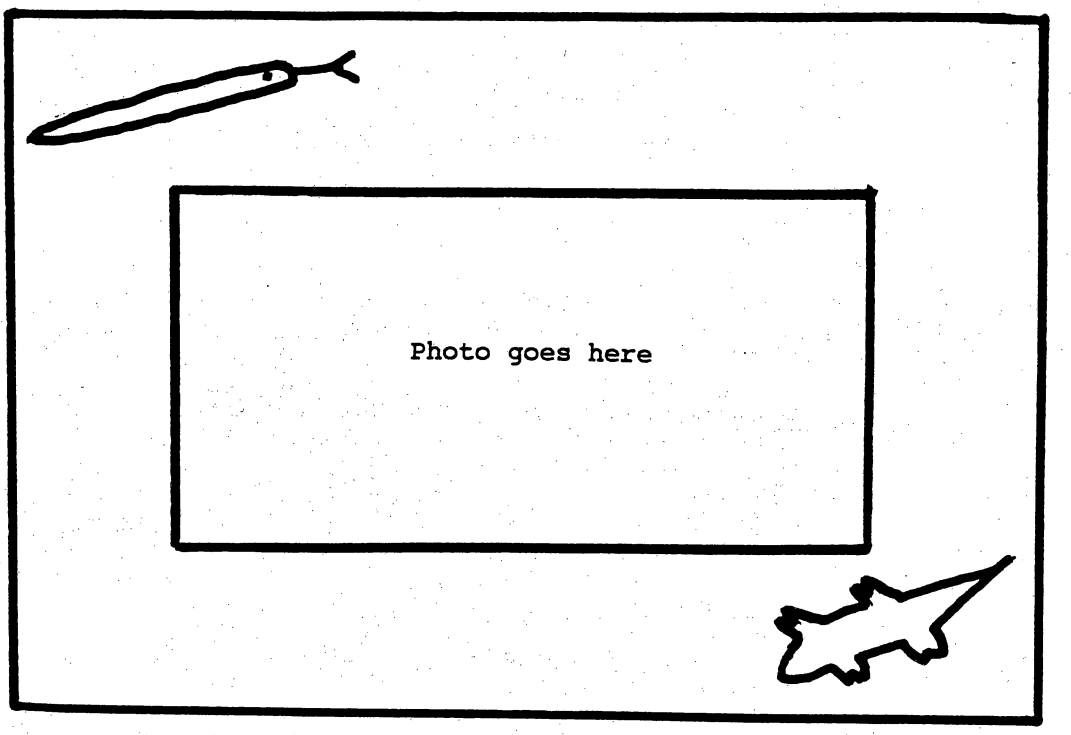
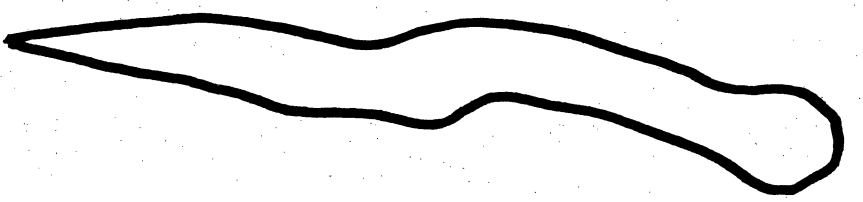
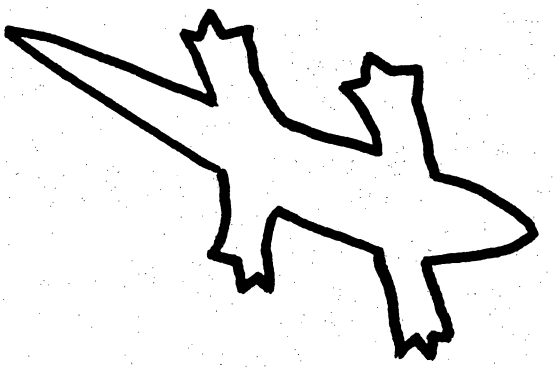


Photo goes here





Fossils

Background: Dinosaurs can be discussed with children when introducing reptiles. Fossils are part of the dinosaur era that children can learn about. Explain how "things" left their impression in the earth's crust thousands of years ago.

Grade Level: K-5

Materials per student: one ziploc baggie, one cup of plaster of paris, 1/2 cup of water in any container, a shell or leaf, newspaper, Vaseline (optional)

Preparation: Put one cup of plaster of paris in a baggie for each student. Put half a cup of water in a container. Lay out newspaper on the work space.

Procedure: Have students choose a leaf or shell to make the imprint. A thin coat of Vaseline may be applied to the side of the object making the imprint if desired. This can help the object come out of the plaster more easily. At the same time, instruct everyone to pour the water in the baggie, zip it shut, and shake vigorously. Next, open the baggie and pour the plaster onto the newspaper. Take the leaf or shell and press it part way into the plaster. Leave it in for approximately 10-15 minutes. Remove the object and let the plaster dry completely. Note: It is important to remove the object before the plaster fully dries. The time for this will vary depending on how thick the plaster is originally. The plaster should be just thick enough that it will not completely spread out on the newspaper. It should stay fairly confined on the newspaper. A trial run is highly recommended not only for time allotment in drying, but also for plaster/water ratio.

Variation: Instead of pouring the plaster directly on the newspaper, a more evenly shaped fossil can be made by using the lid of a plastic container such as Cool Whip or butter. The plaster can be poured into the lid. Using a popscicle stick or tongue depressor, level off the plaster, and then continue with the same procedure as described above. Note: This variation makes the fossil much thinner. A smaller lid is recommended. Larger lids create too much surface area and results in breakage.

Clothespin Alligator

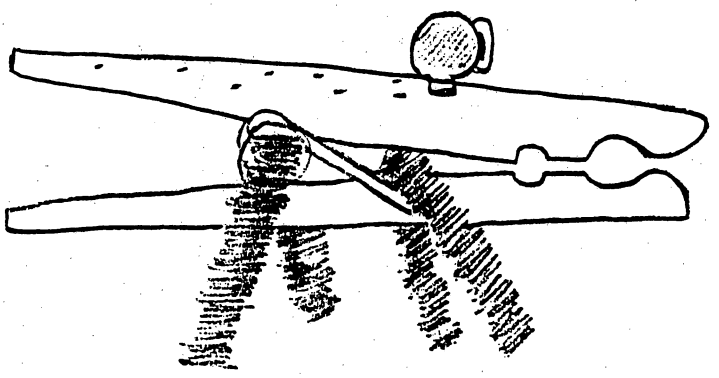
Grade Level: K-5

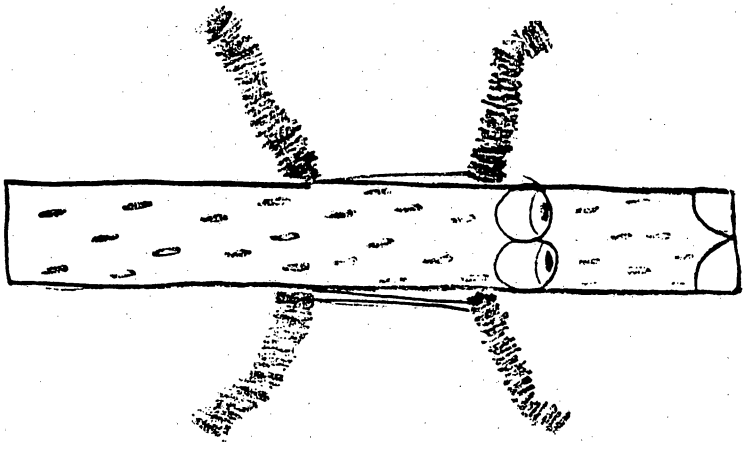
Materials per student: one clothespin, two 3" length green pipe-cleaners, two 7mm moving eyes, one 1/2" ball of tacky poster putty, green and red markers, glue

Materials for teacher: tacky poster or craft putty purchased from a local craft store

Preparation: Precut pipe-cleaners and separate a small ball of tacky poster putty for each student. The putty will be used as the eye sockets to hold the moving eyes.

Procedure: Have each student color a clothespin with green marker by either coloring the entire clothespin or dotting it to simulate scales. Using a red marker, make two dots on the top, opening end of the clothespin to create nostrils. Separate the ball of putty into two small balls. Place them side by side on top of the clothespin where the metal spring crosses. Push the moving eyes into each putty ball, making sure they are facing forward. Slide one pipe-cleaner through the metal spring and the other inside the opening end behind the eyes. Glue in place.





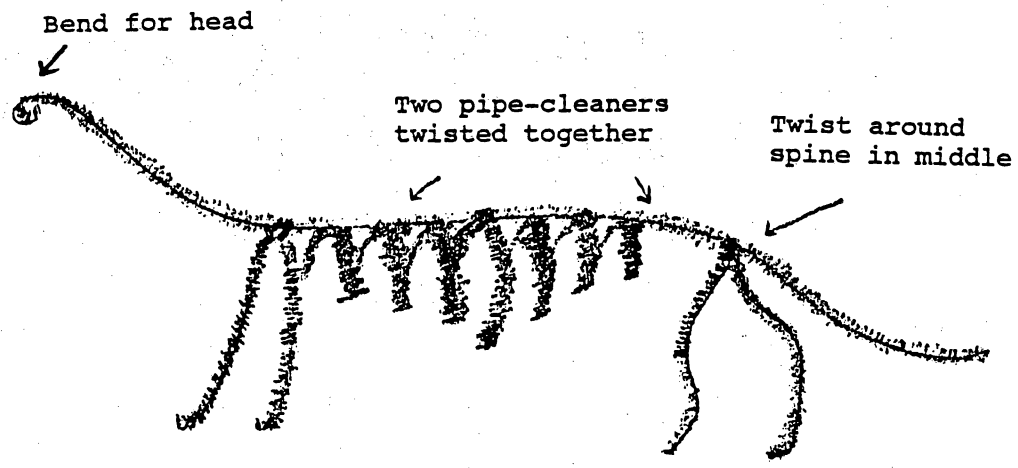
Pipe-cleaner Dino

Grade Level: 3-5

Materials per student: four pipe-cleaners full length (any color), one pipe-cleaner 8 cm long, two 7 cm, two 6 cm, two 5 cm

Preparation: Precut pipe-cleaners that are not full length. For older students, part of the lesson can be measuring and cutting, if desired.

Procedure: Refer to drawing for visual of directions. Take two pipe-cleaners and twist them together at the ends. Bend them to look like a dinosaur's spine and head. Bend two pipe-cleaners in half for the legs. Twist them around the spine and bend them at the knees and ankles. Use the precut pipe-cleaners for ribs. Put the longest pipe-cleaner in the middle of the spine, twisting it around like the legs. Add the other pipe-cleaners from 7 cm down to 5 cm in both directions from the center rib. Bend the ribs to create curves.



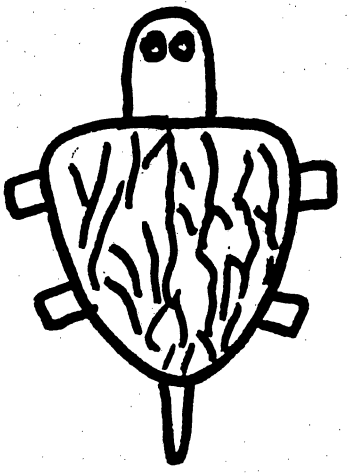
Walnut Turtle

Grade Level: K-5

Materials per student: one-half of a walnut shell, green marker, one 2" square of green construction paper or tag board, two 5mm moving eyes, glue, marble (optional)

Preparation: Break open whole walnuts in the shell carefully. Precut green squares.

Procedure: Give each student half a walnut shell. Have them color the shell with green marker. Before children cut, demonstrate cutting out the body parts. Taking the green square, cut a rectangle, rounding one end for the head, four small rectangles for feet, and one long, narrow rectangle for the tail. Sizes will vary depending on how each student cuts. Make sure to tell students that they need to get all body parts out of the one square. Glue each body part in place on the bottom side of the shell. When dry, have turtle races! Put a marble under the shell and roll! See who rolls their turtle the farthest.



Mini Wetland

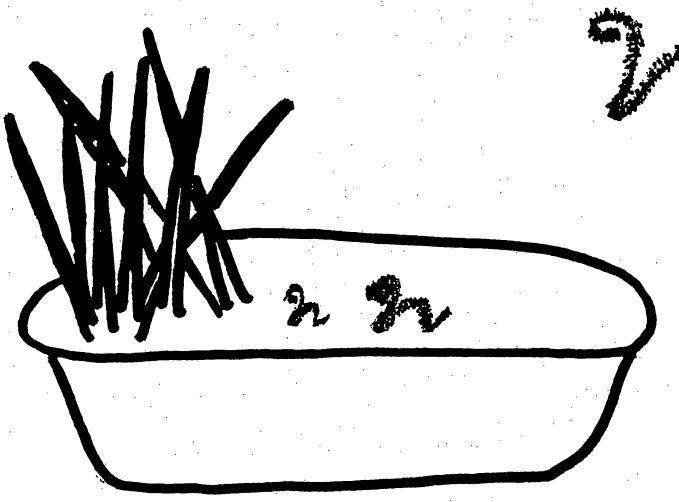
Background: This activity is a good introduction to some of the plants and animals you might find in a wetland habitat. Encourage children to be creative and add other items that could be found.

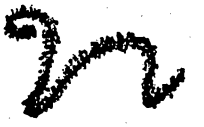
Grade Level: K-5

Materials per student: 2 cups of plaster of paris, approximately one cup of water, one paper or plastic bowl, tall grasses from outside, two 1" or 1-1/2" pieces of yellow and white pipe-cleaner, blue food coloring or paint, baggie

Preparation: For younger students, it may be helpful to mix up a very large amount of plaster of paris in a bucket and just walk around pouring it in to the bowls for them. Older students can mix it themselves by adding water to the plaster in a ziploc baggie, shaking it well, then pouring it into their cups. The blue food color or paint can be added, as desired, to make the plaster look like water.

Procedure: Before making the plaster of paris, make sure that all materials are ready to go so they can be added to the plaster immediately. The plaster needs to be thick in order to hold the contents upright. When it is thick, it tends to dry quickly. In some cases, it may dry before a student has a chance to add their contents. The teacher may want to do a trial run to find a good consistency that still gives the students time to add their contents. The pipe-cleaners should be used to make ducks. Have each student fold one end over to make a head. Put a bend in the middle of the pipe-cleaner for the body. Fold the other end up to make a tail. (See picture.) When grass and ducks are ready, make plaster as mentioned in preparation. Pour the plaster in a bowl. Immediately add the grasses on one side to simulate cattails. In front of the grasses add the ducks.





Duck magnified

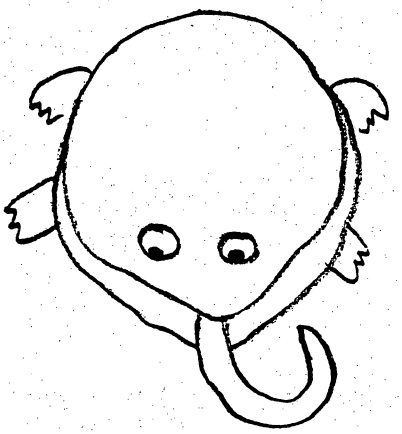
Jacaranda Frogs

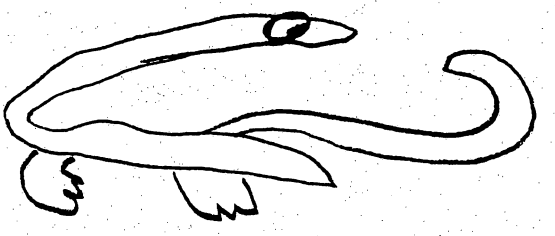
Grade Level: K-5

Materials per student: one dried Jacaranda seed pod that is opened, two black-eyed peas, one 1/4" x 4" strip of red construction paper, four 2" x 2" squares of green construction paper, tracer for feet (found at end of lesson)

Preparation: For kindergarten and some first grade children, precutting the feet may be desired. Making tracers from tag board or file folders will replicate the feet as presented. To bypass this preparation, verbally directing the students in cutting feet can add variation and allow for creativity.

Procedure: If the students are cutting the feet, instruct them to trace two of the front feet and two of the back feet on their green rectangles. After cutting, glue the feet to the bottom of the Jacaranda pod. The curved feet belong in the front toward the pod opening. The rounder feet belong in the back at the closed end. Glue two black-eyed peas on top of the pod close to the opening. Glue one end of the red construction paper strip to the inside of the pod opening. Curl the free end around a pencil after it is dry. Let the students add a little spider or insect to the tongue for an added effect! Note: If tracers are not being used, instruct the students to cut out the feet in any manner desired.





Crayon Resist Water Scene

Background: This activity allows children the chance to reveal what they see in the water. This is a great follow-up activity to studying water habitats that can show what the children have learned about underwater life. A before and after picture could be used as an assessment.

Grade Level: K-5

Materials per student: crayons, white paper, blue watercolor, paint brush, cup of water, one piece of construction paper in any color (to be used as a mount if desired)

Preparation: none

Procedure: Give each child a piece of white paper (any size). Tell them to draw an underwater scene containing some of the creatures they have learned about such as fish, crayfish, or frogs. The key is to color VERY hard and completely. There should be no white showing through any of the drawings. Once the picture is completed, have the students paint over their pictures with blue watercolor. The darkness of the background is variable: more paint makes a darker background, less paint makes a lighter background. The crayon will resist the paint and stand out quite brightly after the watercolor dries. Mount the picture on a piece of construction paper to make the picture appear more finished (optional). Note: This method can be used for any picture on any subject!

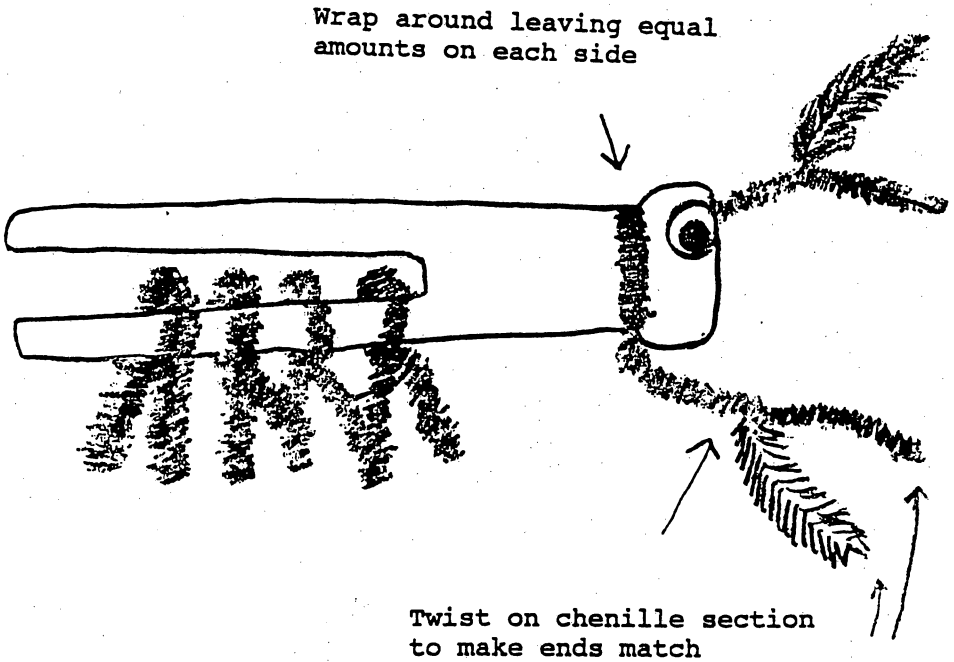
Clothespin Crayfish

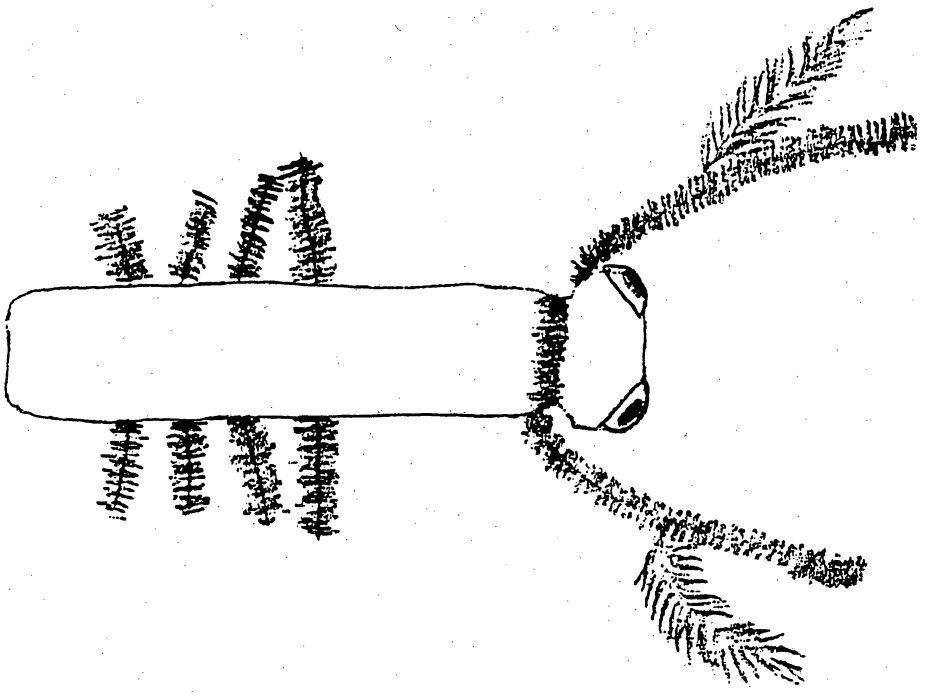
Grade Level: K-5

Materials per student: one 3-3/4" doll pin, one 8" piece of red pipe-cleaner, four 4" pieces of red pipe-cleaner, red paint, paintbrush, two 7mm moving eyes, two sections from a red chenille pipe-cleaner (refer to drawing), glue

Preparation: Precut the pipe-cleaners for younger students. Older students may be allowed to measure and cut on their own.

Procedure: First have the children paint their doll pin with red paint. Allow sufficient amount of time to dry. Take the 8" pipe-cleaner and wrap it around the round end of the doll pin in the groove. Make sure it is even on both sides. Take a section from the chenille pipe-cleaner and twist one end to the pipe-cleaner already attached so that the ends meet to make a claw. (Refer to drawing). Do the same to the other side. Next, twist the four 4" pipe-cleaners around the cut-out of the pin. These may be glued in place if they slip too much. Last, glue on the moving eyes to the round end of the doll pin.


Wrap around leaving equal
amounts on each side
Twist on chenille section
to make ends match



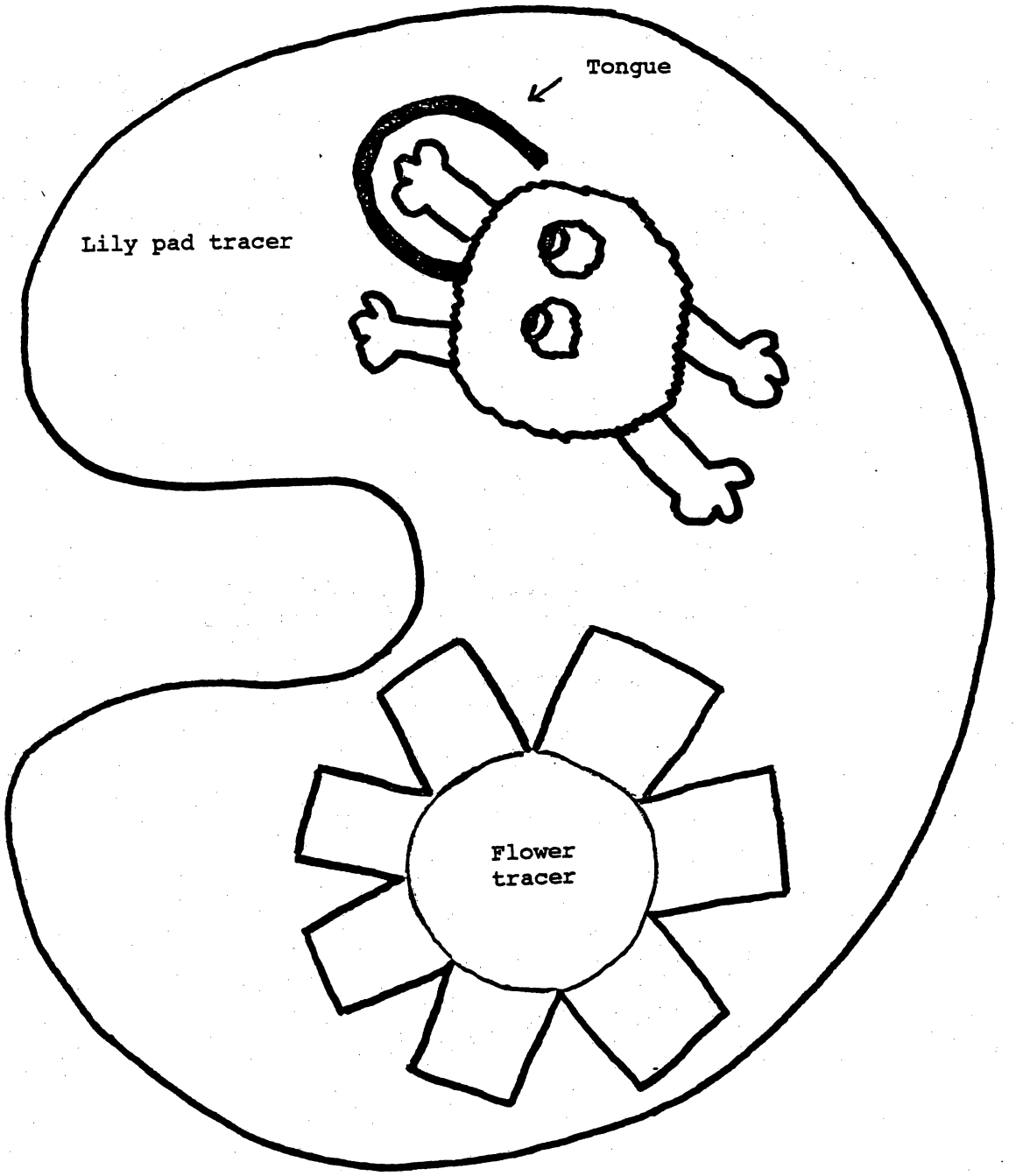
Pom-pom Frog on a Lily Pad

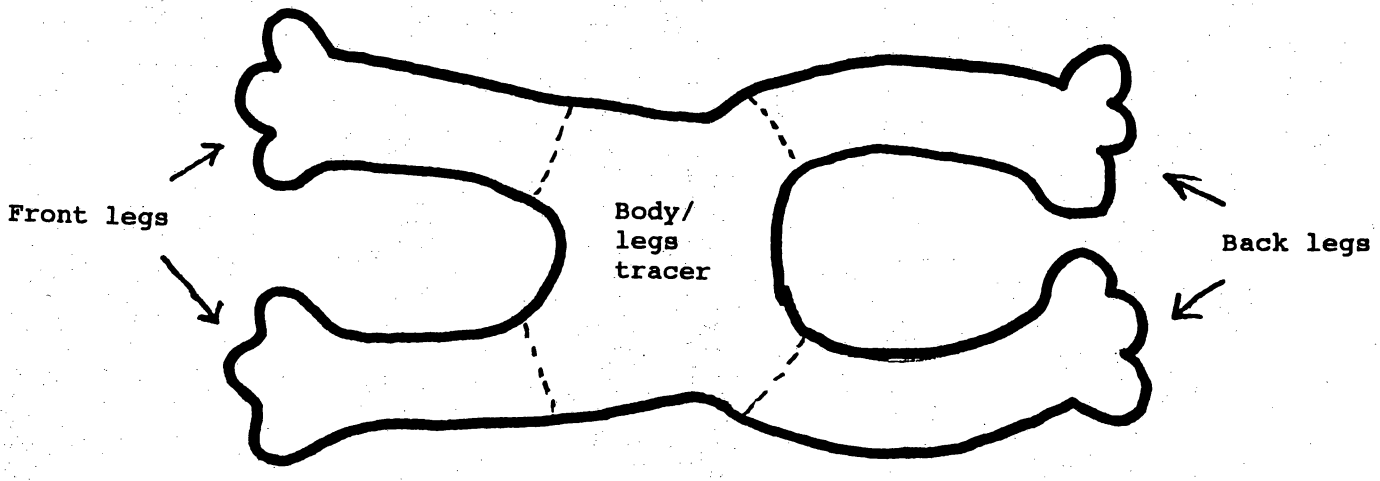
Grade Level: K-5

Materials per student: one 2" green pom-pom, two 3/8" or 1/2" green pom-poms, two 10mm moving eyes, one 4" x 1/4" red strip of construction paper, one lily pad, flower, and lower body made from tracer provided (Make sure the lily pad and lower body are on heavier paper if possible. The flower can be cut out of yellow or white paper.)

Preparation: Precut lily pad, flower, and lower body for very young students. For older students, make several tracers of the lily pad, flower, and lower body on tag board or file folder paper for students to trace and cut out themselves. Number of tracers to be shared by each student is optional.

Procedure: Either have students trace and cut out the lily pad, flower, and frog's lower body, or provide precut pieces. Bend the legs of the lower body at the lines provided. Glue the 2" pom-pom on the lower body. Glue the two smaller pom-poms on top of the larger pom-pom for eye bulges. Glue the two moving eyes to the front of each smaller pom-pom. Glue the red construction paper strip in the center front of the larger pom-pom for a tongue. Roll the paper around a finger or pencil to create a roll in the tongue. Mount the frog onto one side of the lily pad. Glue the flower on the other side of the lily pad. Note: Students can cut out a flower of their choice if they prefer to make their own design.


Tongue
Lily pad tracer
Flower
tracer



Bend on dotted lines

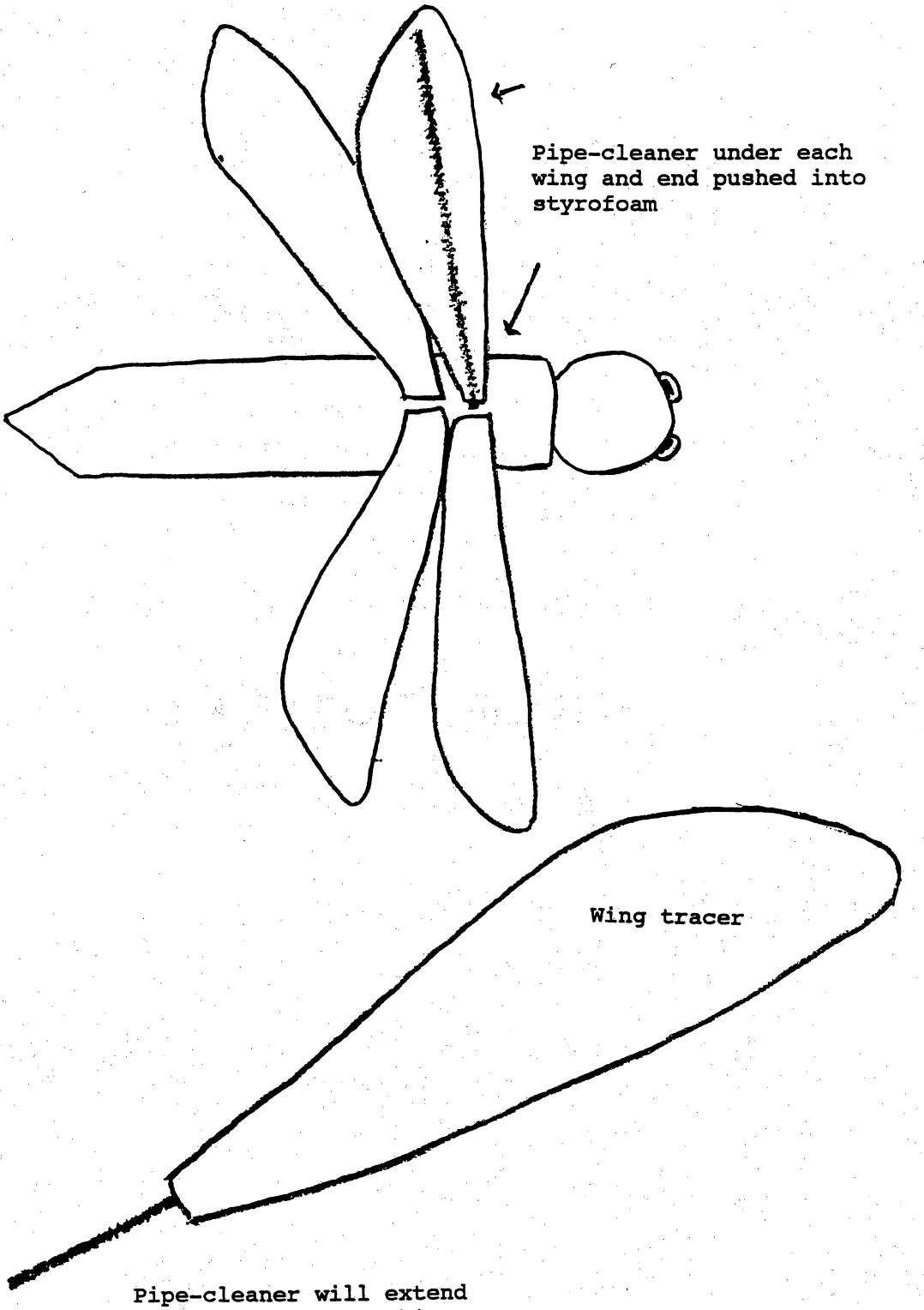
Styrofoam Dragonfly

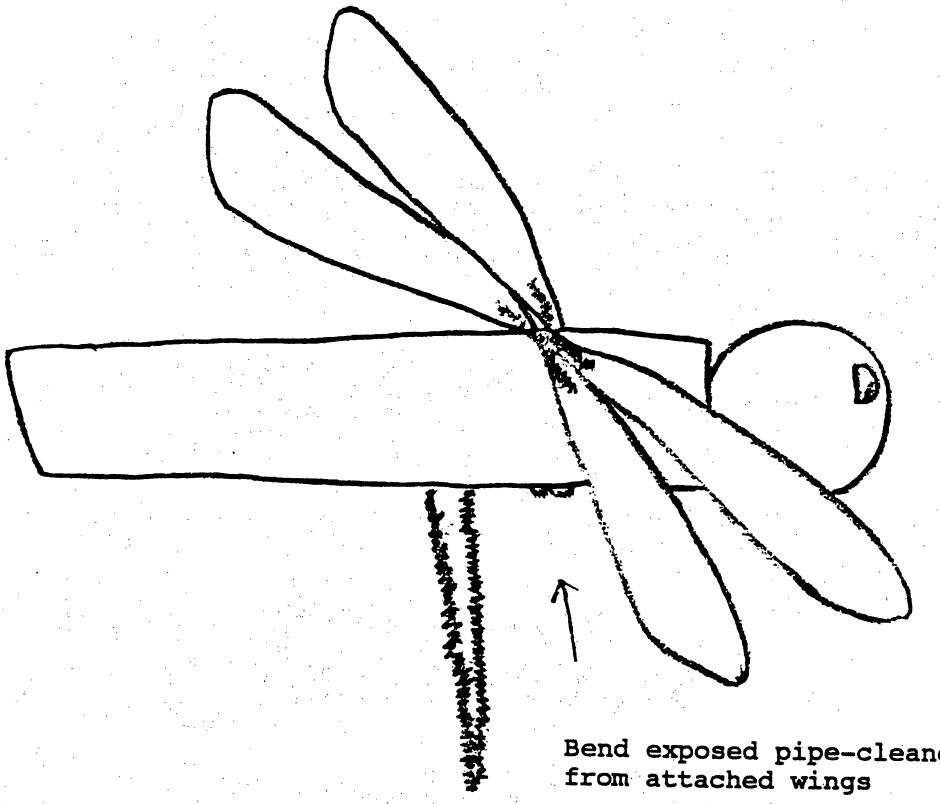
Grade Level: K-5

Materials per student: one 4" long x 2" diameter piece of styrofoam tubing, one 1-1/2" styrofoam ball, three pipe-cleaners (any color, shiny ones look great), one 4" pipe-cleaner (any color), two 7mm moving eyes, four precut wings from pattern provided or a tracer for making wings, No. 9 Metallic Ribbon, blue or red paint

Preparation: The styrofoam tubing will need to be precut into 4" long pieces. Cut one end of the tube on opposite sides about an inch from the end to create a tail. If working with younger students, precut the wings. For older students, provide a tracer for them to make their own wings. Cut two of the pipe-cleaners in half.

Procedure: Have students paint the styrofoam tube and ball. When dry, connect the ball to the tube using the 4" pipe-cleaner. Push the pipe-cleaner through the uncut end of the tube and into the ball until both pieces are touching. Provide precut wings or tracer for wings. Note: If children are cutting out wings, they should cut two wings with the tracer on one side and two wings with the tracer flipped over on the opposite side. Take four half-size pipe-cleaners and lay them horizontal on the working surface. Glue the wings to the ends of the pipe-cleaners as shown in the diagram. When dry, push each open end of pipe-cleaner through the styrofoam tube close behind the head. If the pipe-cleaner goes all the way through the tube, bend the ends around to hold in place. Glue moving eyes to the front of the styrofoam ball. Take the full length pipe-cleaner and bend it in half. Taking the ends, push it into the bottom side of the dragonfly below the wings. This can be used to hold the dragonfly up and make it fly!


Pipe-cleaner under each wing and end pushed into styrofoam
Wing tracer
Pipe-cleaner will extend on this end for pushing through styrofoam


Bend exposed pipe-cleaner
from attached wings

Styrofoam Water Strider

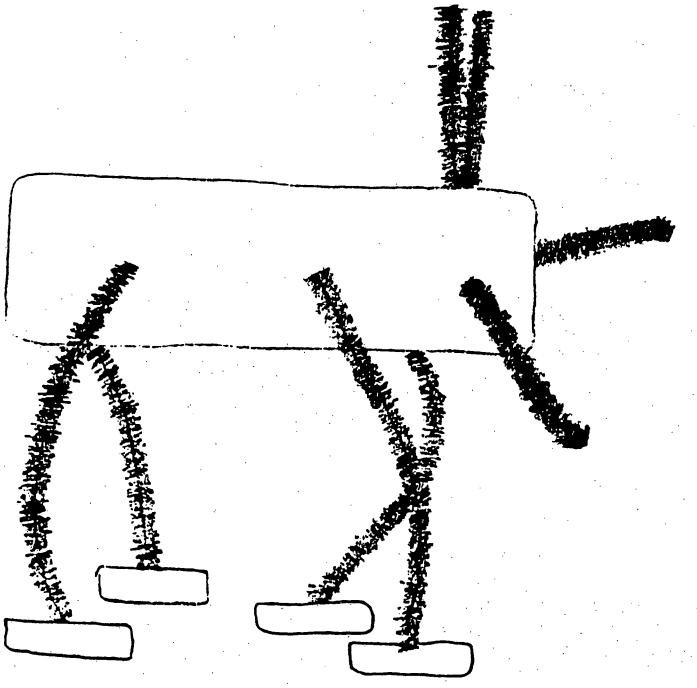
Grade Level: K-5

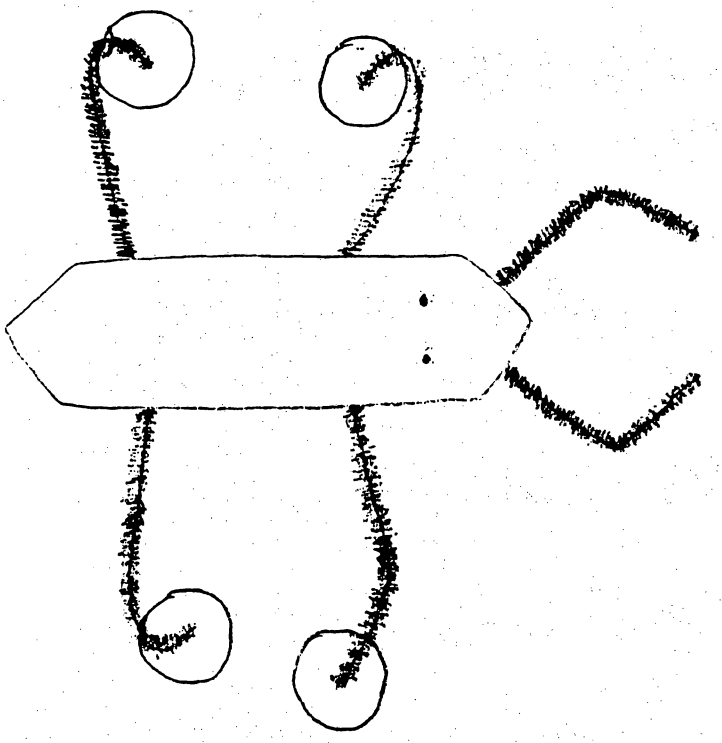
Background: There are different types of water striders. They use the surface tension of the water to stay astride. These styrofoam water striders will float. Use this when discussing properties of water!

Materials per student: one 2" or 2 1/2" length of styrofoam tubing for a body, four 1/4" thick pieces of styrofoam tubing for feet, four 2" long black pipe-cleaners for shorter legs and antennae, four 5" long black pipe-cleaners for longer legs, black paint

Preparation: Precut styrofoam tubing. Cut both ends of the 2" piece at an angle (See diagram).

Procedure: Have each student paint all pieces of styrofoam. After sufficient drying, push two 2" pipe-cleaners into the top at one end of the body for antennae. Push the other 2" pipe-cleaners into the front sides for shorter legs that help aid the water strider in eating. The four long pipe-cleaners go into the body spaced out evenly for the other legs. At the end of four longer legs, put a 1/4" styrofoam tube for feet.





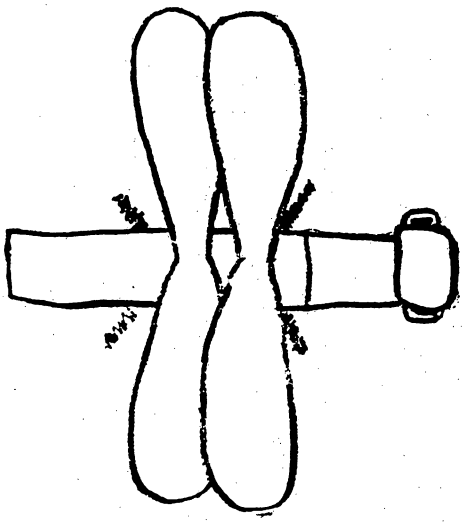
Doll Pin Dragonfly

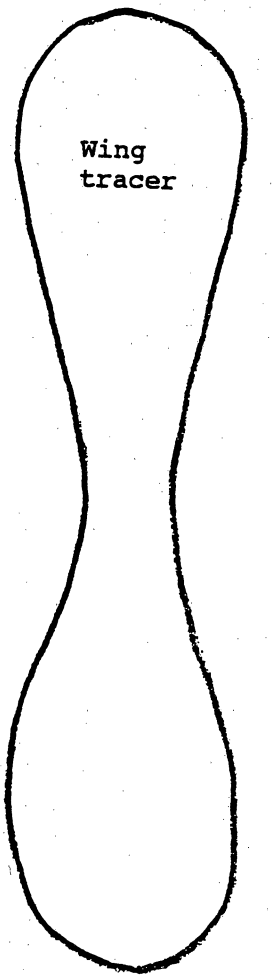
Grade Level: K-5

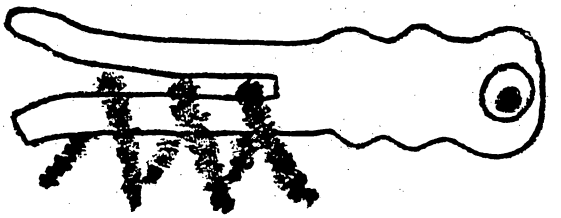
Materials per student: one small doll pin (2 1/2" length), green or red paint, two 7mm moving eyes, three 1 1/2" long black pipe-cleaners, two 3" long white pipe-cleaners, two wings precut from No. 9 Metallic Ribbon or a tracer made from pattern, glue

Preparation: For younger students, precut the wings. For older students, provide a tracer of the pattern out of file folders or tag board and a sufficient piece of metallic ribbon for two wings. Precut black and white pipe-cleaners for all students.

Procedure: Have students paint one doll pin either blue or red. When dry, glue eyes on either side of pin top. Slide all three black pipe-cleaners through the open end of the pin leaving equal space on both sides. Glue in place. On bottom side of wings, glue a pipe-cleaner to add stability. Glue wings on top of doll pin.







Legs can be slid in
without being twisted
around clothespin

Frog in the Grass

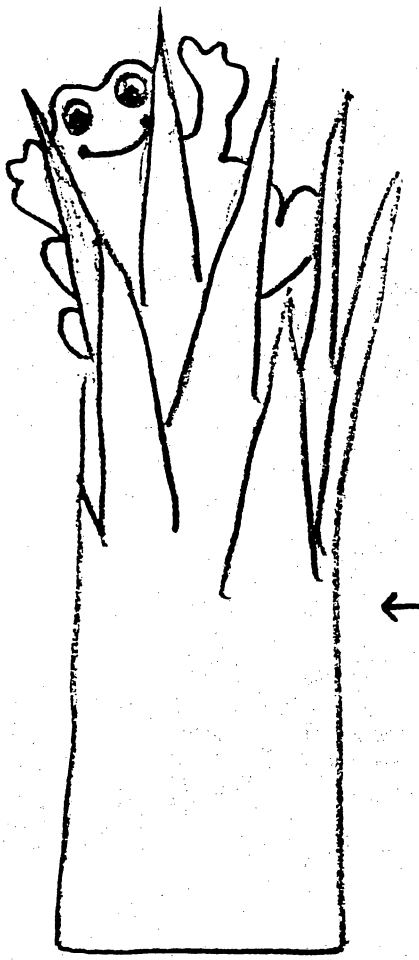
Grade Level: K-5

Materials per student: one 3" x 3" square of Fun Foam and tracer made from pattern for older students or one precut frog for younger students, one toilet paper roll, one 9" x 12" piece of green construction paper, two 7mm moving eyes, glue

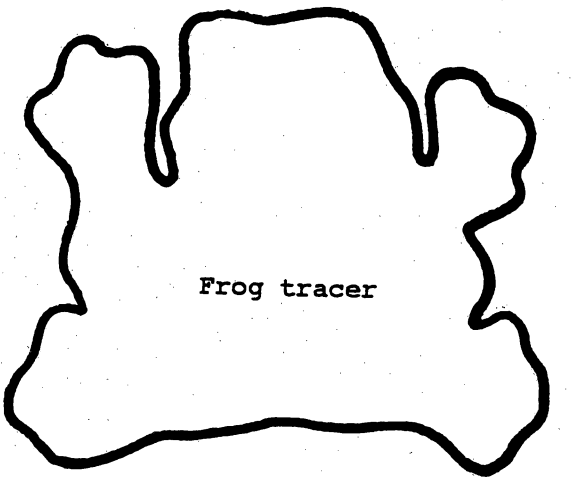
Materials for teacher: 11 1/2" x 17 1/2" Fun Foam sheet in any color, puff paint for putting on mouth

Preparation: Precut Fun Foam squares for older students and make frog tracers out of tag board or file folders. Precut frogs for younger students. Cut construction paper.

Procedure: Have older students trace and cut frogs. Glue on eyes. Fold construction paper in half like a hot dog (lengthwise). Cut. Lengthwise on each piece of paper, cut out triangles approximately to the middle of the paper. Wrap one piece of construction paper around a toilet paper roll at the bottom. Glue in place. Wrap the other piece of construction paper around the toilet paper roll at the middle. Glue in place. Glue the frog to the grass toward the top inside area. Note: don't forget to add a puff paint mouth to the frog. Teacher may want to do this one student at a time while students are cutting out grass.



Cut construction paper wrapped around toilet paper roll



Diving Beetle

Background: Diving beetles have an air sac at the end of their body that holds air. This allows them to dive underwater to search for food. They also have a protective layer underneath their wings for water resistance.

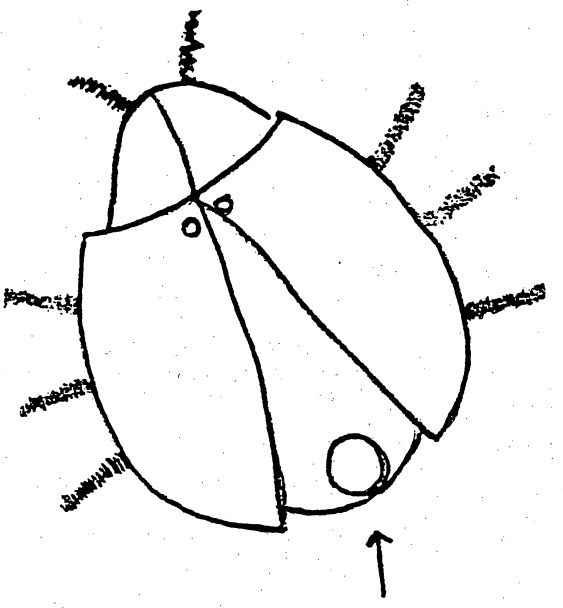
Grade Level: K-5

Materials per student: one bubble from bubble wrap used in shipping or packing, two paper fasteners, two 8" x 6" rectangles of black construction paper, tracers of body and wings, one 8" x 6" piece of thin packing foam, wax paper, or some material that can portray a protective film on the underside of the wings, six 4" black pipe-cleaners, two 2" black pipe-cleaners, tape, glue, black marker

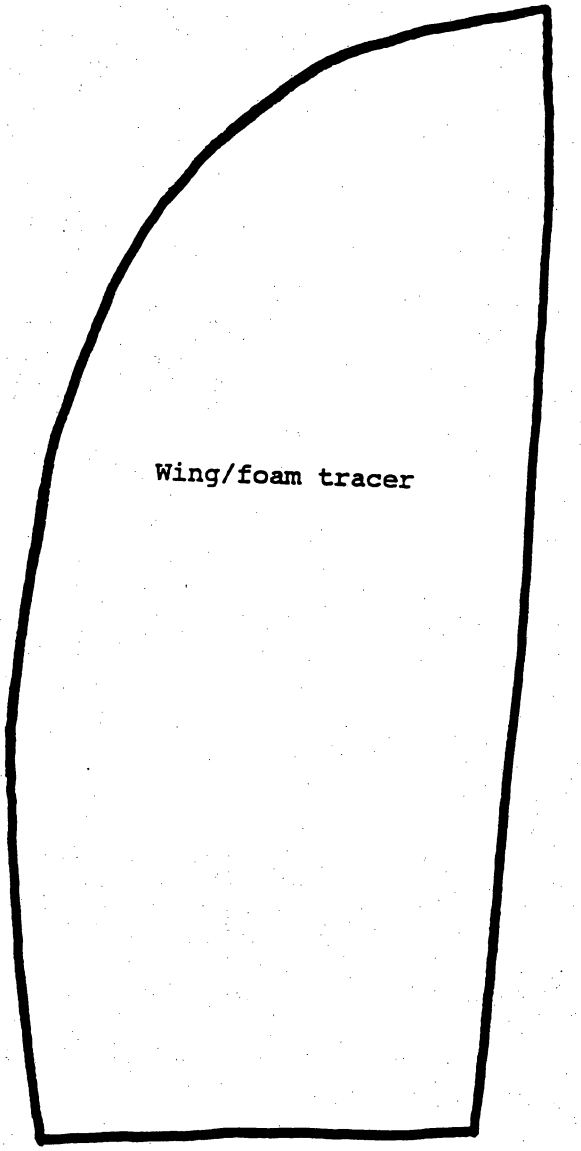
Materials for teacher: Bubble wrap and very thin foam wrap can usually be found in packaging. Check with local businesses that could supply these materials from their shipments or local mailing businesses.

Preparation: For younger students, precut the body, wings, and protective wing lining. For older students, make tracers from file folders or tag board of the body and wings. Precut all pipe-cleaners.

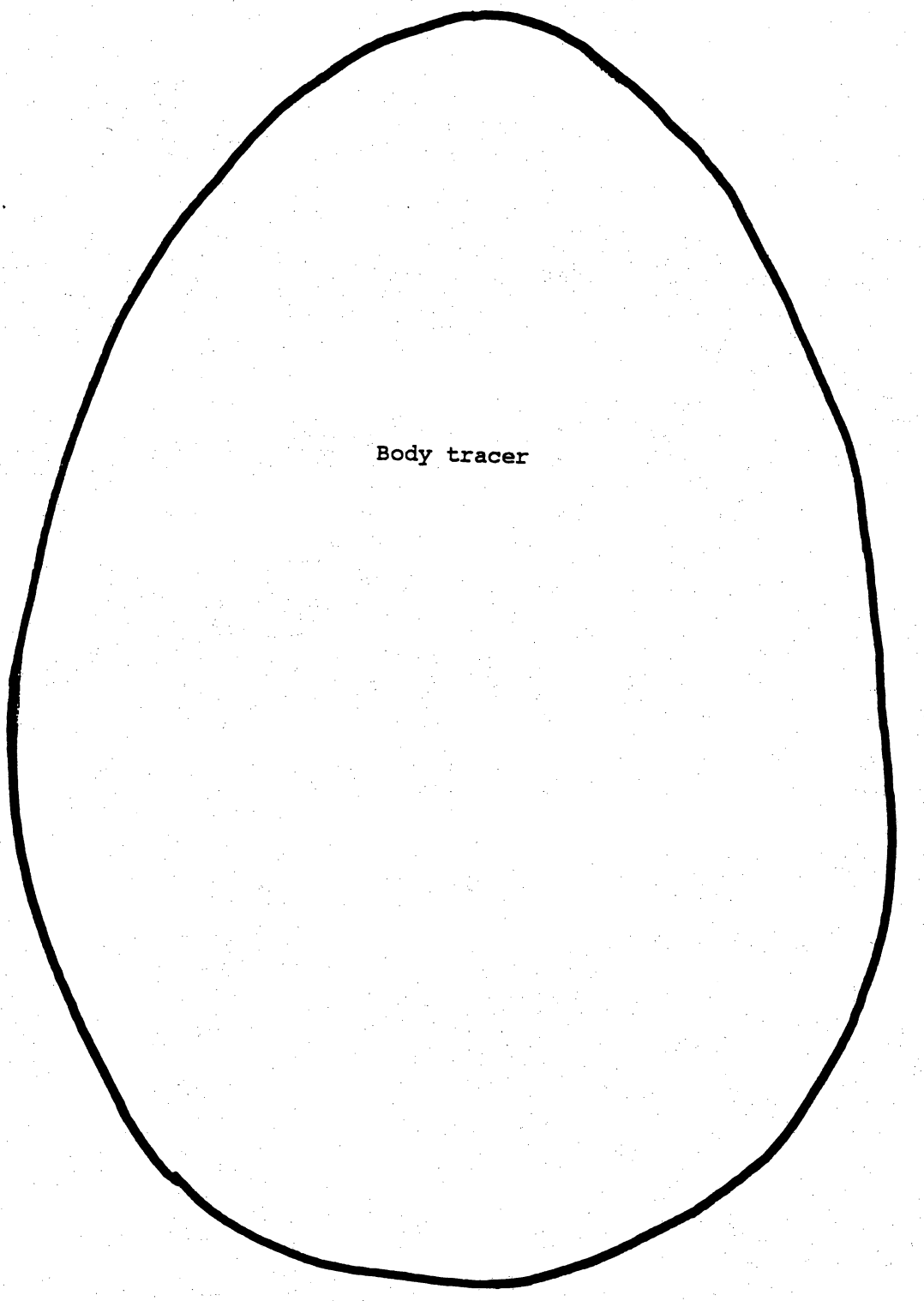
Procedure: On the top side of the body, lay the protective wing liners, then the wings. The curved edge of each wing should match the curved edge of the body. The straight edges of the wing and lining should match in the center. Push a paper fastener through the top center corner of each wing, fastening on underside of body. Glue a bubble at the end of the body. Tape or glue 4" pipe-cleaners underneath the body for legs. Tape or glue the 2" pipe-cleaners underneath the head of the beetle for antennae. Using a black marker, draw a line directly above the top part of the wings by the head. Draw another line down the middle from the top of the head to the wings.



Air bubble



Wing/foam tracer


Body tracer

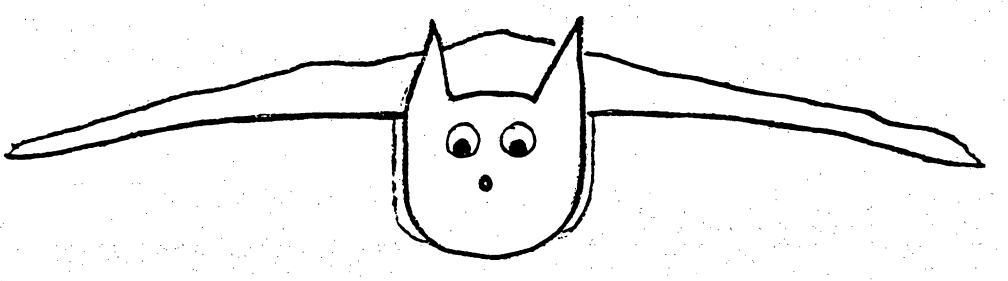
Felt Finger Puppet Bat

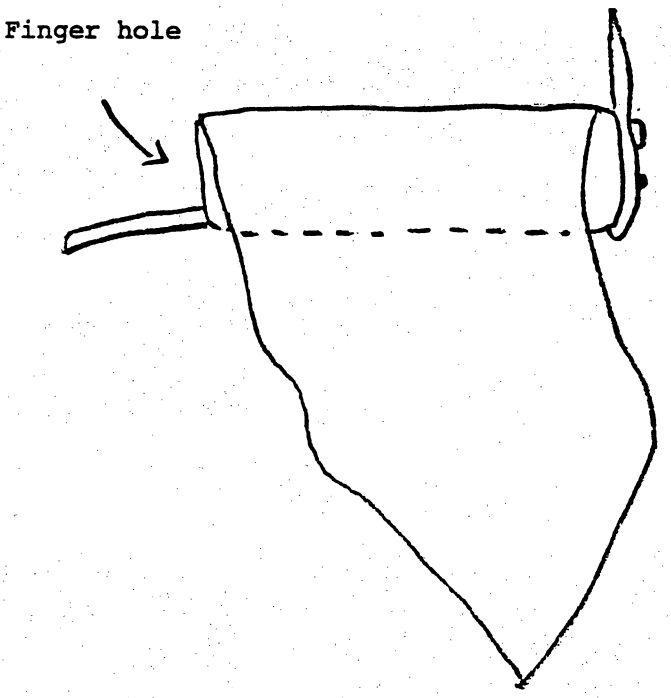
Grade Level: K-5

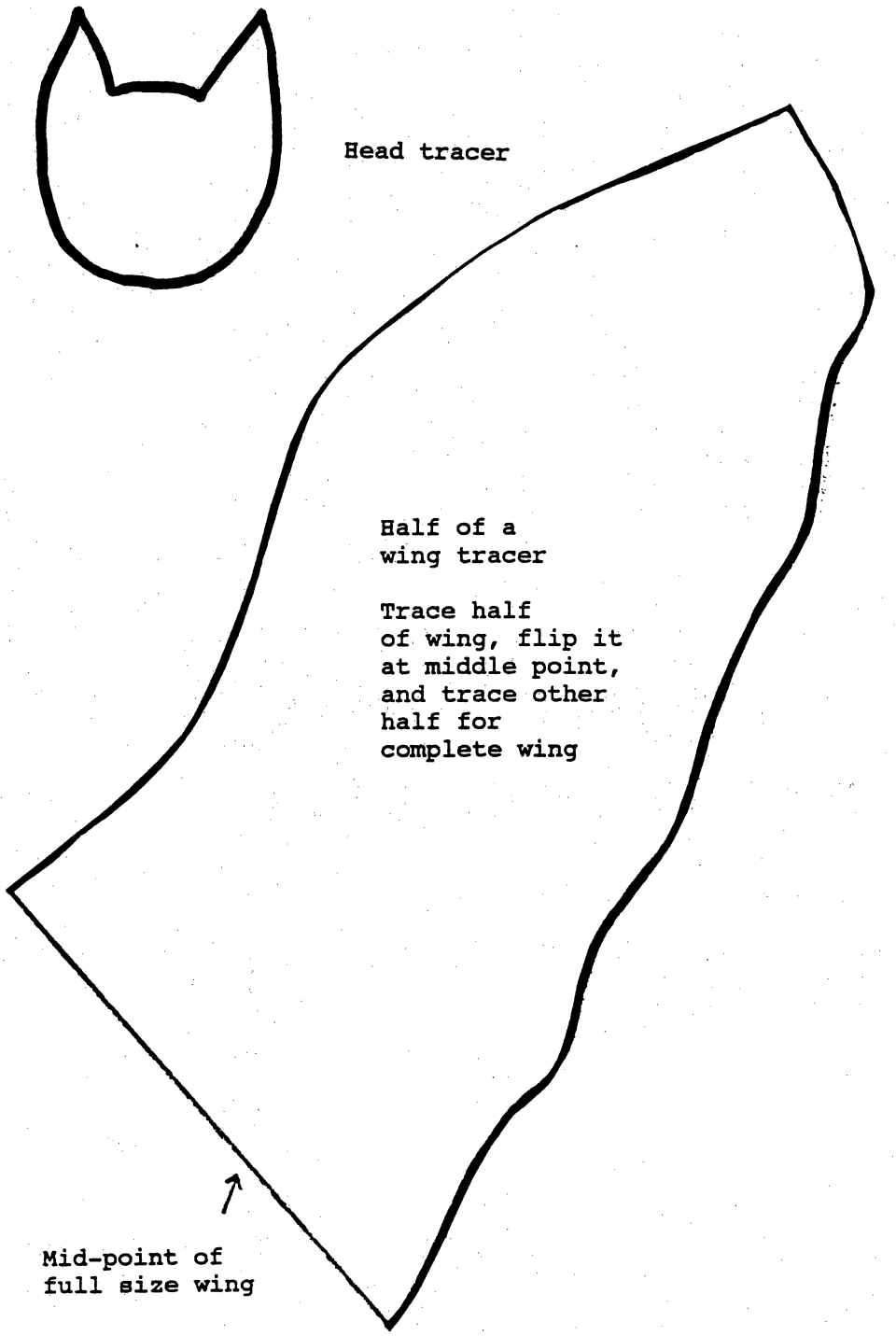
Materials per student: one 3" x 4" black felt rectangle for body, one black felt head made from tracer, one 1/8" pink pom-pom, two 7mm moving eyes, one 1-1/2" x 1/4" black felt rectangle for tail, one 9" x 12" piece of black construction paper for wing, tracer for wing made from pattern (can be shared by several students), glue

Preparation: Precut the felt head, body, and tail. Create several wing tracers from file folders using the pattern provided.

Procedure: Roll the 4" length of the 3" x 4" rectangle into a cylinder. Glue edges together. Make sure the rolled, glued cylinder is 3" in length. Glue the head to one end of the cylinder. Note: This needs plenty of time to dry. The surface area for the glue is small and the head tends to fall off if not given time to dry undisturbed. Once dried, add moving eyes and pink pom-pom nose to the head. Add the tail and the wings last. The smooth curve of the wing should be directly behind the head. The scalloped edges of the wing should be in the back.




Finger hole


Head tracer
Half of a
wing tracer
Trace half
of wing, flip it
at middle point,
and trace other
half for
complete wing
Mid-point of
full size wing

Butterfly Life Cycle

Background: The four stages in the life cycle of the butterfly are egg, caterpillar, chrysalis, and butterfly. It is important to remember that a butterfly forms a chrysalis and a moth forms a cocoon. After discussing the life cycle of a butterfly and moth, comparing and contrasting them, students can make these life cycles. They could choose to create a moth or a butterfly life cycle. For a moth life cycle, the only difference from the directions given below will be calling the section pipe-cleaner a cocoon and making the moth less colorful.

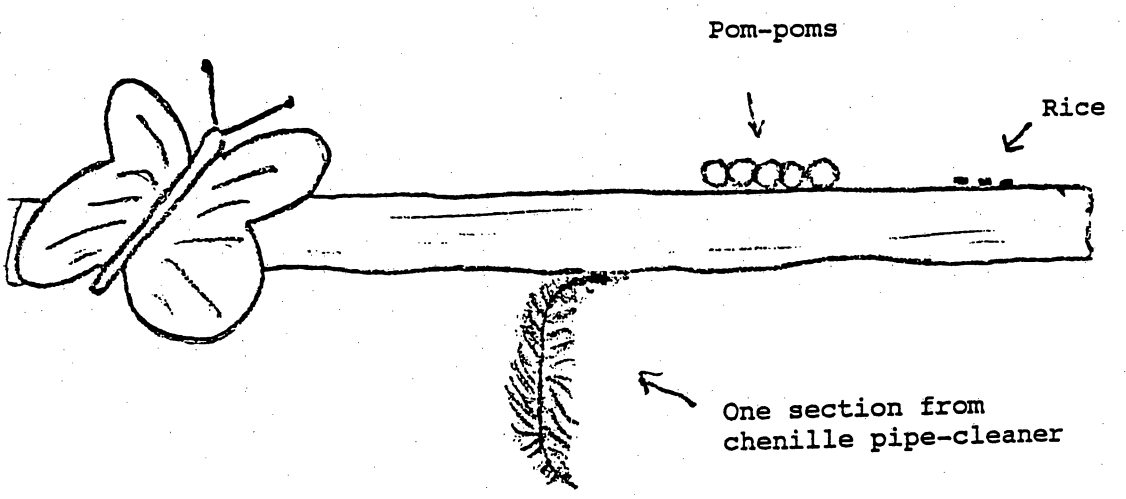
Grade Level: K-5

Materials per student: one stick that is fairly straight and about 6"-8" long, three to five grains of white rice, four or five 1/4" pom poms, one section from a chenille pipe-cleaner, one 3" x 3" piece of heavy paper or tag board, glue, markers, scissors

Materials for teacher: A glue gun may be necessary for the parts that don't seem to dry quickly enough.

Preparation: Precut one section for each student from the chenille pipe-cleaners. Cut tag or heavy paper for butterfly.

Procedure: Take students outside to hunt for their own stick to use for this project. This makes the experience more meaningful. On one end of the stick, glue the rice. These represent the eggs. Leave a little space and then glue the pom pom balls in a row to create a caterpillar. Next, glue one section from a chenille pipe-cleaner on the bottom side of the stick. Glue one end and leave the rest hanging loose like a chrysalis. Lastly, have the students design their own butterfly on the tag board or heavy paper. Cut and paste to the stick following the pipe-cleaner.



Bee Whizzer

Background: This activity is a great introduction or conclusion to a study on bees.

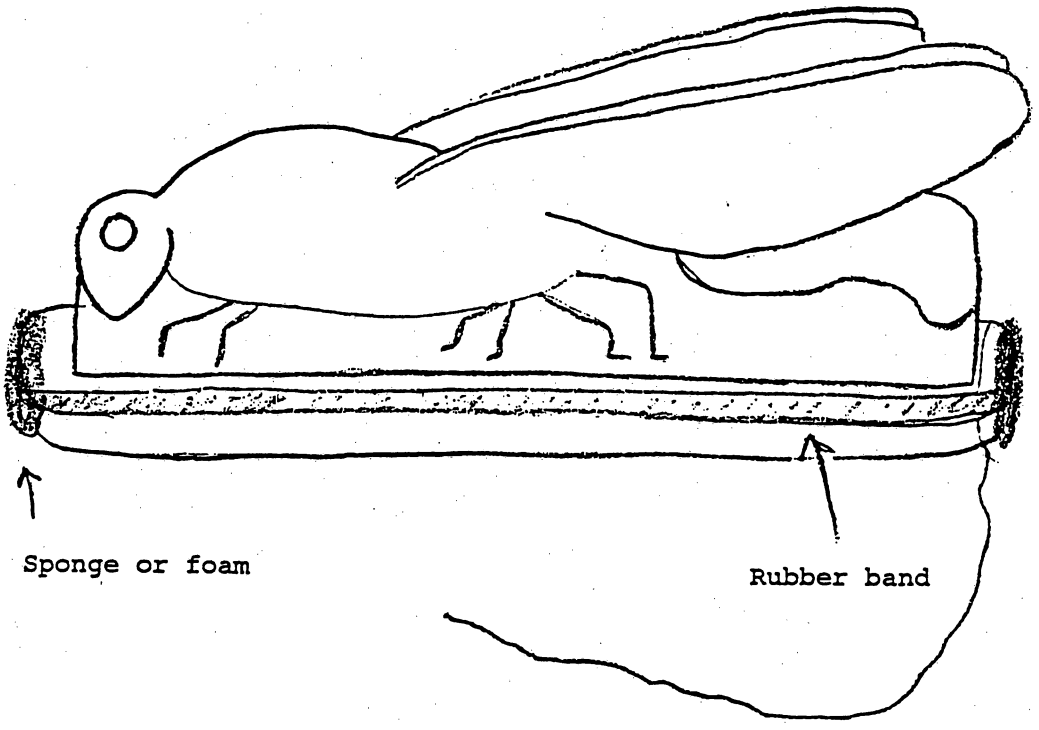
Grade Level: K-5

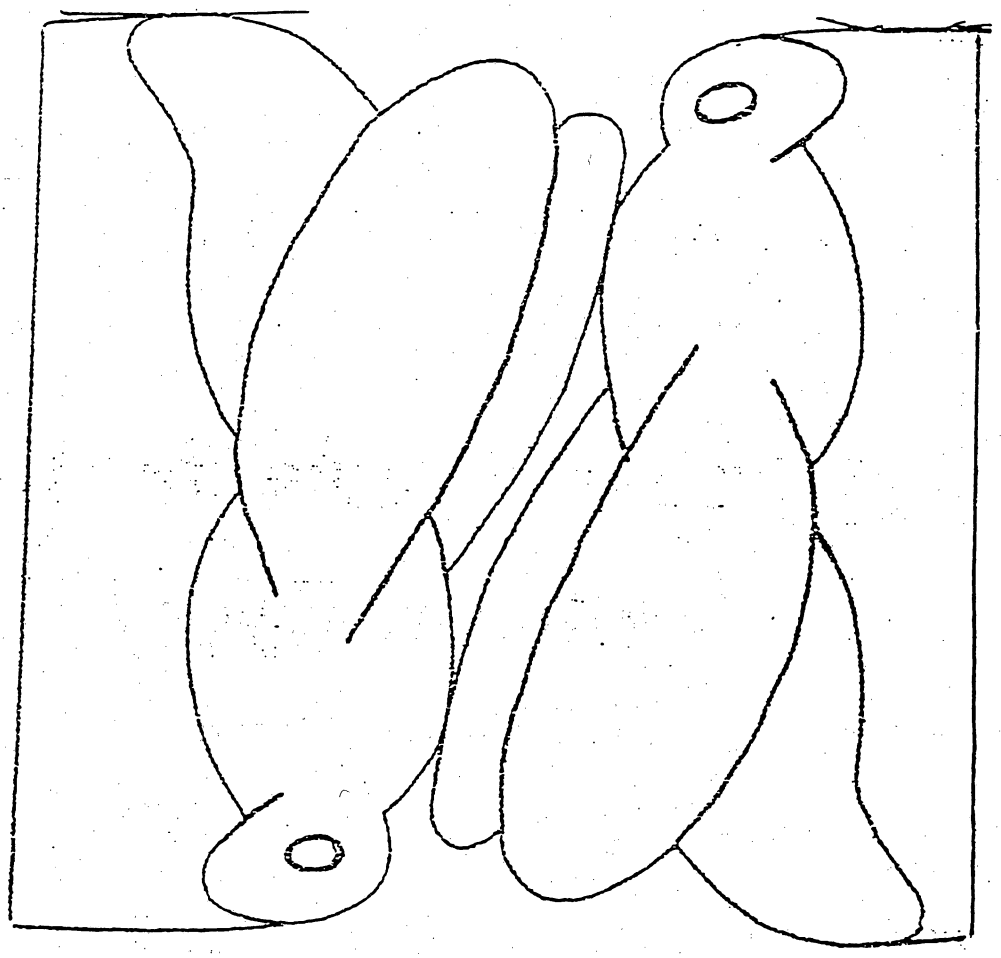
Materials per student: one copy of the provided bee, one tongue depressor, packing foam or something similar (styrofoam peanuts in packing or small pieces of sponge work), one rubber band, glue, markers, one piece of string any length

Materials for teacher: If glue doesn't hold the bee, a stapler can quickly keep it in place.

Preparation: Xerox the provided bee page. Heavy paper works best. Make enough for each student to have one bee. (Each page has two bees).

Procedure: Students should color their bee. Attach the bee to a tongue depressor. Tie a piece of string around one end of the tongue depressor. Place foam or a similar material on each end of the tongue depressor. The purpose of this is to keep the rubber band off of the tongue depressor. Whatever material is available that can satisfy this purpose is acceptable. Wrap the rubber band around the tongue depressor lengthwise making sure that it is not touching the tongue depressor. Spin the bee by the string as rapidly as possible. If a buzzing sound is heard, the placement of the rubber band is correct. If there is no buzzing sound, adjust the rubber band and try again. Note: There can be no interference between the rubber band and the tongue depressor.





Camouflage Hats and Binoculars

Background: After studying birds or animals, have the students make camouflage hats and binoculars and go on a bird or animal hunt.

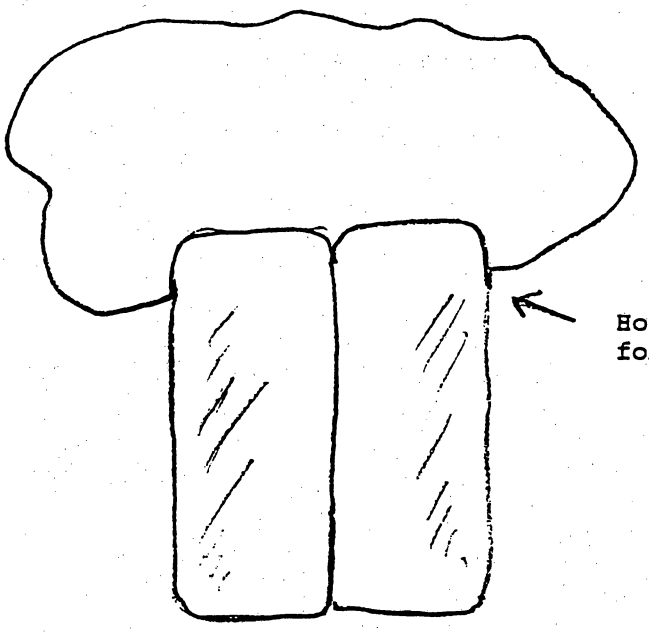
Grade Level: K-5

Materials per student: **Hats:** Chinet dinner plate, Chinet bowl, glue, paints in green, brown, and yellow, dried grasses or ground covering materials from outside, string for tying hat on head **Binoculars:** two toilet paper rolls, one piece of string long enough to hang around student's neck comfortably (approximately arm length)

Materials for teacher: Exacto knife for cutting hats, hole punch

Preparation: Follow the preparation provided in Turtle Hats p. 38 for making the hats. Cut string.

Procedure: Make the hats as described in Turtle Hats p. 26. Students should then paint the hats in camouflage colors. When dry, glue on bits of dried grasses, leaves, or other ground cover. Add string as instructed in Turtle Hats. For binoculars, glue two toilet paper rolls side by side. Put a hole punch on each side toward one end. Tie one end of string through one hole and the other end of string through the other hole. Decorate binoculars if desired.



Paper Plate Owl

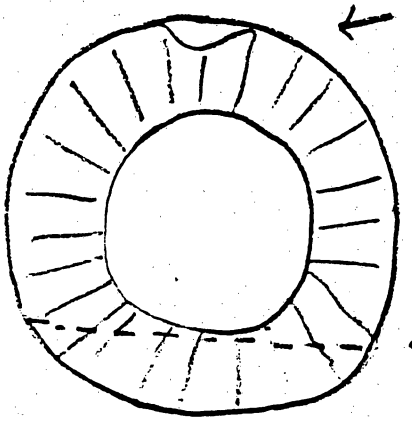
Grade Level: K-5

Materials per student: one paper plate, handful of cotton balls, precut face parts or precut squares of construction paper for cutting face parts, face parts include: one 4" x 2" piece of light brown construction paper, three 1" x 1" squares of dark brown construction paper, two 1" x 1" squares of yellow construction paper, glue, markers

Materials for teacher: stapler

Preparation: For younger students, precut face parts. Precut paper plate by cutting approximately 2" off one side. This will become the bottom of the owl. For older students, precut construction paper to dimensions given above.

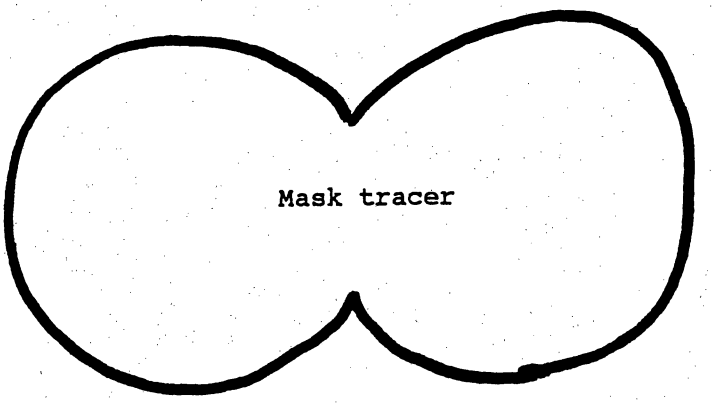
Procedure: Direct older students to cut two circles out of the yellow squares by cutting all four corners off. With two of the dark brown squares, cut circles that will fit inside the yellow circles. Demonstrate how to cut a mask from the light brown rectangle or use tracer provided. Take the last dark brown square and hold it like a diamond. Push from the right and left corner in toward the middle, creating a little bulge in the center. Take a paper plate (with 2" cut off from one side) and hold it so the cut portion is at the bottom. Fold the plate around so the sides meet and staple together. Glue all the face pieces on as shown in the diagram. One cotton ball at a time, stretch it apart so that the fibers are still attached, but very thinned out. Glue to the paper plate everywhere except the face.



Cut small groove at top if desired

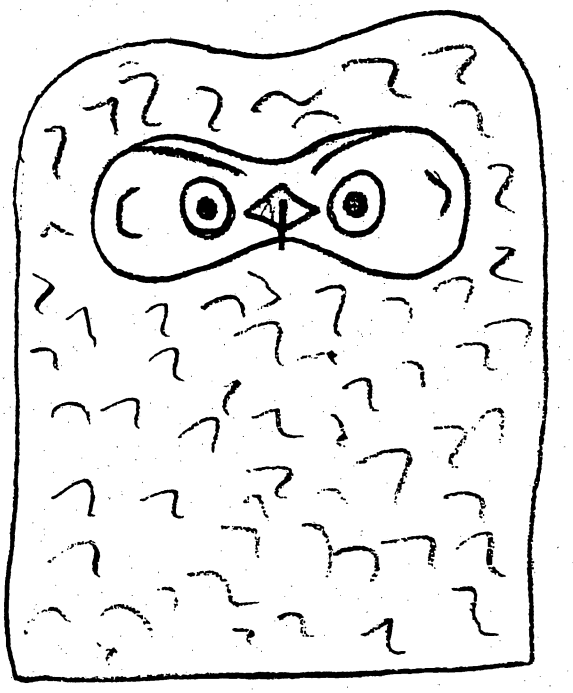
Paper plate

Cut off



Mask tracer

Plate is folded and stapled in back



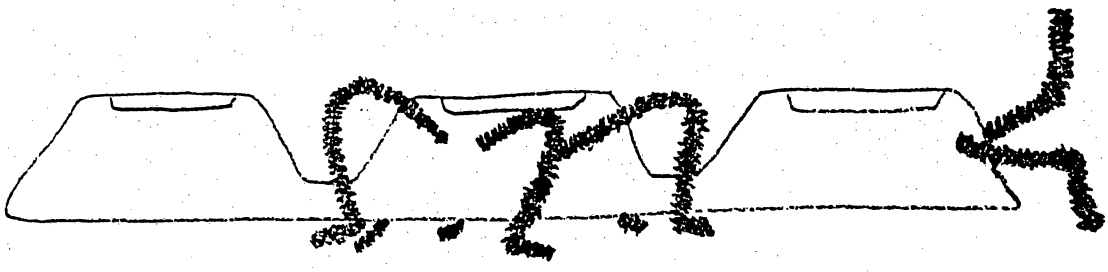
Egg Carton Ant

Grade Level: K-5

Materials per student: Three connected sections of a cardboard egg carton (in a straight line), six 3" pieces of black pipe-cleaner, two 4" pieces of black pipe-cleaner, black paint

Preparation: Precut three connecting sections of a cardboard egg carton for each student. They must be in a straight line to simulate an ant's body. Precut pipe-cleaners.

Procedure: Paint the cardboard egg carton black. Allow time to dry. Choosing one side for the head, place two of the 3" pipe-cleaners in the front for antennae. In the middle section, the abdomen, place all the remaining pipe-cleaners. The 4" pipe-cleaners are the last pair of legs toward the back of the ant. These are slightly longer. Bend the legs at the knee and ankle to simulate walking.



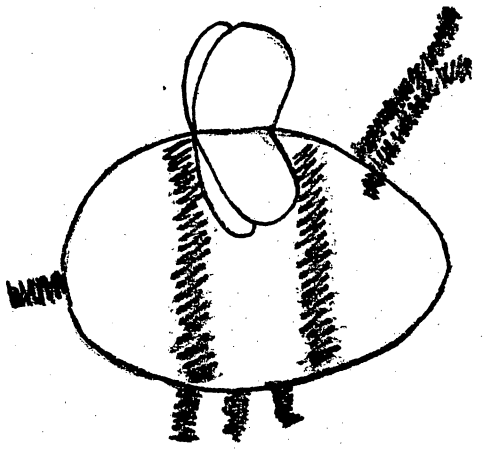
Styrofoam Bee

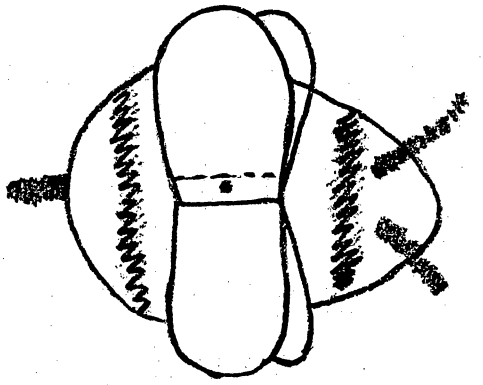
Grade Level: K-5

Materials per student: one 2" long egg-shaped styrofoam, seven 1" pieces of black pipe-cleaner, two 2" pieces of black pipe-cleaner, one straight pin, four 1" x 1-1/2" pieces of No. 9 Metallic Ribbon, yellow and black paint, scissors

Preparation: Precut pipe-cleaners. Precut pieces of ribbon. Precut wings for younger students by rounding one end of the ribbon.

Procedure: Paint the styrofoam egg black and yellow striped. Allow time to dry. Toward the pointed end of the egg, put two 2" black pipe-cleaners for antennae. Put six 1" pipe-cleaners on the underside for legs. (The pipe-cleaners will slide right into the styrofoam). Put the last pipe-cleaner in the very back for a stinger. Have students who are cutting their own wings round one end of the metallic ribbon. Overlapping the square ends of each piece of ribbon, place all four wings on top of the egg behind the antennae. Use the straight pin to hold the wings in place.





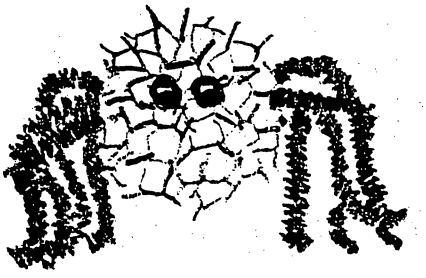
Liquid Amber Spider

Grade Level: K-5

Materials per student: one dried seed pod from a Liquid Amber tree (they look like balls with spikes all over them), two 7mm moving eyes, six 3" pieces of brown pipe-cleaner, glue or tacky putty for holding eyes in place

Preparation: Precut pipe-cleaners. Collect seed pods if none are found on school grounds.

Procedure: Insert all of the pipe-cleaners into the holes of the seed pod to create legs. Place four on one side and four on the other side. Glue the pipe-cleaners into the holes after finding correct placement. Using glue or tacky putty, secure the moving eyes on the front.



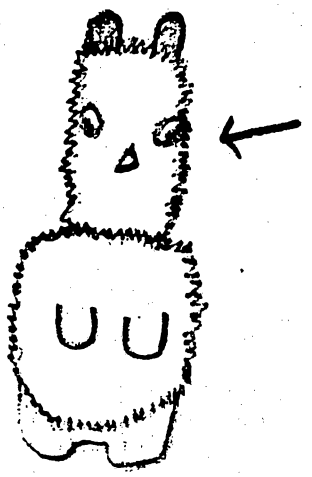
Pom-Pom Squirrel

Grade Level: K-5

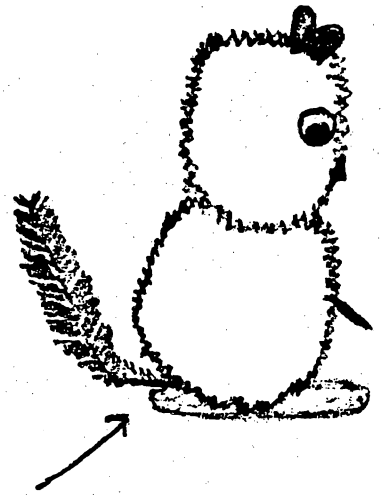
Materials per student: two 2" light brown pom-poms, one brown section from a chenille pipe-cleaner, one 2"x 2" square of brown felt, two 7mm moving eyes, one 1-1/2" x 2-1/2" rectangle of brown construction paper, glue, scissors

Preparation: Precut sections from chenille pipe-cleaners. Take one of each student's 2" pom poms and cut off about 1/4" of fuzz from opposite sides to create a narrow head. For younger students, precut all body parts. The felt square is for cutting ears, hands, and a nose. The construction paper rectangle is for the foot pattern. For older students, precut the dimensions of felt and construction paper listed above and have them cut their own body parts. Make several tracers of the foot pattern on file folders or tag board.

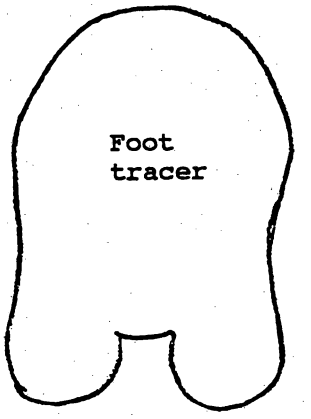
Procedure: If students are cutting their own body parts, instruct them to cut two triangle ears, two rounded rectangle hands, and a nose of any shape from the felt square. Have them trace the foot pattern on the construction paper and cut. Take the cut down pom-pom and glue it on top of the other pom-pom. Make sure the cut off sides of the head are to the right and left while facing it. Glue on ears, eyes, nose, and hands. Place the bottom pom-pom on the foot pattern making sure to insert the section pipe-cleaner in between the pom-pom and feet before gluing.



Cut off sides
to make flatter



Glue tail between
feet and pom-pom



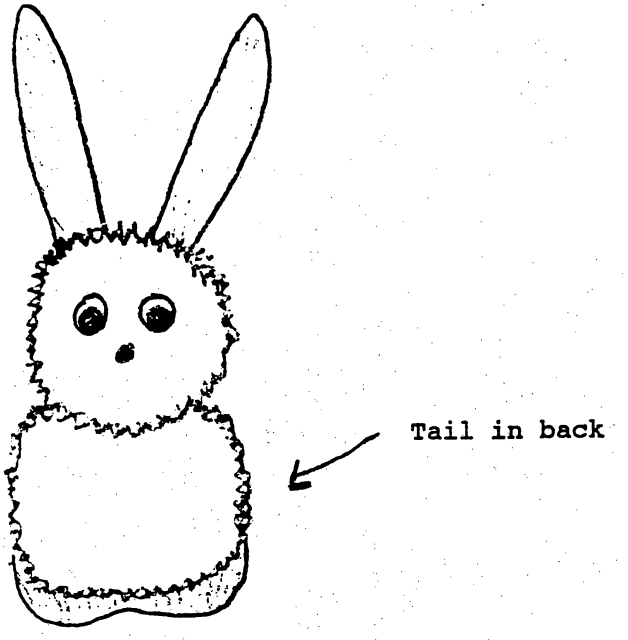
Pom-Pom Rabbit

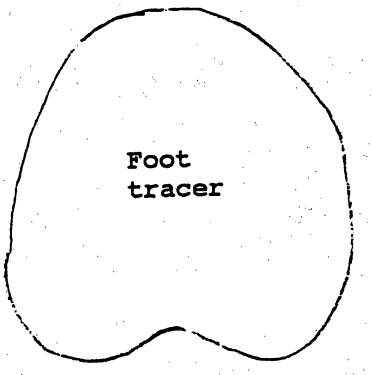
Grade Level: K-5

Materials per student: two 2" brown pom-poms, one 1/2" white pom-pom, one 3mm pink pom-pom, two 7mm moving eyes, one 3" x 3" square of brown felt, glue, scissors

Preparation: For younger students, precut the ears and feet. For older students, make a tracer of the foot pattern on tag board or file folders and precut felt squares.

Procedure: If students are cutting their own feet and ears, have them trace the pattern for the feet on the felt square and cut. Cut two long triangles out of the same felt square for ears. Note: Students can cut their own feet free-hand to save time. Just place a pom-pom over the felt and trace around the ball adding two extra sections for feet that extend beyond the perimeter. Glue both 2" pom-poms together to make a head and body. Glue the 1/2" white pom-pom to the back for a tail. Glue the eyes and 3mm pink pom-pom for a nose. Glue the ears on the head and the feet on the bottom.


Tail in back


Foot
tracer

Film Canister Raccoon

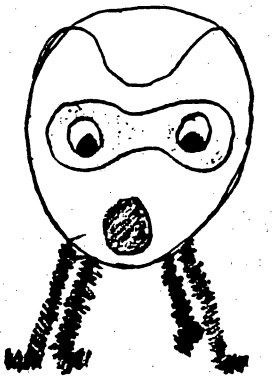
Grade Level: K-5

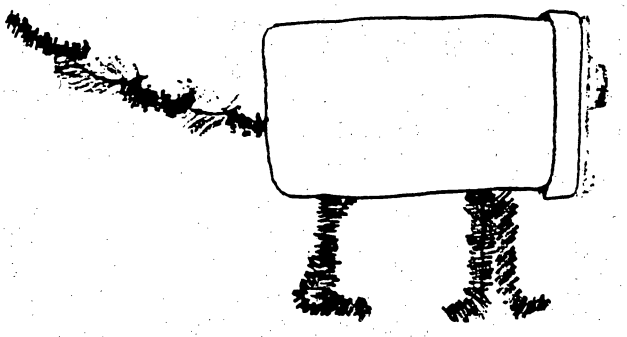
Materials per student: one empty plastic film canister with lid, one 4" grey pipe-cleaner, one black section from a chenille pipe-cleaner, four 2" black pipe-cleaners, two 7mm moving eyes, one 2" x 2" square of grey felt, one 1-1/2" x 1-1/2" square of black felt

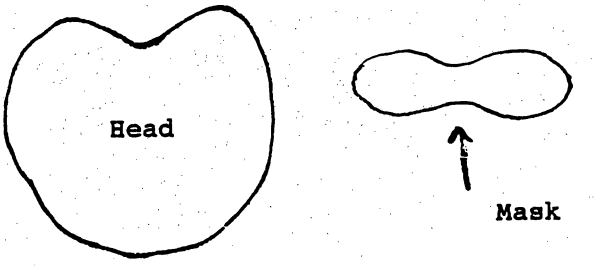
Materials for teacher: It is necessary to collect film canisters before doing this project. An exacto knife is necessary.

Preparation: Using an exacto knife, poke one hole in the bottom of the canister for the tail and four holes on one side of the canister for the feet. Precut the head from grey felt and mask/nose from black felt for younger students. For older students precut felt squares in dimensions listed above. Make a tracer of the mask and head, if desired. Precut pipe-cleaners.

Procedure: Students cutting their own head, mask, and nose can do this using a premade tracer, or free-hand. The head can be created by placing the lid of the film canister on the grey felt, tracing a circle, and adding two sections on one side for ears. The mask is an oval, that fits inside the head, with slight indentations in the middle of both sides. The nose is a circle. Glue the head, mask, nose, and eyes to the lid of the canister. Twist the grey and black section pipe-cleaners together to make a tail. Push it through the tail hole. Push the 2" black pipe-cleaners through the four feet holes. Bend the legs at the ankles to help the raccoon stand.






Head
Mask

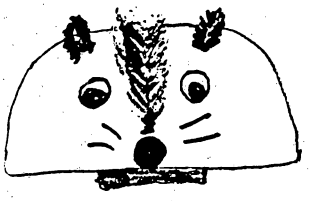
Styrofoam Skunk

Grade Level: K-5

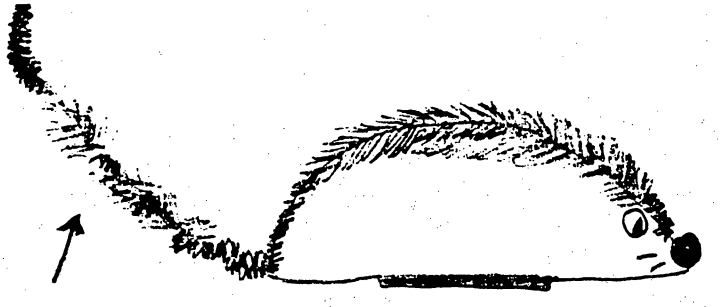
Materials per student: One-half of a 2" styrofoam egg cut lengthwise, one black section from a chenille pipe-cleaner, two white sections (still connected) from a chenille pipe-cleaner, two 7mm moving eyes, two 1" black pipe-cleaners, one black bead (approximately 1/4"), plastic coated wire or similar material for making whiskers, black paint, glue

Preparation: Precut styrofoam eggs in half lengthwise. Precut pipe-cleaners.

Procedure: Paint the stryofoam black and allow time to dry. On the narrower end of the styrofoam, push in the black bead to make a nose. Glue in place. Twist the black section pipe-cleaner with one white section pipe-cleaner. This end will be the tail. Directly above the nose, push the plain white section pipe-cleaner into the styrofoam. Bring it down the middle of the back. The twisted end should meet at the back of the styrofoam. Push an extended end of the black pipe-cleaner into the styrofoam to help hold it in place. Leave the twisted tail extended. Glue eyes on either side of the white pipe-cleaner. Bend the 1" black pipe-cleaners in half and push in the styrofoam behind the eyes to create ears. Push whiskers in by the nose. Note: The plain white section pipe-cleaner may be glued down if desired.



Magnet



Black and white

Plaster Animal Tracks

Grade Level: K-5

Materials per students: one plastic ziploc bag with 2 cups of dry plaster, one cup of water, one animal track mold, one popscicle stick or tongue depresser

Preparation: Prepare the ziploc bags of plaster. Provide newspaper on the work area to protect the tables. Purchase or borrow molds of animal tracks. If these cannot be found, follow the same procedure described in Fossils p. and have children try to draw in tracks with sticks when the plaster is almost dry. A test run of this is highly recommended.

Procedure: Add the water to the plastic bag and shake vigorously. Pout the mixture into the mold and level it off with a popscicle stick or tongue depresser. Allow approximately 20-30 minutes to dry. Remove from mold. Note: Molds can be purchased from mail-order catalogs. They can be rather costly. If enough teachers would like to use them, perhaps a set can be ordered for the whole school. Also, check a local nature center. They may be willing to lend out for a short period of time.

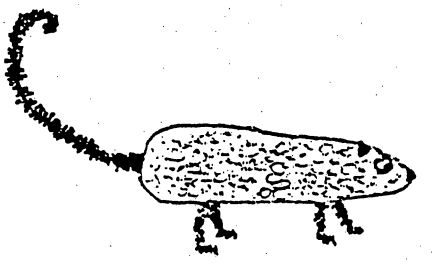
Yorba Mansa Opossum

Grade Level: K-5

Materials per student: one dried cone from a yorba mansa plant, two 5mm moving eyes, four 1" grey pipe-cleaners, one 2" grey pipe-cleaner, pink paint, a small square of grey felt or construction paper (1/2" x 1/2"), glue

Preparation: Precut pipe-cleaners and felt.

Procedure: On one side of the cone, push in the 1" pipe-cleaners to make feet. If the holes of the cone are small enough, pipe-cleaners should stay without glue. If not, glue in place. The 2" pipe-cleaner is the tail. Push this into the larger end of the cone. Glue in place if necessary. Glue the eyes toward the smaller end of the cone. Paint on a pink nose. Cut two triangles from the felt square. Glue behind the eyes for ears. Curl the tail and have the opossum hang from a finger or a stick!



Dough Mammals

Background: This is a great follow-up activity to a unit on mammals. After students have had a chance to see different kinds of mammals through pictures, displays, etc., they can choose their favorite and make a lasting memento!

Grade Level: K-5

Materials per student: one golf ball-sized lump of dough, toothpick, paint, wax paper, small magnet (optional)

Materials for teacher: baking soda, cornstarch, large plastic bag for storage of dough

Preparation: The following dough recipe needs to be prepared ahead of time. The recipe will make enough for approximately 20 mammals.
Materials needed:
- 4 cups of baking soda
- 2 cups of cornstarch
- 2-1/2 cups of water

Mix all ingredients in a saucepan, cooking over medium heat about 10 minutes. Stir constantly until the mixture is the consistency of mashed potatoes. Remove from heat and place on a plate. Cover with a damp cloth and allow to cool. Knead dough into a smooth ball and store in a plastic ziploc bag. Refrigerate until ready to use.

Procedure: Give each student a golf-size ball of dough. Have them shape it into a mammal of their choice. They may want pictures to help them shape their mammal accurately. Make sure to keep the dough at least 1/4 inch thick to avoid breaking. Using a toothpick, add details to the mammal. Place on wax paper to dry overnight. Paint when dry. If desired, add a magnet. If the self-adhesive magnets do not stay in place, glueing with a hot glue gun may be necessary.

Predator-Prey

Grade Level: K-5

Associated Topics: reptiles; birds, bats, and bugs; water ecosystems; and mammals

Objective: Children will participate in a game related to relationships of predators and prey.

Directions: Before playing, designate a playing area with defined boundaries. Next, choose a predator and a prey that align with the current topic of study. For example, if reptiles is the topic, a snake can be the predator and a field mouse can be the prey. Depending on the size of the group, choose anywhere from one to three children to be predators. A larger number of predators makes the duration of the game shorter. The rest of the children are prey. Line up all the prey on one end of the playing field. This is their home. The predators can move freely within the playing area. They cannot enter the prey's home or the food collection area on the other end. The object of the game is for the prey to run to the other side of the field in search of food. They must retrieve a piece of food and return home without being eaten by a predator. The predators lurk in the playing area trying to tag (eat) the prey as they go in search of their food. If a prey is caught, he/she must sit out of the game. The last remaining prey becomes the predator(s) for the next round. Note: Sticks, pieces of paper, or any other item can be placed at the food collection end for children to retrieve if desired. The game can be played without "food" items and children can pretend they are grabbing food. This allows flexibility for set-up time. **Variation:** A variation to this game is to put out several Hoola Hoops in the playing area. These are temporary shelters for prey to hide in and escape the predator. A prey can have one or both feet in the hoop and avoid being eaten for five-ten seconds. (The instructor can choose a duration of time the prey is allowed to remain in the shelter.) After the child counts to the alloted time limit, they must leave or they are automatically eaten. A predator must leave at about six feet between themselves and the shelter to give the prey a chance to escape.

One, Two, Three, Food for Me!

Grade Level: K-5

Associated Topics: reptiles; birds, bats, and bugs; water ecosystems; and mammals

Objective: This game is a modified version of Red Light, Green Light. Childs will engage in another activity that will assist them in understanding predator-prey relationships.

Directions: First, create a playing area. Side boundaries are not necessary in this game. Select a predator and a prey that represent a

topic of study. For example, if the topic is water ecosystems, the predator can be a frog and the prey can be a dragonfly. Choose one child to be the predator. The predator stands at one end of the playing area. The rest of the children are prey. They line up on the other end. The predator turns around so his/her back is facing the prey. When the predator isn't looking the prey move toward the predator. Note: The prey are not aware of the predator's presence. This explains why the prey are running toward the predator! The predator shouts, "One, two three, food for me!" and turns around quickly. As soon as the predator turns around the prey need to freeze. If the predator sees any prey moving, he/she get to eat the moving prey and send them back to the beginning again. This continues until one prey reaches the predator and tags them. That person gets to become the predator. Everyone goes back to the beginning and begins again.

How Many Can Survive?

Grade Level: 1-5

Associated Topics: reptiles; birds, bats, and bugs; water ecosystems; and mammals

Objective: Children will participate in a game that teaches about the concept of carrying capacity.

Directions: Have everyone stand in a circle. Scatter pieces of construction paper or any other item in the center of the circle. These represent food. Give each person an envelope. Decide what the children will pretend to be. If the group is studying about mammals, they can be a raccoon or some other mammal. If they are learning about wetlands, they can be an animal that lives in a wetland. After determining what the group will be representing, tell them that they are in competition with one another and must collect a certain amount of food to survive. The amount of food needed to survive can vary. Begin with a number such as ten. Children collect food by running into the circle, picking up ONE piece, returning to their envelope, and placing it inside. This is repeated until all the food is gone. Each person should count their food and see how many pieces were collected. Anyone who didn't get enough food died! Variations can be added. Have some children be wounded animals. For example, one person can only collect with their eyes blindfolded. Another can only hop on one leg. Comparisons can be made between the healthy and the unhealthy animals. Who would survive longer? Another adapation is to say there was a drought and the amount of food available has decreased. Take some of the food away and discuss how this affected the number of animals that survived. Note: This activity was adapted from "How Many Bears Can Live In This Forest?" found in Project Wild (Western Regional Environmental Education Council, 1983).

Charades

Grade Level: K-5

Associated Topics: reptiles; birds, bats, and bugs; water ecosystems; and mammals

Objective: Children will act out the movements of different animals while others try and guess what animal they are.

Directions: There are two ways to play this game. One way is to write the names of different animals on paper and place them in a container. The child who will be performing draws an animal and acts out a common movement. A simpler version is for the instructor to have a list of all possible animals the children are familiar with in the area of study. The instructor can pick one and whisper it to the child performing. This allows for personalizing the selections to children's abilities. It also cuts down on preparation time. The object of the game is to guess what animal a child is portraying. The child who guesses correctly gets the next turn. **Variation:** Instead of having one child perform at a time, choose four or five children to work together in creating an animal. This allows for different body parts to be represented that may not be possible to represent by one person.

Who Am I?

Grade Level: K-5

Associated Topics: reptiles; birds, bats, and bugs, water ecosystems; and mammals

Objective: Children will be assigned a critter that remains unknown only to themselves and proceed to ask other students yes and no questions in order to figure out who they are.

Directions: Following the same format as charades, have a child select the name of a critter from a container without looking or the instructor can designate a particular critter for the child. The name should not be revealed to the child. It will need to be revealed to the rest of the group. The child proceeds to ask the rest of the group yes/no questions to find out who they are. For example, the child might ask if he/she has a certain number of legs or if fur is present. As long as the questions solicit only yes/no answers, anything can be asked. Have someone keep track and see if the child can guess who they are in 20 questions or less. To expediate the process, before beginning, have the group come up with categories of critters such as: reptiles, water creatures, birds, etc. This can narrow down the guessing right away. Another approach is to restrict the critters to the topic of study. Continue play allowing other children a chance at guessing.

Food Webs

Grade Level: 2-5

Associated Topics: reptiles; birds, bats, and bugs; water ecosystems; and mammals

Objective: Children will participate in an activity which demonstrates how everything in a food web is affected by one another.

Directions: Have all children stand in a circle. Using yarn or preferably rope (yarn can tangle easier), approach a child in the circle and ask him/her to name a creature the group has been studying about. The child might say, "a frog." Hand the end of the rope to that child. Walk to another child that is not standing next to the previous child. Ask what a frog eats or what eats a frog. As he/she answers, have him/her hold a section of the rope. Continue approaching children and asking them what the animal just named eats or is eaten by until every child is holding a section of the rope. Be sure to walk back and forth across the circle to create a "web" of rope inside the circle. Next, walk up to one of the children, i.e., the child who answered "raccoon" as one of the animals that eats a frog, and tell the children that the raccoon died. Remove the child from the web and tell the children who are holding the rope directly before and after that child to give a tug. Each person who feels a tug on the rope should also tug. The object is for every person to feel the rope being tugged and to tug the rope in return. This shows how every creature in a food web is dependent on one another. Every creature will directly or indirectly feel the loss or addition of any other creature to a food web. Note: Sometimes this activity is difficult to get going. It may be necessary to help the first two children tug the rope. The child who was handed the rope right before the child who left the circle and the child who was handed the rope right after the child who left the circle are directly affected by the loss of the animal. Therefore, they start the rope tugging. Also, a very large group of children will complicate the web too much. It is better to keep the groups smaller, about 8-12 children. The children not participating can be working on something else until it is their turn, or there can be several different webs going at the same time with adults to monitor the other webs.

Exploration

Grade Level: K-5

Associated Topics: reptiles; birds, bats, and bugs; water ecosystems; and mammals

Objective: Children will explore their surroundings and find evidence of the lifeforms they have been learning about. (Simple hikes, walks, and hunts are often overlooked, yet can be thoroughly rewarding and exciting for children.)

Directions: Have children explore their surroundings. Tell them to look for birds, insects, lizards, animal tracks, etc. They can take an observation notebook with them, if they are old enough, and record their findings. Magnifying lenses can give them close-up views of things as well.

Migration Game

Grade Level: K-5

Associated Topics: birds and water ecosystems

Objective: Children will participate in a game that teaches the concept of migration and the hazards that birds face when trying to reach their destinations.

Directions: Create a playing area with designated boundaries. Each end of the playing area is a wetland. The object of the game is for the birds to migrate from their current inhabited wetland to another without being killed by various hazards along the way. Select several children to be hazards. They should be scattered throughout the playing area. One child can be a house, another can be a hawk, another can be a telephone pole, etc. Stationary hazards can not move from their spot. They can only swing their arms to try and tag a bird coming through. The instructor can choose to make one hazard free-moving such as the hawk. The remaining children are birds. When the instructor says go, the birds begin migrating from one end of the field to the other. They cannot be touched by any of the hazards. If they are tagged, they must stop where they are and become a new hazard in the migration path. After each round, see how many birds survived the migration. Allow some of the hazards to become birds in subsequent rounds.

Bat and Moth

Grade Level: 1-5

Associated Topics: birds, bats, and bugs and mammals

Objective: Children will participate in a game that teaches how bats use sound instead of sight to catch their prey. Bats use echolocation. They emit a high-pitched sound that bounces off of the surroundings and allows the bat to identify prey and other objects.

Directions: Have all children stand in a circle. Select two children to be moths and one child to be a bat. Blindfold the bat. The bat is going to say, "Bat!". The moths must answer back, "Moth!". Explain to the children that the bat is using sound bouncing off of the moths to detect them. The object of the game is to have the bat catch a moth by

hearing. To add difficulty to the game, add more bats and/or moths. Also, several children can become trees. When the bat calls out, "Moth!", the trees will answer, "Tree!" while the moths are still answering as well. This adds to the excitement of the hunt!

Blind Snake Walk or Blind Caterpillar Walk

Grade Level: K-5

Associated Topics: reptiles and birds, bats, and bugs

Objective: While children are pretending to be either a blind snake or a blind caterpillar, they are really exploring their surroundings by touch and sound instead of sight.

Directions: Have five or six children walk in a straight line with their arms on the shoulders of the person in front of them. Blindfold all the children except the one in front. While the snake or caterpillar is walking along, encourage the blindfolded children to get a sense of what is around them by listening and touching. The snake should go by trees and give everyone a chance to touch. Give children time to discuss what they experienced. **Variation(1):** Blindfold the child in front as well as everyone else in the chain and lead them around. Take off the blindfolds and see if the snake can make its way back to the starting point. **Variation(2):** Blindfold the whole chain as in the first variation. Take them to a special spot such as a tree. Have each person feel the spot chosen. Take them back to the beginning still blindfolded. Remove the blindfolds and see if they can find the spot they were taken to.

Camouflage Critters

Grade Level: K-5

Associated Topics: reptiles; birds, bats, and bugs; and mammals

Objective: Children will experience the effectiveness of camouflage as a defense mechanism against predators.

Directions: Give children construction paper that matches a designated area such as brown for soil and green for grass. Have each child draw a critter that would be camouflaged in a certain area. For example, they can make lizards that blend in with either soil, bark of a tree, or grass. After the critters are made, send an adult or child helper to hide the critters in a designated area. They shouldn't be completely placed out of view. At least a portion of the critter must be exposed. The key is to have the critter the same color as its background. After all the critters are hidden, send children off to find them. Take a count first to make sure all critters have been retrieved. Discuss how

easy or difficult it was to spot the critters from close up or far away. **Variation:** Either in place of the handmade critters or in addition to, the instructor can place a number of items that are camouflaged and not camouflaged in the same area. This gives children something to compare. How quickly were they able to find the items that were not camouflaged? An adult could also dress up in camouflage and hide in an area. Did the children notice the person?

Tails

Grade Level: 1-5

Associated Topics: reptiles

Objective: Children will participate in a game that demonstrates the defense mechanism of a lizard to lose its tail and escape when being attacked by a predator.

Directions: Create a playing area with designated boundaries. Give each child a strip of material or string that will represent his/her tail. They should tuck one end in their pants at their lower back while leaving a significant amount exposed. Designate two or three people to be predators of the lizard, i.e. a hawk. The object of the game is for the lizards to stay alive. The predators begin the game by trying to grab the tails of the lizards. If the predator gets a tail, the lizard can stay in the game, but only until they are tagged again by a predator. This indicates that the first time, they were able to escape by leaving their tail, but the second time they were caught. The lizard must then exit the game after the second catch. Continue play until time is up or there are only two or three remaining lizards. These survivors then become the predators for the next round.

Fossil Hunt

Grade Level: 1-5

Associated Topics: reptiles

Objective: Children will become archaeologists and simulate a fossil hunt.

Directions: Instructors must spend preparation time making the fossils, hiding them, and creating maps to their locations. To make the fossils, create a mixture of plaster of paris and soil. The ratio should be approximately 2:1 of plaster to soil. The soil makes it possible for children to dig out the bones or other objects. If there is too much plaster the bones will not come out. If there is too much soil the bones will practically fall out. The dried fossil should be able to

come out with chipping away of the plaster mixture. A test batch is highly recommended.

Taking a paper cup, fill it with the plaster mixture and a bone or other breakable object to represent a fossil. Make sure part of the object is in the mixture and part is sticking out. Make enough of these for each group of children. Teams of no more than four are recommended. Create a simple map of the area and mark where each groups fossil can be found. Let the kids go find their fossil. Upon retrieving it, they should come back to a work station and using a spoon or other tool, chip the bone or object out of the plaster. They cannot break the bone or object so they must be very careful. After getting all the plaster mixture off, they can rinse off the object and they are done. This can be turned into a race if desired. Have children discuss their experience and whether or not they would enjoy being an archeologist.

Bird Beaks

Grade Level: K-5

Associated Topics: birds, bats, and bugs

Objective: Children will participate in an activity that demonstrates how different shaped bills are designed to prey upon different types of food.

Directions: Instructors will need to collect the following objects: spoons, clothespins, scissors, marbles, metal washers, and toothpicks. The spoons represent birds with a scooping bill such as a pelican. Their food is fish which are represented by the marbles. The clothespins represent small song birds that use their beaks to collect seeds or worms. The toothpicks represent the worms. The scissors represent birds with longer, more forceful bills that can catch beetles or even stab at their food. An example of this type might be a jay. The beetles are represented by the washers.

This activity can be run two ways. The first way is to set up stations and let children explore what utensil picks up what object the easiest. They should find the spoon to go with the marbles; the scissors to go with the washers; and the clothespin to go with the toothpicks. When all children have had a chance to explore these in a center situation, the class can then discuss their findings. Another way to run the activity is to make it a game. Have a small group of 6-8 children sit in a circle and take one of the beak-type utensils. Throw all the food in the center. On a signal to begin, the children must try to collect as much food as they can with their utensil. When all the food is gone, discuss which types of food were easiest for each person to catch and why that might be so. Note: If the activity is being done in stations, a hummingbird bill can be added. Provide an eye-dropper and water to represent this bill. This is not recommended if the activity is being run as a game!

Insect Life Cycle Relay Races

Grade Level: 1-5

Associated Topics: birds, bats, and bugs

Objective: Children will get to act out the life cycle of many flying insects through active movement.

Directions: Create a playing area. Side boundaries are not necessary. Make as many teams as desired. When children are standing at the starting line, they are eggs. The first children who run must run with their arms to their sides to simulate a larvae, nymph, pupa, or cocoon, whichever fits the insect being studied. When the runners reach the end of the field, they become adults. On the way back, they flap their arms as wings. They tag the next egg in line who then becomes a larvae, nymph, pupa, or cocoon and runs to the end of the field with their arms to their sides. They return flapping arms as adults and the process continues until all groups have finished. The first team to finish wins!

Habitat Sketches

Grade Level: K-5

Associated Topics: mammals

Objective: Children will use observation skills and purposefully seek signs of any mammal's presence in a given area.

Directions: Go on a walk and look for different mammal habitats and homes. Look for entrances to burrows and dens; smell for skunks; look for droppings; try and find animal tracks; see if there are food clues such as broken nutshells, chewed or bitten plants, or left over fur or bones. After the walk, give children, either individually or in groups, butcher paper and crayons or markers. Have them draw a picture of a habitat and what they saw. If signs of an animal were found, include the animal and its food, home, and perhaps a predator. Display the sketches and discuss food chains if appropriate.

The Smelling Game

Grade Level: 1-5

Associated Topics: mammals

Objective: Children will use their sense of smell to try and find their partner.

Directions: Ahead of time, make up a double set of "smelling jars." To do this, collect film canisters or some other small container. Place cotton in the container and add a scent to each one. It is important to make two containers of each scent. If possible, try not to repeat any scents. Some examples of scents to add would be: extracts such as peppermint, almond, or vanilla, bug spray, perfume, cod liver oil, sunscreen, etc. Label one set of containers with a letter and label the other identical set with numbers. Keep an answer sheet of which letter and number are the same scent.

Divide the children into two groups. One group are the mothers. The other group are the babies. Pass out one set of containers to the mothers and the other set to the babies. Tell the children that animals have distinct smells. The mothers need to find their babies based on their distinct smell. At that point, the mothers and babies need to smell their containers and go in search of each other. Children will have to smell other people's containers to find their match. If a pair thinks they have found each other, check the answer key and see if the letter and number recorded match. If not, send them back out again!

Mammal Match

Grade Level: K-5

Associated Topics: mammals

Objective: Children will act out common movements of selected mammals and try to find their mate.

Directions: Divide the class in half and have two identical sets of mammal cards, one set for each group. Distribute the cards and have the children begin acting out their mammal. When they spot someone who thinks is the same mammal as they are, they pair up and wait until everyone else has paired up as well.

Below is a possible list of mammals and their associated movements. It is important to discuss the different mammals and have all the children practice the movements so they are ready for the activity.

Mammal	Movement
Striped Skunk	Stomp feet, lift tail, spray
Bat	Fly
Cottontail Rabbit	Big hops
Ground Squirrel	Sit on haunches and chirp, stuff cheeks with food
Kangaroo Rat	Little hops
House Mouse	Scurry about
Gray Fox	Run with long strides
Raccoon	Wash hands

Jackrabbit	Big jumps and simulate long ears with arms
Oppossum	Walk slowly on hands and legs, lumber along

Note: This list is enough for 20 children, ten pairs. If the class is larger, repeat some of the animals.

Recommended Children's Literature
for Reptiles

All Grades

Heller, R. (1981). Chickens aren't the only ones. New York: Grosset and Dunlap.

Heller, R. (1994). How to hide a crocodile. New York: Grosset and Dunlap.

Primary Grades

Buckley, R. (1985). The greedy python. New York: Scholastic, Inc.

Carle, E. (1984). The mixed-up chameleon. New York: Crowell.

Dewey, J. (1989). Can you find me?. New York: Scholastic, Inc.

Lionni, L. (1975). A color of his own. New York: Pantheon Books.

Lopshire, R. (1968). I am better than you. New York: Harper & Row.

Upper Grades

Brenner, B. (1970). Snake lover's diary. New York: Young Scott Books.

Recommended Children's Literature
for Birds, Bats, & Bugs

All Grades

Baylor, B. (1976). Hawk, I'm your brother. New York: Scribner.

Cooke, J. (1977). The butterfly cycle. New York: Putnam.

Farber, N. (1979). Never say ugh to a bug. New York: Greenwillow.

Politi, L. (1948). Song of the swallows. New York: Macmillian.

Van Allsburg, C. (1988). Two bad ants. Boston: Houghton Mifflin.

Yolen, J. (1987). Owl moon. New York: Philomel Books.

Primary Grades

Carle, E. (1977). The grouchy ladybug. New York: Thomas Y. Crowell.

Carle, E. (1981). The very hungry caterpillar. New York: Philomel Books.

Carle, E. (1985). The very busy spider. New York: Putnam.

Carle, E. (1990). The very quiet cricket. New York: Philomel Books.

Carle, E. (1995). The very lonely firefly. New York: Philomel Books.

Dorros, A. (1987). Ant cities. New York: Harper Collins, Crowell.

Hirschi, R. (1987). What is a bird?. New York: Walker & Co.

Leonni, L. (1988). Six crows. New York: Alfred A. Knopf.

Oppenheim, J. (1987). Have you seen birds?. New York: Scholastic, Inc.

Peet, B. (1969). Fly homer fly. Boston: Houghton Mifflin.

Upper Grades

Mowat, F. (1961). Owls in the family. Boston: Little, Brown.

Pringle, L. (1976). Listen to the crows. New York: Thomas Y. Crowell.

Selden, G. (1960). Cricket in times square. New York: Dell.

Recommended Children's Literature
for Water Ecosystems

All Grades

McCloskey, R. (1941). Make way for ducklings. New York: Viking Press.

Michl, R. (1985). A day on the river. New York: Barron's.

Robertson, K. (1986). Signs along the river. Boulder: Robert Rinehart, Inc.

Heller, R. (1995). How to hide a meadow frog. New York: Grosset and Dunlap.

Primary Grades

Curran, E. (1985). Life in the pond. New Jersey: Troll.

Sabin, K. (1982). Wonders of the pond. New Jersey: Troll.

Upper Grades

Cobb, V. (1986). The trip of a drip. Boston: Little, Brown.

Cherry, L. (1992). A river ran wild. New York: Harcourt Brace.

Recommended Children's Literature
for Mammals

All Grades

Ryder, J. (1987). Chipmunk song. New York: E.P. Dutton.

Heller, R. (1994). How to hide a polar bear. New York: Grosset and Dunlap.

Primary Grades

Arnosky, J. (1987). Raccoons and ripe corn. New York: Lothrop, Lee & Shepard Books.

Brett, J. (1989). The mitten: A ukranian folktale. New York: Putnam.

Casey, D. (1987). The friendly prairie dog. New York: Dodd, Mead.

McCloskey, R. (1948). Blueberries for sal. New York: Viking Press.

Potter, B. (1903). The tale of peter rabbit. New York: Warne.

Tresselt, A. (1964). The mitten. New York: Lothrop, Lee, & Shepard Co. Inc.

Wildsmith, B. (1975). Squirrels. New York: Franklin Watts.

Upper Grades

Lawson, R. (1944). Rabbit hill. New York: The Viking Press.

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California Department of Education. (1989). Visual and performing arts framework. Sacramento, CA: Author.

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Cornell, J. (1979). Sharing nature with children. Nevada City, CA: Dawn Publications.

Disinger, J. (1993). Environment in the K-12 Curriculum: An Overview. In R. J. Wilke (Ed.), Environmental education teacher resource book: A practical guide for K-12 environmental education. New York: Kraus International Publications.

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Hungerford, H. & Volk, T. (1990). Changing learner behavior through environmental education. Journal of Environmental Education, 21(3), 8-21.

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