1992

The Heaps Peak Arboretum environmental unit

Darrell Ruppel

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The Heaps Peak Arboretum Environmental Unit

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
Environmental Education

By
Darrell Ruppel and Tina Ibbs
June 1992
The Heaps Peak Arboretum Environmental Unit

A Project

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Approved by:

Dr. Darleen K. Stoner
Date: 5/30/92

Dr. Iris Rigg
Date: 5/30/92
Abstract

The Heaps Peak Arboretum Environmental Unit

Darrell Ruppel and Tina Ibbs

California State University, San Bernardino, 1992

The Heaps Peak Arboretum Environmental Unit was designed for implementation within the science curriculum of the Rim of the World Unified School District. Along with activities to be done at the Heaps Peak Arboretum, a series of pre-activities and post-activities were designed to maximize the value of student learning.

The unit was aligned with the Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990). It was field tested by a fourth grade teacher, a fifth grade teacher, and two sixth grade teachers at three different school sites throughout the district.
Acknowledgements

We would like to thank Dr. Darleen K. Stoner for her insight and initiative in starting an environmental education program at California State University, San Bernardino.

We would like to thank our families for their continued faith, patience, and support.

We would like to thank Maryann Torbett, Carol DeLapp, Merle Smeltzer, and Douglas Long for field testing and providing their input in the development of this unit.

We would like to thank the Science Committee of Rim of the World Unified School District and the Rim of the World Interpretive Association.

A special thanks to George Hesemann for his years of hard work in development of the Heaps Peak Arboretum.
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Introduction

Since the first settlers arrived in the San Bernardino Mountains the area has experienced rapid growth. In recent history, "population in the San Bernardino Mountains grew 680 percent between 1950 and 1987 -- more than twice the county's overall increase of 312 percent" (Brooks, 1992, p. A1). Although, the growth rate has been alarming, a conscious effort has been made to preserve sections of this once pristine area. The Heaps Peak Arboretum is an excellent example of the on-going effort towards conservation and preservation in the San Bernardino Mountains.

The Heaps Peak Arboretum is a 40-acre site that has been developed by the Rim of the World Interpretive Association. The founding president of the Association has described the area by saying, "Here is represented in microcosm the entire forest environment, both plant and animal" (Flore, 1990 p. 46). This area could provide students with an observable means of studying the forest environment. The site is found within the transitional life zone, and is part of the biotic community of the Yellow Pine Forest. Ecosystems
at the site include a riparian area, woodland chaparral, and a coniferous forest.

The Heaps Peak Arboretum was chosen for the development of the Heaps Peak Arboretum Environmental Unit because of the diversity of life forms at the site. The Arboretum site is located within the boundaries of the Rim of the World Unified School District. The Arboretum Unit was developed in an effort to provide students with a means of studying the local environment. The site is located on Highway 18 and is easily accessible to students in the Rim of the World Unified School District.

The Rim of the World Unified School District is comprised of five elementary schools, one middle school, and one senior high school. The population of the school district is approximately 4,800 students. It encompasses twelve separate and distinct communities.

The Arboretum Unit provides a new and interesting way for students to master many of the concepts in the *Science Framework for California Public Schools, Kindergarten Through Grade Twelve* (1990). A section of the
framework was devoted entirely to life science concepts. Key concepts in this section include the study of living things, evolution, and ecosystems. An effort was made to align the unit with the Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990).

The Arboretum Unit was designed to allow students to develop a background knowledge of the local environment. Students can study and experience the local environment through a series of participatory outdoor activities. All of the lessons deal with the topic of living things, and provide students with the information needed to address conceptual questions contained within the life science section of the State Framework. In addition, there are specific lessons that deal with evolution (adaptation), and the Yellow Pine Forest ecosystem.

The intent of the unit is to develop within students: appreciation of the local environment, awareness of an environmental site, and knowledge of the local environment. The students' participation in the Arboretum Unit should not
only increase their environmental awareness, but instill within them a sense of community ownership of the Arboretum and a need to preserve and conserve the local environment.

A supplemental seasonal video will be added to the unit by August of 1992. The video examines the changes that occur seasonally at the Heaps Peak Arboretum.
The need for environmental education has been documented in educational journals, state frameworks, magazine articles, and books. The concept of environmental education is frequently divided into topics of concern which include: definitions of environmental education; the need for environmental education; activity based environmental education; ideas for planning environmental education; and the importance of outdoor education.

Definitions and Goals of Environmental Education

Stoner, Clymire, and Helgeson (1989) defined environmental education to be any education which increases the understanding of nature, culture, technology, people, ideas, and feelings about the environment. The idea of environmental education covering more than one subject area was confirmed by Orr (1989), who stated that all education is environmental. This idea is that, dependent on what is included or excluded, emphasized or ignored, students learn that they are part of or apart from the natural world.
Engelson (1985) in Wisconsin's Guide to Curriculum Planning in Environmental Education stated that "the goal of environmental education is to help students become environmentally knowledgeable, skilled, dedicated citizens who are willing to work, individually and collectively, toward achieving and maintaining a dynamic equilibrium between the quality of life and the quality of the environment".

The consideration of values is an integral component of environmental education. The theme of values runs throughout the definition of, and goals for, environmental education. In A Guide for the Development of an Interdisciplinary Environmental Education Curriculum (1973), the California State Department of Education explained that values become involved when there are two or more choices, each of which has possibilities for action. For example, a conflict of values might involve human versus wildlife needs.

The Need for Environmental Education

Pemberton (1988) stated that because of our
diverse population, understanding of our natural resources ranges from little knowledge to a high level of expertise. In order to increase environmental knowledge and ecological literacy, individuals must understand the nature of environmental issues, and the ecological and human implications. Ownership and empowerment variables are critical issues in training environmentally responsible citizens (Hungerford, 1990).

Ford and Blanchard (1985) liken the human involvement in the environment to a delicate web. Students need to develop an interrelationship between themselves and the environment. The concept of a web is clear when one considers that the environment to which we and our societies are so finely tuned is only the current equilibrium state in an ongoing process of adjustment and readjustment, and shifts in this equilibrium can threaten every aspect of the human experience.

Activity Based Environmental Education

The Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990) supported the idea of activities being used
to explain environmental terms and concepts through the development of themes, because active learning better promotes the internalization of ideas and processes. A thematic approach is necessary to assure that the study of environmental education is not merely the collection of isolated facts. Nichols (1989) found that a variety of sensory opportunities during outdoor experiences allows for enhanced cognitive processing by all participants. This can be used in application of a thematic approach.

O'Neil (1992) stated that people learn by actively constructing and evaluating new information against previously held ideas. This process allows the learner to develop new understandings by constantly re-examining beliefs in light of new information. This method of obtaining new information by participation in activities is termed constructivism.

The Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990) suggested that a variety of direct activities be used to teach science. Strategies to ensure successful instruction during activities
Included: grouping students into small-groups, large-groups, and cooperative learning groups. It is suggested that forty percent of instructional time be spent on direct experience learning.

**Ideas For Planning Environmental Education**

When planning an out-of-doors experience it is essential that students participate in pre-activities or advance organizers to increase their learning potential (Ausubel, 1968). A pre-activity is an activity designed to be completed in the classroom prior to visiting an out-of-doors site. A post-activity is an activity designed to be completed upon returning to the classroom. Gross and Pizzini (1979) found that teachers should involve the learner in classroom instructional activities designed to enhance an outdoor environmental experience. They also found that it is important to use pre-activities and post-activities to provide a complete spectrum of educational opportunities.

**Importance of Outdoor Education**

An aspect of environmental education is
learning in the out-of-doors, whether on the school grounds, or at parks, nature centers, or residential outdoor schools. Outdoor sites provide students with an opportunity to effectively gain awareness, knowledge, and a positive attitude toward the environment (Stoner et al., 1989).

In conclusion, participation in an outdoor education experience may increase student awareness, appreciation, and knowledge of the environment. A positive environmental attitude may lead to an increased environmental ethic and accompanying educated behavior.
Goals and Objectives

The goal of the Heaps Peak Arboretum Environmental Unit was to develop an environmental education program to facilitate student learning at an outdoor site in the San Bernardino Mountains. To reach this goal fifteen author designed lessons were developed. The lessons include pre-activities, site specific activities, and post-activities.

Upon completion of the unit, students will have been given the opportunity to learn the concepts that may enable them to answer the questions presented in the life science section of the Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990) as they pertain to the San Bernardino Mountains and the Heaps Peak Arboretum.

The life science topic areas and questions are as follows:

Living Things
1. What are the characteristics of living things?
2. How do the structures of living things perform their functions, interact with each other, and contribute to the maintenance and growth of
the organism?

3. What are the relationships of living organisms, and how are living things classified?

4. How do humans interact with other living things?

**Cells, Genetics, and Evolution**

1. How has life changed and diversified through time? What processes and patterns characterize the evolution of life?

**Ecosystems**

1. What are ecosystems, and how do organisms interact in ecosystems?

2. How does energy flow within an ecosystem?

3. How do ecosystems change?

4. What are the responsibilities of humans toward ecosystems?

A matrix found in the appendix A of this project illustrates how the lessons contained in the Arboretum Unit correlate to the life science section of the *Science Framework for California Public Schools, Kindergarten Through Grade Twelve* (1990).

Students use a variety of process skills
while participating in the Heaps Peak Arboretum Environmental Unit. The process skills that students use include:

1. Communicating orally with fellow students.
2. Predicting life forms found in the San Bernardino Mountain environment.
4. Generalizing about the types of life forms within the Heaps Peak Arboretum.
5. Comparing different environments and associated vegetation.
6. Analyzing the difference between plant and animal life forms within the San Bernardino Mountains, and those within the Heaps Peak Arboretum.
7. Writing a list of plants and animal life Indigenous (naturally occurring) to the Heaps Peak Arboretum.
8. Sequencing organisms in a food chain.
9. Predicting the consequences of the removal of an organism from a food chain.
10. Communicating the concept of a food chain pictorially.
11. Grouping animals in the categories of herbivore, carnivore, and omnivore.
12. Recognizing the adaptations of animals.
13. Interpreting the importance of adaptation.
14. Analyzing how some animals meet their basic needs.
15. Classifying birds according to the size and shape of the birds beak, wings, and claws.
16. Inferring what types of foods are eaten by birds.
17. Recognizing bird adaptations.
18. Using their senses to gather and analyze information.
20. Sequencing a growth cycle.
21. Analyzing the importance of various organisms in a forest.
22. Analyzing the importance of historical events.
23. Inventing a student designed list of learning objectives.
24. Generalizing the harmful effects that humans have on the environment.
25. Identifying life forms in the Heaps Peak
26. Predicting various limiting factors. (A limiting factor directly affects the well-being of an animal and may cause the animals' death. Limiting factors may result from causes in nature as well as human activities.)

27. Analyzing the problems associated with habitat destruction and considering alternative solutions.

28. Observing environmental areas.

29. Evaluating the effectiveness of the Heaps Peak Arboretum trail.

It is a belief of the authors of this unit that a conscious effort must be made by educators to develop within students a positive attitude and knowledge of the local forest environment. The implementation of the Heaps Peak Arboretum Unit will provide educators in the Rim of the World Unified School District with a means of achieving this goal.
Project Design

This project was designed to be incorporated into the science curriculum of the Rim of the World Unified School District. The unit will be used in the "local ecosystems" subject area, which is part of the fourth, fifth, and sixth grade curriculum. The unit has been correlated to the Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990). The unit contains pre-activities, site specific activities, and post-activities developed around the Heaps Peak Arboretum, which is easily accessible to all students in the Rim of the World School District. The project design included: research of the Arboretum's history, development of a teacher handbook with lesson plans, and field testing. A seasonal video is being developed as a separate project which will be used in conjunction with this project.

A background history for the Arboretum has been included in the teacher handbook. It is the opinion of the authors of the project that students, as well as teachers, will benefit from this added knowledge of the Arboretum's history.
The history will enable both students and teachers to view the Arboretum from a perspective other than a nature trail. As a result, their appreciation of the Heaps Peak Arboretum may be increased. The background history of the site begins in the early 1880's and spans over 100 years in order to bring students and teachers up-to-date with current developments at the site.

Fifteen lesson plans were developed for the teacher handbook. They were designed so that the teacher may use one each day, thus enabling a three-week unit. The lessons include the following areas: a lesson summary, goals, suggested grade levels, lesson duration, learning objectives, process skills used, prerequisite knowledge for students, background for teachers, lesson preparation, instructional strategy, discussion questions, and evaluation activities. The lessons have been divided into three groups: pre-activities, those for the actual field trip to the Heaps Peak Arboretum, and post-activities. During the trip to the Arboretum, students are given the opportunity to participate in a seven-tenths of a mile long walk along an
The project was field tested by four teachers at three different schools throughout the district. The field testing occurred in a fourth grade classroom, a fifth grade classroom, and two sixth grade classrooms. The teachers received copies of the teacher handbook. They were then asked to do the lessons with their class and note any problems or concerns that they had with the unit. The authors met with these teachers upon completion of the unit and discussed the various problems and concerns. The primary area of concern dealt with lesson clarity and instructional strategies. Based on input obtained from the field testing, changes were made to the teacher handbook.

As previously stated, the project will become part of the Rim of the World Unified School District's science curriculum. The teacher handbook will be distributed to all fourth, fifth, and sixth grade teachers in the district. The authors of the project intend to visit each of the school sites and give a presentation on the handbook.
Implications for Education

The Heaps Peak Arboretum Environmental Unit has been approved by the district science curriculum committee. The unit will provide educators with an effective means of utilizing a nearby outdoor site. The implementation of the unit will provide educators with a means of instilling within students a strong commitment and responsibility towards all life forms, and the preservation of the San Bernardino Mountains.
Bibliography


Sacramento, CA: California Department of Education.

Appendix A

Heaps Peak Arboretum Environmental Unit

Correlations with

Science Framework for California Public Schools,

Kindergarten Through Grade Twelve (1990)
### Heaps Peak Arboretum Environmental Unit Correlations with Science Framework for California Public Schools: Kindergarten Through Grade Twelve (1990)

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<td>How do the structures of living things perform their functions, interact with each other, and contribute to the maintenance and growth of the organism?</td>
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<td>How do humans interact with other living things?</td>
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<td>How has life changed and diversified through time?</td>
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<td>What processes and patterns characterize the evolution of life?</td>
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<td>What are the ecosystems, and how do organisms interact in ecosystems?</td>
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<td>How does energy flow within an ecosystem?</td>
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<td>How do ecosystems change?</td>
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Appendix B
Teacher Handbook
Lesson 1
INTRODUCTORY LESSON

Lesson Summary: Students will develop an environmental observation folder. Students will generate a list of plant and animal life native to the San Bernardino Mountains.

Goal: To provide students with an opportunity to share their knowledge of the San Bernardino Mountains. To provide students with their own journal in which to record their personal, as well as classroom observations, of various plant and animal species.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:

Upon completion of this lesson, students will be able to:

1. Use a journal/folder to record environmental information.

2. Recognize various plant and animal species native to the San Bernardino Mountains.

3. Write a description of the San Bernardino Mountain environment.
Process Skills Used In This Lesson:
1. Communicating orally with fellow students.
2. Predicting what may be found in the San Bernardino Mountain environment.
4. Organizing of notes in a written format.

Prerequisite Knowledge For Students:
Students should have previously visited the San Bernardino Mountain area.

Background For Teachers:
1. The ability to observe our surroundings will give students an opportunity to appreciate, respect, and learn more about the San Bernardino Mountains.
2. Careful observation by students will develop their sense of concern for their surroundings. As a result, students will notice environmental changes and problems.
3. The journal/folder will include:
   a. All written forms of student observations.
   b. Drawings which express students feelings and show their observations.
   c. All future assignments, concerning the
arboretum unit.

4. Posters obtained for the National Forest Service are a good source of information when identifying naturally occurring species for the San Bernardino Mountains.

**Preparation For Lesson:**

1. Chalkboard and chalk for the teacher.
2. Paper and pencil for each student.
3. Manila folder for each student.

**Instructional Strategy:**

1. The teacher will explain to the class, that they are starting a new unit on their local environment.
2. The teacher will ask students to get out paper and pencil, and record their knowledge based on the class discussion of the environment.
3. The teacher will give students a manila folder, and explain that it will be their environmental folder. Students should keep all of their work on the environment in this folder.
4. The teacher asks students to orally give as many names as possible for living things which
exist in the local environment.

5. The teacher lists the answers on the chalkboard. A brief discussion is held on each of the items.

6. Students copy the information from the chalkboard.

7. Students place their completed list in their folder.

Discussion Questions:

1. What plants and animals are truly naturally occurring species?

2. How can we discover whether or not the species is a native?

Evaluation Activities:

1. Have students research plants and animals listed to be sure they are native species.

2. Have students research for other native plants and animals.

3. Have students share any researched information.

4. Ask students to make any necessary corrections to their lists.
Lesson 2

VIEWING OF THE ARBORETUM VIDEO

Lesson Summary: Students will view a video tape on the Heaps Peak Arboretum. Students will be required to produce a list of species native to the Arboretum site, after viewing the video.

Goal: To provide students an opportunity to view the Arboretum site. To provide students with the understanding that the Arboretum environment has a variety of plant and animal life forms.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:

Upon completion of this lesson, students will be able to:

1. Differentiate between native species and species that are non-indigenous to the Heaps Peak Arboretum.

2. Use a journal/folder to record environmental observations.

3. Write a description of the San Bernardino Mountain environment.
Process Skills Used In This Lesson

1. Generalizing about the types of life forms in the Heaps Peak Arboretum.
2. Comparing different environments and associated vegetation.
3. Analyzing the difference between plant and animal life forms within the San Bernardino Mountains, and those within the Heaps Peak Arboretum.
4. Communicating orally with fellow students.
5. Organizing a written list of plant and animal life indigenous to the Heaps Peak Arboretum.

Prerequisite Knowledge For Students:

Students should have a list of plant and animal species that they have found to be indigenous to the San Bernardino Mountain area. This should have been completed during lesson 1.

Background For Teachers:

1. Plant and animal species that live in an area may not be indigenous (native) to that area.
2. The ability to differentiate between various plant and animal species will give students a better understanding of the uniqueness of the Heaps Peak Arboretum site.
3. Careful observation will develop students' sense of concern for their surroundings. As a result, students will notice environmental changes and problems.

4. The Heaps Peak Arboretum is located in the Yellow Pine Forest.

5. The Yellow Pine Forest is known as a transitional life zone, which is located between the elevation of 4,200 and 7,100 feet above sea level.

6. In the San Bernardino Mountains the communities of Crestline, Lake Arrowhead, Running Springs, and Big Bear Lake are all found in the transitional life zone of the Yellow Pine Forest.

7. Posters obtained from the National Forest Service list all naturally occurring species within the San Bernardino Mountains.

Preparation For Lesson:

1. Students need to have their environmental folder.

2. Paper and pencil for each student.

3. Video cassette player and monitor.

5. Chalkboard and chalk for the teacher.

**Instructional Strategy:**

1. The teacher will explain to the class that they will be viewing a video tape of the Heaps Peak Arboretum site.
2. The teacher will show the video.
3. The teacher will discuss the uniqueness of the Yellow Pine Forest.
4. The teacher will ask the students to orally name plant and animal species recognized in the video.
5. The teacher will ask students to get out their environmental journal, and put a star by recognized species.
6. The teacher will ask students to name the identified life forms. The teacher will place this information on the chalkboard.
7. Students will copy the information from the chalkboard.
8. The word list can later be used as a spelling list.
9. Students can create their own word searches, and solve those created by fellow classmates.
Discussion Questions:

1. What plants and animals are native to the Heaps Peak Arboretum site?

2. How or why would a non-indigenous species come to live in the San Bernardino Mountains?

3. What kind of effect could a non-indigenous species have on the region?

Evaluation Activities:

1. Give students a spelling test based on the student developed word list.

2. Have students create and solve a word search.

3. Have students add any important information to their environmental journal.
List the words used in the word search below.

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Lesson 3

KNOW THAT TERM

Lesson Summary: Students will create an environmental game that can be played with family members or at school.

Goal: To provide students with a list of twenty environmental words and definitions. To allow students to become familiar with environmental terminology.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Recognize twenty different environmental terms.
2. Record the terms and use a dictionary to help them define the terms.
3. Develop a usable definition for the terms.
4. Design an activity that will depend on the terms and definitions.

Process Skills Used In This Lesson:

1. Identifying environmental terminology.
2. Analyzing definitions.
3. Creating a usable definition to accompany the terminology.

Prerequisite Knowledge For Students:
Ability to correctly use a dictionary.

Background Knowledge For Teachers:
1. Different dictionary sources will provide varying definitions of terms.
2. Definitions should be rephrased to provide the best explanation of the term as it pertains to the local area.

Preparation For Lesson:
1. A dictionary for every student.
2. Two copies of the blank square worksheet for every student.
3. Two pieces of construction paper for every student.
4. Writing utensils for every student.
5. Scissors, glue, and an envelope for every student.
6. Chalkboard and chalk for the teacher.
7. Students will need a piece of lined writing paper to record terms and definitions.
Instructional Strategy:

1. The teacher will place the following words on the board: herbivore, carnivore, omnivore, population, deciduous, conifer, species, organisms, environment, ecology, biome, niche, community, decomposer, humus, consumer, producer, food chain, adaptation, habitat.

2. Students will copy the list of words.

3. The teacher will then instruct students to use a dictionary to help define the words. Students should not write the definition down, but they should be prepared to discuss it orally.

4. The class will orally decide on the best definition, for application to an outdoor setting. The teacher writes the definition on the board, students will record the definition.

5. Continue this process until all of the terms have been defined.

6. The teacher will hand out the two worksheets with printed squares on them.

7. Students will write a term in one square and a definition in another.
8. Once all twenty terms and definitions are placed in squares. Students should come and get two pieces of construction paper, scissors, glue, and an envelope.

9. Students will glue the squares to the construction paper.

10. When the glue has dried students will cut the squares out and place them in an envelope. The list of definitions should also be placed in the envelope.

11. The game that accompanies this activity is a type of memory game.

12. The squares are all placed faced down. One person choses two cards and turns them over face up. If the cards give the correct term and definition, then the student may chose two more cards, and keep the match. If the cards do not match, then another person is given the opportunity to chose two cards. The person with the most matches at the end of the game wins.

13. Students should refer to the list of terms and definitions when unsure.
Discussion Questions:

1. What terms were completely unknown to students?
2. What terms are any terms missing from the list?
3. What would be a good name for the game?

Evaluation Activities:

1. Encourage students to take the game home and play it with family members.
2. Have students develop additional terms and definitions to add to the game.
3. Have students write sentences using the terms.
Lesson 4

THE MAKING OF A FOOD CHAIN

Lesson Summary: Students will review the concepts of omnivore, carnivore, and herbivore. After a review of these key terms students will design a food chain based on the local flora and fauna.

Goal: To introduce students to the various components that create a food web in the San Bernardino Mountains. To provide students with an opportunity to create their own food chain comprised of five different examples of indigenous vegetation and wildlife.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:

Upon completion of this lesson, students will be able to:

1. Define and give examples of a herbivore, carnivore, and omnivore.
2. Describe and illustrate a food chain.
3. Arrange the sequence in which animals and plants may be eaten in a food chain.
4. Determine the various dependencies that exist in nature.

**Process Skills Used In This Lesson:**

1. Communicating orally with fellow students.
2. Sequencing organisms in a food chain.
3. Communicating the concept of a food chain pictorially.
4. Predicting the consequences of the removal of an organism from a food chain.
5. Grouping animals into the categories of herbivore, carnivore, and omnivore.

**Prerequisite Knowledge For Students:**

Students will need to know a variety of plant and animal life forms that exist in the San Bernardino Mountains.

**Background For Teachers:**

1. A carnivore is an animal that eats meat only. The word "carni" means meat.
2. A herbivore is an animal that eats plants only. The word "herbi" means plant.
3. An omnivore is an animal that eats both plants and animals. The word "omni" means everything or all.
4. The word "vore" means eater.
The energy of the sun is captured by plants through the process of photosynthesis. This energy is transmitted to animals when the plants are eaten. It is again transferred when that animal is eaten. The energy flow is called a food chain.

A simple example of a food chain is a green plant, a leaf-eating insect, and an insect-eating bird.

Preparation For Lesson:

1. The teacher should prepare overhead transparencies to provide students with examples of an herbivore, carnivore, and an omnivore.

2. The students will need their environmental journals and the list generated from the introductory lesson.

3. Students will need yarn, crayons, scissors, and drawing paper.

4. Several hole punches should be available to students.

5. The teacher will need to check out animal books from the library to be used as reference sources by the students.
**Instructional Strategy:**

1. The teacher should share the background knowledge information with students.

2. The teacher should place the transparencies on an overhead projector and ask students to identify the animals. Examples of an omnivore, carnivore, and herbivore have been provided to further aid the teacher in the explanation.

3. Students should be given their art supplies, and with a partner they should be directed to construct a food chain consisting of at least five indigenous species.

4. Students should draw pictures of the plants and animals using the library books as a reference.

5. Using a hole punch, students should place a hole in the bottom and the top of the picture.

6. Students should use the yarn to place the species into a food chain.

7. Once students have completed their food chain, they should encouraged to share their creation.

8. Using the yarn the teacher should hang
the students' food chains from the ceiling of
the classroom.

9. Have students record key concepts in their
journals.

Discussion Questions:
1. What is the role of an herbivore, carnivore,
and omnivore in the San Bernardino Mountains?
2. How can human encroachment endanger the
food chain?
3. What kinds of pollution could possibly effect
the food chain?

Evaluation Activities:
1. Ask students to list five things that an
animal needs to survive.
2. Have students create additional food chains.
3. Have students give written examples of food
chains or record the examples in their
environmental journals.
BALD EAGLE
Lesson 5
ANIMAL TRACKS

Lesson Summary: Students will design a chart of animal tracks that are native to the San Bernardino Mountains. Students will draw a picture of the animal, list the specific habitat, and a principle food. This chart should be placed in the students' environmental journal.

Goal: To provide students with a means of correctly identifying animal tracks. To enable students to recognize ten different animal tracks from species indigenous to the San Bernardino Mountains, and describe the animals' habitat and food supply.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Identify ten animal tracks.
2. Describe the habitat and food source for the identified animal.
3. Infer how some animals meet their basic needs.
4. Use a journal to record information, and distinguish between animal tracks.
5. Classify animals according to habitat and food supply.
6. Develop a chart of animal tracks for personal use.

Process Skills Used In This Lesson:
1. Communicating pictorially, and in written form the concepts of habitat, food source, and animal tracks.
2. Recognizing adaptations of animals.
3. Interpreting the importance of adaptations.
4. Analyzing how some animals meet their basic needs.

Prerequisite Knowledge For Students:
Students need to have their environmental Journal, and an idea of what the following animals look like: Western Gray Squirrel, Brush Rabbit, Raccoon, Gray Fox, Coyote, Bobcat, Black Bear, Mule Deer, Stellar Jay, and a Western Toad.

Background For Teachers:
1. Animals can be identified by their tracks.
2. Animals can be categorized according to their habitat and food source.
3. Animal habitat and food supply are as follows:

A. The Western Gray Squirrel's habitat is the Pine Forest and Black Oak Woodland. The primary food source for the Western Gray Squirrel is acorns.

B. The Brush Rabbit's habitat is the Woodland chaparral, Chamise chaparral, and thicket. The primary food source for the Brush Rabbit is plant seeds.

C. The Raccoon's habitat is the Riparian Woodland. The primary food source is for the Raccoon is acorns.

D. The Gray Fox's habitat is the Woodland chaparral. The primary food source for the Gray Fox is rodents.

E. The Coyote will live in all areas of the Yellow Pine Forest. The primary food source for the Coyote is rabbits.

F. The Bobcat will live in all areas of the Yellow Pine Forest. The primary food source for the Bobcat is rabbits.

G. The Black Bear's habitat is the Coniferous forest, Woodland chaparral, Riparian
woodland, and stream areas. The primary food sources for the Black Bear are rodents and acorns.

H. The Mule Deer’s habitat is all areas of the Yellow Pine Forest. The primary food source for the Mule Deer is plant life.

I. The Stellar Jay’s habitat is all areas of the Yellow Pine Forest. The primary food source for the Stellar Jay is insects.

J. The Western Toad’s habitat is the Riparian Woodland and stream areas. The primary food source for the Western Toad is insects.

Preparation For Lesson:
1. Each student should have their environmental journal, pencil and crayons.
2. Five ink stamp pads.
3. The rubber animal track stamps.
4. The teacher should check out animal books from the school library to be used as reference materials for students.

Instructional Strategy:
1. The teacher should describe what an animal track is, and explain that animals can be
identified by their tracks.

2. The teacher will tell students that today they will be creating their own animal track chart.

3. Students should take several pages of their journal and divide them into three columns. This can be done without removing the pages.

4. Each column should be labeled; species, track, and observations.

5. Students will draw pictures of the animals, stamp in the animal’s track, and using reference materials students will record information about the animals.

Discussion Questions:

1. What is an example of new information obtained during this lesson?

2. What are some experiences in which students have actually observed animal tracks?

Evaluation Activities:

1. Encourage students to look for animal tracks, record the place and type observed. All observations should be shared with the group.
Lesson 6
GOING TO THE BIRDS

Lesson Summary: Students will identify ten different types of birds, research and write a brief description of the birds, and then make a bird using art materials.

Goal: To enable students to correctly identify ten different types of birds.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Identify ten different types of birds.
2. Discuss characteristics of the various birds.

Process Skills Used In This Lesson:
1. Comparing various types of birds.
2. Classifying birds according to the size and shape of the bird's beak.
3. Inferring what types of foods are eaten by birds.
4. Recognizing bird adaptations.
5. Interpreting the functions of adaptations.
Prerequisite Knowledge For Students:

Students should understand the concept of adaptation, and be able to infer the function related to a beak.

Background For Teachers:

1. The size and shape of a bird beak can help to identify the types of foods eaten by the bird.
2. Long thin beaks are for sucking nectar.
3. Short and pointy beaks are for crushing seeds.
4. Hooked beaks are for tearing apart animal flesh.
5. The shape and size of a bird wing is an adaptation. Students should research the adaptation.
6. Bird claws are also subject to adaptations, students can discover the purpose for the adaptation through research.
7. Adaptation is a physical or behavioral characteristic of an animal that helps it to survive.

Preparation For Lesson:

1. Copies of the bird identification worksheet should be made available to every student.
2. Encyclopedias and bird reference books from
the school library should be available for student use.

**Instructional Strategy:**

1. The teacher should give the worksheet to the students.

2. The teacher should explain that students will be responsible for the identification of the birds, and that research materials are available.

3. A chart should be made by students to record additional information about the birds. This information will include: a drawing of a bird claw, length of the bird’s wing span, the bird’s primary food source, description of the bird’s beak, and typical habitat.

4. Students should record information regarding the birds in their environmental journal.

5. Students should be given forty minutes to complete the assignment.

6. The remaining minutes of the period should be spent discussing bird adaptations, and answering student questions.

**Discussion Questions:**

1. What birds can be correctly identified?
2. What are some of the types of foods eaten by birds?
3. What is adaptation, and give an example?

Evaluation Activities:
1. Challenge students to do a report on birds.
2. Have students give a written description of a bird, and record the information in their environmental journals.
LESSON 6
DO YOU KNOW MY NAME?

Name: ______________________

RED-TAILED HAWK
TURKEY VULTURE
CLIFF SWALLOW
COMMON FLICKER
ACORN WOODPECKER
STELLER'S JAY
RAVEN
QUAIL
LESSON 6
ANSWERS TO STUDENT WORKSHEET

1. Turkey Vulture
2. Raven
3. Quail
4. Cliff Swallow
5. Nuthatch
6. Red-tailed Hawk
7. Steller's Jay
8. Acorn Woodpecker
9. Tanager
10. Common Flicker
Lesson 7

HOW TO MEASURE A TREE

Lesson Summary: Students collect and analyze information regarding the trees located on their playground. Using a worksheet, measuring tape, and metric stick students will record the type, circumference, height, and crown spread.

Goal: To provide students with an opportunity to acknowledge the different types of trees located on their school playground. To enable students to differentiate between coniferous and deciduous trees. To provide students with the opportunity to measure the circumference, height, and crown spread of a tree.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:

Upon completion of this lesson, students will be able to:

1. Differentiate between coniferous and deciduous trees.

2. Know the meaning of circumference, height, and crown spread.
3. Measure the circumference, height, and crown spread of a tree.

4. Write an accurate description of a tree.

**Process Skills Used In This Lesson:**

1. Using senses to gather and analyze information on a specific tree.

2. Communicating in an oral, written and pictorial form.

3. Comparing different types of trees.

**Prerequisite Knowledge For Students:**

Students will need to know how to read the measurements obtained from using a metric stick and measuring tape.

**Background For Teachers:**

1. A coniferous tree is a tree with cones, and is sometimes referred to as an evergreen.

2. A deciduous tree is a tree that loses its leaves in the fall and winter.

3. Circumference is the distance around a tree trunk.

4. The height of a tree is the measurement of how tall a tree is from its base to the top.

5. Crown spread is the measurement of the distance the tree limbs spread out away from
the tree.

Preparation For Lesson:

1. A copy of the Tree Worksheet for every student.
2. Fifteen metric sticks, and fifteen measuring tapes.
3. A pencil and a book to write on so that students may record their data.

Instructional Strategy:

1. The teacher should hand out the worksheet and orally go over each section with students.
2. The teacher should briefly discuss appropriate behavior with students. (Students should walk at all times, be quiet, and be respectful and courteous to others.)
3. The teacher should assign each student a partner.
4. The teacher should hand out a metric stick and measuring tape to each pair of students.
5. The teacher should monitor the students' behavior as the data are being collected.

Discussion Questions:

1. What was the most difficult part of this assignment?
2. What were some of the different types and sizes of the trees?

3. What is something new that you learned about the trees on the playground?

**Evaluation Activities:**

1. Make a chart recording all of the information gathered.

2. Have students record their thoughts and feelings in their journal.
1. What season is it? ____________________________

2. Is your tree coniferous or deciduous? ________________

3. What is the name of your tree? __________________________

4. To discover the circumference of your tree you must measure four and one half feet up from the base of your tree. Four and one half feet from the ground represents the height that foresters use in estimating the board feet of a tree. Once you are four and one half feet up, you must carefully place your measuring tape around the trunk. This measurement will give you the circumference.

   What is the circumference of your tree? ________________

5. To measure to height of the tree you must do the following:

   A. Hold your arm straight out in front of you, with your fist right at eye level.

   B. Have your partner measure the length of your arm.

   C. Hold the metric stick so that the measurement that is the length of your arm is sticking up out of your hand.

   D. Face the tree while still holding the metric stick.

   E. Walk backward away from the tree. When you can see the base of the tree by looking over your fist, and the top of the tree by looking over the top of the metric stick, stop.

   F. Have your partner measure the distance between you and the tree. This number is the same as the height of the tree.

   What is the height of your tree? __________________________

6. The crown spread is the measurement of how far out the tree limbs extend. Find the limb that sticks out the farthest on each side, and measure the distance in between the two.

   What is the crown spread of your tree? ________________

7. On the back of this paper write a five sentence description of your tree, and draw a picture of it.
Lesson 8
ALL IN THE CONES

Lesson Summary: Students will view a variety of overhead transparencies depicting different trees, leaf formats, needle structure, and seeds or pine cones. Students will collect pine cones to be shared and identified by the entire class.

Goal: To help students identify the difference that exists between trees in the San Bernardino Mountain environment. To provide students with the information needed to realize that trees can be identified by their leaves and cones.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Identify various types of pines and firs in the San Bernardino Mountains.

2. Use their environmental journal to record data.

3. Create a chart to identify the various tree species.
4. Describe the importance of trees in an ecosystem.

Process Skills Used In This Lesson:
1. Communicating orally, pictorially, and in written form.
2. Analyzing the importance of various organisms in a forest.
3. Sequencing a growth cycle.

Prerequisite Knowledge For Students:
Students will need to have a basic knowledge of the types of trees that live in the San Bernardino Mountains.

Background For Teachers:
1. A Coulter Pine has three long needles and large, heavy cones.
2. Pinyon Pines have four needles and a small, open pine cone.
3. Sugar Pines have five needles and large, sticky pine cones. The pine cones at the end of the branches hang downward.
4. Ponderosa Pines have three needles, and medium sized, barbed cones. They are commonly known as the Prickly Ponderosa.
5. Jeffrey Pines have three needles, and
tightly formed cones. These pines are also known for their strong vanilla scent.

6. White Firs have short, singular needles that cover the branch. Their cones have a long oval shape.

Preparation For Lesson:

1. Make overhead transparencies.
2. Have overhead equipment available.
3. Ask students to bring in pine cones and needles from home. Also, plan on collecting a variety yourself.
4. Students will need their environmental journals and a pencil.
5. Each student will need a copy of the handout describing all of the different varieties of trees.
6. The teacher may want to purchase a bag of pine nuts (pinyons) to share with the class. These nuts can usually be found at fruit stands or specialty stores.

Instructional Strategy:

1. Thank students who remembered to bring in examples of pine cones and needles.
2. View and orally discuss the overhead
transparencies.

3. Divide students into groups of three or four and have them identify cones and needles. The cones and needles should be placed at stations throughout the room, and group should rotate through them.

4. Once the class has had an opportunity to look at all of the stations, students should be asked to orally identify the cones and needles. Students should be prepared to justify their answers.

5. Once the student has identified the cone or needle, the teacher should place the appropriate overhead up on the screen, and pass the item around for other students to examine.

6. Students should write a brief description and make a sketch of the cone and needle. All information should be placed in the their environmental journals.

Discussion Questions:

1. How comfortable do you feel identifying various trees?

2. What are some ways to identify trees?
Evaluation Activities:

1. Have students name the types of trees they have at home.

2. Have students count the number of trees they have at home.

3. Have students record any additional information in their journals.
KNOBCONE PINE
FOUR NEEDLED

PINYONS
WHITE FIR
BLACK OAK
COULTER PINE

3 LONG NEEDLES

CONE: LARGE and HEAV
SUGAR PINE

5 SHORT NEEDLES
Lesson 9
SQUIRRELS ON THE GO

Lesson Summary: Students simulate the activities of gray squirrels. Students will become gray squirrels collecting acorns during a very active physical education game. The concept of limiting factors will be introduced.

Goal: To provide students with an understanding of limiting factors that exist within the San Bernardino Mountain Environment. To provide students with the information needed to discuss the importance of conservation, and the need to provide animals with a safe place to live. To provide students with an understanding that animals need food, shelter, and space in order to survive.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Identify limiting factors that exist in the San Bernardino Mountain environment.
2. Describe various components that make an environment suitable for animals.

3. Infer how gray squirrels meet their basic needs.

**Process Skills Used In This Lesson:**

1. Communicating orally ideas with fellow students.

2. Predicting various limiting factors.


4. Analyzing problems associated with habitat destruction, and consider alternative solutions.

**Prerequisite Knowledge For Students:**

Students should know what a gray squirrel is and have a basic idea of its habitat.

**Background For Teachers:**

1. Any area where a plant or animal naturally lives is a habitat.

2. Animals need food, water, shelter, and space in order to survive.

3. A limiting factor is anything that causes the animal population to decrease: e.g., a lack of food, water, shelter, space, disease,
predation, climatic conditions, pollution, hunting, poaching, and accidents.

4. Loss of habitat is the major reason for loss of wildlife populations.

5. In order for successful conservation of natural resources to occur, responsibilities must be shared by all members of the mountain community.

Preparation For Lesson:

1. The teacher should reserve a large outdoor area or auditorium to be used as a playing field.

2. The teacher should have at least three hundred small pieces of paper (one inch by one inch) to represent acorns.

3. Each student should have paper and pencil or crayon.

Instructional Strategy:

1. The teacher should share the background knowledge information with students.

2. The teacher will ask each student to design a gray squirrels' home on a piece of paper. Students should put their names on their homes.
3. The teacher will explain the idea of the game which is as follows:
   A. Students become gray squirrels and need to collect nuts for the winter.
   B. All nuts should be kept in their homes, which are located in a circle outside of the playing area.
   C. Squirrels may only collect one acorn at a time.
   D. The acorns are spread out in the center of the playing area.
   E. Squirrels must hop to and from their homes to their food supply.
   F. Squirrels may rest at their homes.
   G. After several minutes of play the teacher should blow the whistle. Students should freeze as the teacher gives them the bad news: a new housing development is going in, and will decrease the size of the squirrels' habitat. From now on they must jump on one leg only, but they may still rest at their homes.
   H. Allow students to hop on one leg for several minutes. Then blow the whistle
again. Tell the students you are sorry, but a fire has just burned down all of the trees in the area. So, they no longer have a home to rest at and must hop non-stop on their one leg.

1. The game is over when only one student is left hopping.

4. Once the game is completed the teacher may choose to play it over again. Otherwise, students should return to class for a discussion.

Discussion Questions:

1. What are some of the limiting factors that occurred during the game?

2. What measures could have been taken to protect the animal homes and food supply?

3. What happened when the homes were built in the area?

4. What it was like after the fire destroyed your home?

Evaluation Activities:

1. Have students record their feelings and thoughts about the game in their environmental folder.
2. Have students research the gray squirrel and its habitat.

3. Have students record their own definition of limiting factors in their journals.
Lesson 10

BACKGROUND HISTORY

Lesson Summary: This lesson prepares students for the visit to the Arboretum. A background history, list of things to do, and appropriate behavior will be discussed.

Goal: To provide students with some of the history of the San Bernardino Mountains and Heaps Peak Arboretum. To provide students with their own set of learning objectives, and give them guidelines for appropriate outdoor behavior.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:

Upon completion of this lesson, students will be able to:


2. Develop a list of things to do while visiting the Heaps Peak Arboretum.

3. Discuss why appropriate behavior is essential for a visit to an outdoor site.

4. Discuss the consequences inappropriate
behavior may have on the environment.

Process Skills Used In This Lesson:
1. Analyzing the importance of historic events.
2. Inventing a list of learning objectives.
3. Orally communicating trail behaviors considered to be appropriate.
4. Generalizing the harmful effects that humans can have on the environment.

Prerequisite Knowledge For Students:
The completion of lessons one through eight will aid students in creating a list of things to do while at the Heaps Peak Arboretum.

Background For Teachers:
1. Everyone has a responsibility towards the protection of the environment.
2. Respect toward the environment will help students to learn how to live peacefully with one another.
3. Every human activity has an effect on the environment.
4. Appropriate behavior begins with consideration.
5. Responsible behavior can be divided into three categories: respecting the environment around
you, respecting other people, and being aware of safety.

**Preparation For Lesson:**

1. A teacher copy of the background history.
2. A chalkboard and chalk.
3. Pencil and journal for each student.

**Instructional Strategy:**

1. The teacher will read the background history to students.
2. The class will have a discussion concerning the length of time their families have been in the mountains in comparison to the Heaps family.
3. The class will discuss the importance of developing a nature trail, and who would benefit from it.
4. Using their environmental journals as a guide students will generate a list of things to look for while visiting the Heaps Peak Arboretum.
5. Students will develop a list of questions they have about the Arboretum, which might be answered during their visit.
6. Students should record questions concerning
the Arboretum in their environmental Journal.

7. The teacher will list the three categories of behavior on the chalkboard and discuss their importance. (See Background For Teachers, number 5.)

8. Students will be asked why each behavior is important, and the teacher will list the reasons on the chalkboard.

9. Remind students that they will need to bring twenty-five cents to purchase an Arboretum Trail Guide. Anyone who has a problem with this should see the teacher privately. Trail Guide may be borrowed for the duration of the visit. This money is considered to be a donation that will help to further develop the site.

Discussion Questions:

1. Why is it so important to protect the Arboretum environment?

2. What would happen if everyone chose to use inappropriate behavior?

Evaluation Activities:

1. Have students write a report on their family history. Many students are third and fourth
generation mountain residents, and their relatives may have known members of the Heaps family.

2. Have students write about experiences they have had at other outdoor sites, including, but not limited to, city, state, and national parks.

3. Have students create their own list of rules to be followed when visiting an outdoor site.
Background History

In 1982, the RIm of the World Interpretive Association received permission from the United States Forest Service to develop a 40-acre area of land along Highway 18. Although, the land was officially given the name of "Heap's Peak Arboretum" in 1982, it has a recorded history of over a century.

In his book, The San Bernardinos, John W. Robinson (1989) tells the story of Fred Heaps, the man whose name was given to the arboretum. According to county tax records, Heaps settled the area sometime in the 1880's. He grew apples, hunted, and entertained friends at his ranch which was just below the east slope of what is today known as Heaps Peak. In 1918, a tragedy hit the ranch:

Heaps' niece, Clara Allison, with her husband Harry and son Dunlop were vacationing at the ranch. The cantankerous old Heaps and Harry Allison got into a heated argument when Clara intervened. What happened next has been a mystery for many years. The story given out
by the family at the time was that Clara became so upset by "the menacing words of Fred Heaps...that she succumbed to a stroke of apoplexy." But mountain historian Paullena La Fuze has uncovered the fact that Clara's death was caused by a gunshot, not a stroke, when she jumped in front of her husband to protect him from her enraged uncle (Robinson, 1989, p.149).

Charges were never brought against Fred Heaps, but he was taken down to the county hospital for observation. Five years later he died, an outcast from his own family (p. 149).

The history of the site continues with a series of devastating fires. The first of these fires occurred in 1922. By 1928, the tremendous job of replanting was underway with help of the Lake Arrowhead Women's Club and students from Lake Arrowhead Elementary School. In 1931, the site was officially designated as the Heaps Peak Reforestation Project. The replanting of the area continued until the outbreak of World War II. Another fire occurred in 1956, and this time the replanting was done by several Boy Scout troops.
The area was practically forgotten until the early 1980's, but with the tireless work of one man the area has come to life again: George Hesemann.

George Hesemann is a retired teacher from the Rim of the World Unified School District. He is also a biological science information officer with the Arrowhead Ranger District of the United States Forest Service. He has long recognized the uniqueness of the Heaps Peak area. In an interview with Edna Flore about the arboretum site he says, "Here is represented in microcosm the entire forest environment, both plant and animal" (Flore, 1990). Mr. Hesemann has already observed over 147 different species of wildlife in the area. Because of his desire to preserve the area, Mr. Hesemann founded the Rim of the World Interpretive Association. This is the same group that worked so hard to receive permission from the United States Forest Service to develop the land. After permission was granted in 1982, it didn't take long before the arboretum was opened to the public. The official dedication and opening of the Heaps Peak Arboretum took place on June 30,
1984 (Flore, 1990).

The success of the Arboretum has been astonishing. The Rim of the World Interpretive Association "estimated that there would be about 10,000 visitors per year to this site in 1989; there were 92,000" who actually visited this pristine area (Flore, 1990, p. 46).
Lesson 11

A VISIT TO THE ARBORETUM

Lesson Summary: Students will visit the Heaps Peak Arboretum. Time will be spent exploring the site and recording information.

Goal: To give students an opportunity to visit a developed nature trail. To allow students to experience an environmental site that contains the various flora and fauna that they have been studying.

Grade Level: 4-6

Duration: A three-hour field trip

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Identify species which are indigenous (naturally occurring), and those that have been introduced to the Heaps Peak Arboretum.
2. Use a journal/folder to record environmental observations.
3. Write a description of the San Bernardino Mountain vegetation.
4. Answer questions pertaining to the Arboretum
that were developed during the previous lesson.

**Process Skills Used In This Lesson:**

1. Identifying the life forms in the Heaps Peak Arboretum.
2. Comparing different environments and associated vegetation.
3. Analyzing the difference between flora and fauna within the San Bernardino Mountains and those within the Heaps Peak Arboretum.
4. Communicating ideas with fellow students.
5. Writing about plant and animal life indigenous to the Heaps Peak Arboretum.

**Prerequisite Knowledge For Students:**

Students should have developed a list of items to look for while visiting the Arboretum.

**Background For Teachers:**

1. Flora and fauna species that live in an area may not be indigenous (naturally occurring) to that area.

2. The ability to differentiate between various plant and animal species will give students a better understanding of the Heaps Peak Arboretum.
3. Careful observation will develop students' sense of concern for their surrounding. As a result, students will notice environmental changes and problems.

4. A trail guide has been developed by the Rim of the World Interpretive Association. The guide recognizes twenty-four separate sites along the seven-tenths of a mile long Heaps Peak Arboretum trail.

Preparation For Lesson:
1. Students should have turned in their field trip permission slips.
2. Students should have a quarter to purchase the Arboretum nature trail guide.
3. Students need to bring their journal and writing utensils.
4. Students need to be divided into groups of three or four in order to appreciate the experience of visiting the Arboretum.
5. The teacher should contact parent chaperones to accompany students on the field trip.

Instructional Strategy:
1. The teacher will briefly review good behavior with students: walk at all times, be quiet,
and be respectful and courteous to others.

2. The teacher will remind students to bring their journals and writing utensils.

3. The teacher will divide students into groups of three or four to be accompanied by parent chaperones.

4. The teacher will explain that students will be held responsible for their journals in which they should record the following: feelings, observations, answers to questions that were developed during the previous lesson, any additional notes and information that may help them on a test about the Arboretum.

5. Once students have arrived at the Arboretum the teacher should purchase the trail guides, and distribute them among students.

6. Groups should be dismissed to go out on the trail at intervals. Students not on the trail can review their trail guides, or the information bulletin boards at the site. The intervals should be approximately three to four minutes apart. The teacher may chose to have some students start going through the trail in the opposite direction (through
the exit). This will allow a greater number of students to be on the trail at one time.

7. Once students have completed the trail the teacher should ask students to share their feelings about the Arboretum with the rest of the class. A set of benches near the beginning of the trail provides a perfect setting for a class discussion.

Discussion Questions:

1. How does the Arboretum benefit the community?
2. What flora and fauna are indigenous to the Heaps Peak Arboretum site?
3. What flora and fauna are not naturally occurring species, and why are they in the Arboretum?
4. What are some of the problems that occur when introducing species into an area?

Evaluation Activities:

1. Have students prepare an oral presentation on the Heaps Peak Arboretum to be shared with their family.
2. Have students research a plant or animal species that they observed while visiting the Arboretum.
3. Students could develop an invitation to go home which provides friends or family members with a guided tour through the Arboretum.
Lesson 12
WRITING A HAIKU

Lesson Summary: Students will write a Haiku describing the Arboretum. Students will illustrate their Haiku, and then share their creation with the class.

Goal: To provide students with an alternative means of expressing their thoughts and feelings regarding their visit to the Heaps Peak Arboretum.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Write a description of the Heaps Peak Arboretum in a poetic format.
2. Use their memory to recall features of the Arboretum.
3. Draw a picture of the Arboretum to illustrate their poem.
4. Share the product of their work with classmates.
Process Skills Used In This Lesson:
1. Writing thoughts and feeling in a descriptive format.
2. Communicating pictorially ideas regarding the Heaps Peak Arboretum.
3. Communicating orally ideas with fellow students.

Prerequisite Knowledge For Students:
Students should have participated in the Heaps Peak Arboretum field trip, or visited the site on their own.
Students also need to know what a syllable is and how to count them.

Background For Teachers:
1. A Haiku is a descriptive form of poetry, developed by the Japanese.
2. A Haiku usually describes a part of nature.
3. A Haiku is comprised of three lines, the first line has five syllables, the second seven syllables, and the third five syllables. An example of a Haiku is as follows:

The Arboretum
a local community
Yellow Pine Forest
Preparation For Lesson:

1. A piece of paper for each student; this can be either a large piece of white construction paper or just a regular sized piece of paper.
2. Students will need crayons, markers, colored pencils and pens for illustration purposes.
3. Chalkboard and chalk for the teacher.

Instructional Strategy:

1. The teacher should explain the concept of a Haiku to students.
2. Knowing that a Haiku is a descriptive poem, the class should brainstorm a list of adjectives that describe aspects of the Arboretum. The teacher can record the suggestions on the chalkboard.
3. Using the list of adjectives as an example the teacher should briefly review syllables.
4. The teacher should write the format of a Haiku on the chalkboard.
5. The teacher should pass out the paper and drawing materials.
6. The teacher should take a few minutes to remind students about things they may have seen at the Arboretum, and encourage students
to write about feelings they experienced during their visit.

7. Students should begin creating and illustrating their Haiku. Check the structure of each student's Haiku.

8. Students who wish to share their work should be encouraged to do so.

Discussion Questions:

1. Why did you choose the particular plant or animal to write about in your Haiku?

Evaluation Activities:

1. Ask students to share positive comments they have regarding others' work.

2. Have students record their Haiku in their journals.

3. Encourage students to continue to write as a means of expressing themselves.
Lesson 13
ARBORETUM BINGO

Lesson Summary: Students will play a type of bingo game to share their knowledge of the Heaps Peak Arboretum. If time permits, students will also participate in a descriptive guessing game.

Goal: To provide students with a means of sharing their knowledge of the Heaps Peak Arboretum in a non-threatening manner.

Grade Level: 4-6

Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Describe characteristics of the Heaps Peak Arboretum.
2. Review key environmental terms.
3. Give a written description of an item found in their environment.

Process Skills Used In This Lesson:
1. Communicating orally with fellow students.
2. Writing a description of an item that is found in the environment.
3. Predicting what may be found in different environments.

4. Observing areas on the school grounds.

Prerequisite Knowledge for Students:
Students will need to have previously visited the Heaps Peak Arboretum and used the trail guide.

Background for Teachers:
1. Students may need assistance in answering some of the squares on the Arboretum Bingo worksheet. The following information should have been obtained by reading the Heaps Peak Arboretum trail guide:

A. The Western Gray Squirrel eats acorns.
B. A Coulter Pine Cone can weigh up to eight pounds.
C. The Western Bracken Fern is also known as Greek pteris.
D. A tree may "stoop" because of a heavy snow load.
E. The Sugar Pine is the largest pine tree in the world.
F. A Knobcone Pine needs a fire to crack its seeds open so that it may reproduce.
G. Deer eat the Mountain Whitehorn.
H. Serrano Indians ate pine nuts.
I. The Willow Tree was used by early pioneers to cure toothaches.

J. Incense Cedars are used to make pencils.

K. Stinging Nettles have sword-like leaves.

L. For each wildflower picked there will be 100 less next year.

M. The Giant Sequoia is the largest living thing on the earth.

N. Birds eat Sierra Currant.

Preparation For Lesson:
1. A copy of Arboretum Bingo for each student.
2. A pencil for each student.
3. A 3" X 5" index card for each student.

Instructional Strategy:
1. The teacher will give each student a copy of Arboretum Bingo.
2. Students must find other students who are able to answer the questions correctly.
3. The student who is able to answer the question signs his or her name in the square.
4. The first student who is able to get twenty-five different signatures on his or her sheet wins.
5. A student may not sign the same sheet more
than once.
6. Review the Arboretum Bingo sheet and give the students the correct answers to the squares.
7. A follow up activity is to give each student a 3" X 5" index card.
8. Have students in groups of four or five choose an item on the playground to describe.
9. Each student decides on one word to describe the object and then write the word on their card.
10. Groups return to class, and form a line in the front of the room. Students read their word, and then ask the class if they can figure out what the item is.

Discussion Questions:
1. What the most difficult square was to fill?
2. What sort of things would you have placed in the squares?

Evaluation Activities:
1. Have students create their own Arboretum Bingo game.
2. Have students describe an item in five words or less, and have their family identify the item.
3. Students should record the questions and answers to any squares that they did not understand in their journal.
<table>
<thead>
<tr>
<th>ARBORETUM</th>
<th>B I N G O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can name a bird</td>
<td></td>
</tr>
<tr>
<td>Visited the Arboretum with a parent</td>
<td></td>
</tr>
<tr>
<td>Knows what herbivore is</td>
<td></td>
</tr>
<tr>
<td>Saw a bird at the Arboretum</td>
<td></td>
</tr>
<tr>
<td>Knows what the largest pine in the world is</td>
<td></td>
</tr>
<tr>
<td>Knows what a fruit is</td>
<td></td>
</tr>
<tr>
<td>Knows how much a Chinook pine cone can weigh</td>
<td></td>
</tr>
<tr>
<td>Knows what tree bears the largest pine cone</td>
<td></td>
</tr>
<tr>
<td>Knows what tree needs fire to reproduce</td>
<td></td>
</tr>
<tr>
<td>Visited the Arboretum for the first time on the Fall trip</td>
<td></td>
</tr>
<tr>
<td>Knows what plant has spool-like leaves</td>
<td></td>
</tr>
<tr>
<td>Knows what carnivore is</td>
<td></td>
</tr>
<tr>
<td>Can explain the difference between decomposition and recycling</td>
<td></td>
</tr>
<tr>
<td>Can name a food source for the Seminoles</td>
<td></td>
</tr>
<tr>
<td>Can name a food source for the Apache Indians</td>
<td></td>
</tr>
<tr>
<td>Knows how many flowers on the forsythia bush can be found</td>
<td></td>
</tr>
<tr>
<td>Plans on visiting the Arboretum again</td>
<td></td>
</tr>
<tr>
<td>Knows how many flowers will be in bloom next year</td>
<td></td>
</tr>
</tbody>
</table>
Lesson 14
THE ARBORETUM GAME

Lesson Summary: Students will design a board game that asks questions about the Heaps Peak Arboretum. Students will be able to play the games belonging to other students.

Goal: To give students an opportunity to share the information they have acquired regarding the Heaps Peak Arboretum.

Grade Level: 4-6

Duration: Two fifty-minute periods

Learning Objectives:
Upon completion of this lesson, students will be able to:

1. Design a board game on the Heaps Peak Arboretum.
2. Share data with fellow students.
3. List important features of the Heaps Peak Arboretum.
4. Identify characteristics of the Heaps Peak Arboretum.
5. Draw comparisons between designing a gameboard and the development of the Heaps Peak
Arboretum.

Process Skills Used In This Lesson:

1. Analyzing the flora and fauna of the Heaps Peak Arboretum.

2. Communicating orally, pictorially, and in written form.

3. Gathering information on the Heaps Peak Arboretum.

4. Evaluating the effectiveness of the nature trail at the Heaps Peak Arboretum.

5. Comparing the designing of a gameboard, to the development of the Heaps Peak Arboretum.

Prerequisite Knowledge For Students:

Students should have previously visited the Heaps Peak Arboretum. Students should also have their journals available.

Background For Teachers:

1. Through comparisons students may conclude that similarities exist between designing a gameboard based on the Arboretum trail and the actual development of the Arboretum site.

2. People are the only species who can consciously change its environment.

3. People build environments for their activities.
4. Beneficial changes in the environment occur when people work together.

Preparation For Lesson:
1. Pieces of cardboard boxes available for each student.
2. Scissors, paper, and drawing materials for each student.
3. Students will need their environmental journals.

Instructional Strategy:
1. The teacher should begin the lesson by discussing a variety of board games with students and the ways in which they are played.
2. The teacher will then give the students the assignment of designing a board game that uses the Arboretum nature trail as its course.
3. Give students pieces of cardboard and art materials.
4. Suggest that students use their journals as a source for questions which can be placed on game cards.
5. Have students share their games, and keep them in class so that they can be played the
following day.

Discussion Questions:

1. What was the most difficult part of this assignment?

2. What board game did students use as a pattern for their own game?

Evaluation Activities:

1. Have students take their games home to be played with family members.

2. Since this is the last activity for the unit, have students write an evaluation in their journals.
Lesson 15
THE ARBORETUM TEST

Lesson Summary: During this lesson students will turn in their environmental journals, take a test on the Arboretum, and play their Arboretum board games.

Goal: To test students knowledge of the Heaps Peak Arboretum. To evaluate the environmental journals, and judge the effectiveness of the unit. To give students an opportunity to use their board games.

Grade Level: 4-6
Duration: One fifty-minute period

Learning Objectives:
Upon completion of this lesson, students will be able to:
1. Evaluate the quality of their board games
2. Share their knowledge of the Heaps Peak Arboretum.
3. Sense the completion of an environmental unit, and continue the unit on their own.

Process Skills Used In This Lesson:
1. Analyzing stored information,
2. Applying learned information.
3. Communicating orally with fellow students.

Prerequisite Knowledge For Students:
Students should have previously visited the Heaps Peak Arboretum. Students should take time to review their environmental journals. Questions asked on the Arboretum Bingo worksheet will provide an excellent means of review for the test.

Background For Teachers:
1. Journal writing provides students with an affective means of developing ideas.
2. Affective evaluation may be obtained from the quality of and information contained in the students' environmental journals.

Preparation For Lesson:
1. Students will each need a copy of the Arboretum test.
2. Students will need a writing instrument.
3. Chalk and a chalkboard.

Instructional Strategy:
1. The teacher should begin the lesson by asking students to respond to the following questions in their writing journal (questions should be
A. Did you enjoy the Arboretum Unit? Explain your answer.
B. What activity did you enjoy most?
C. Would you visit the Arboretum again?
D. Do you feel it is important for humans to make an effort to preserve environmental sites?

2. The teacher should encourage the students to continue to observe and investigate their environment.

3. The teacher should collect student journals.

4. Students should be instructed that upon completion of the test they may quietly meet in a corner of the room and play their board games.

5. The test should be completed.

6. Tests should be turned into the teacher, and students may begin playing with their games.

Discussion Questions:

1. What are some of the feelings students have regarding the Arboretum Unit?

2. What was the most difficult part of the test and are further explanations needed?
**Evaluation Activities:**

1. Encourage students to continue with their environmental observations and work.

2. Have students take their board games home to be shared with their families.
LESSON 15
ARBORETUM TEST

1. In what year was the great fire?

2. What plant is valuable for its ability to prevent erosion?

3. If you pick one wildflower how many won't exist next year?

4. How much can the cone of the Coulter Pine weigh?

5. Give another name for Greek pteris?

6. Name an important food supply for birds and small mammals.

7. What will feed upon decaying wood?

8. Approximately how old are the San Bernardino Mountains?

9. What type of rocks make up the San Bernardino Mountains?

10. What plant has an interrelationship with the Gray Squirrel?

11. What tree is used to make pencils?

12. The largest pine in the world is the

13. Name a species of tree not native to the Arboretum.

14. What is the Ponderosa Pine's greatest challenge for survival?

15. What do all trees need in order to survive?

16. What may cause a tree to "stoop"?

17. How did the Serrano Indians use the willow?

18. What was the willow used for by the pioneers?

19. What plant has sword-like leaves?

20. What is the largest living thing on the earth?

21. What is known as the Arboretum's tree for all seasons?

22. The practice of cutting trees down to provide sunlight is

23. What tree needs fire to reproduce?

24. A tree that loses its leaves in the winter is considered to be

25. What is a cone bearing tree is called?

Insects Mountain Whitehorn Quaking Aspen Two Million Conifer Dogwood
1922 Western Bracken Fern Bows Deciduous Sugar Pine Smog Thinning
Sunlight Eight Giant Sequoia One Hundred Incense Cedar Stinging Nettles
Sierra Currant California Black Oak Knobcone Pine Toothache Granite Snow
1. 1922
2. Mountain Whitehorn
3. One Hundred
4. Eight
5. Western Bracken Fern
6. Sierra Currant
7. Insects
8. Two Million
9. Granite
10. California Black Oak
11. Incense Cedar
12. Sugar Pine
13. Quaking Aspen
14. Smog
15. Sunlight
16. Snow
17. Bows
18. Toothaches
19. Stinging Nettles
20. Giant Sequola
21. Dogwood
22. Thinning
23. Knobcone Pine
24. Deciduous
25. Conifer