

**Science in Your Own Backyard**  
**A Curriculum Unit for Elementary Mainstream and Learning Support Students**  
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**The Overview**

This unit is developed for elementary mainstream and learning support student's K-5. This unit can however be adapted to all grade levels and for students in both rural and urban settings. Students with specific learning needs can be included in all of these activities with some simple modifications. Teachers or group leaders should be aware of any individual needs and plan accordingly. They should make sure that all areas that are chosen for habitat development are accessible for all. They may need to make modifications by labeling products clearly or providing pictures of supplies or providing actual demonstrations of a task. Pairing a learning support student with another student is usually very beneficial.

In the unit that I will be working on, I will be working closely with the school's science teacher. She and I both have taken part in the Institute, we are both writing curriculum units dealing with creating a native habitat. We have collaborated on the monthly time line but we have developed our own separate curriculums. A person looking for resources on developing their own native habitat will have two resources to refer to from the Everyday Science Curriculum Units.

In this unit, the students will gain an awareness of the nature right outside their window. They will explore the scientific properties associated with developing a natural habitat. They will be given an opportunity to participate in hands on learning activities that will not only enrich them academically and physically, but they will help to enrich the environment that they live in as well. This unit is set up with month-to-month activities to correlate with the planting seasons of a habitat. These activities may overlap at times and are able to be modified to any situation. By using this curriculum, a teacher from any grade level, in any situation, should be able to transform a particular space (no matter how big or small) into a growing, living, ecosystem.

***The Rationale***

A good teacher knows that students learn using a variety of methods, and that not all students learn in the same way and at the same pace. This is a fundamental theory practiced by teachers at all grade levels. This curriculum unit will go a little further to state that not all learning is provided within the four walls of a classroom, and all learning is not achieved by reading information from a text. This is a unit that will take students out of the traditional classroom and into a class that has no boundaries, and one that will provide hands on experiences for both the mainstream student and the special needs

student. This curriculum will provide positive hands on experiences for students as they witness the progression of an area of dirt as it transforms into a habitat that provides shelter, food, space and water for the nature right outside their windows. Students will gain an awareness of their environment and will hopefully take ownership of that environment with the goal of enriching that area and using it for an on going learning experience. The students will go through month-by-month activities to prepare the designated area from dirt to a life giving sanctuary that will become a source of education and enrichment for generations to come.

### **The Objective**

The students will become aware of the environment around them using hands on experiences and scientific technology to create a natural habitat in the space given that will not only enhance them academically, but will increase their self esteem and excitement for learning by enhancing the environment that they live in. The students will follow a monthly curriculum beginning at the very first steps of a habitat development. They will learn about mapping an area that is to be used. They will look at factors that will affect this area such as what is the traffic pattern of the people using this area, are there physical factors that will affect this area, what are the water sources for this area, what are the times that the sun is present in this area and so on. The student will learn how to make overlays for their maps that address these questions. Students will then look at the soil of a given area. They will learn about different soil types, they will learn how to test the pH of the soil and they will research which types of plants do the best in the soil that is provided. Students will use the Internet as well as texts to research native plants to our particular area. They will be introduced to many Internet resources dealing with most areas of the project. They will learn the differences between a “garden” and a “natural habitat”. They will look at medicinal uses for some of the native plants, and will construct educational signs to showcase these plants in the habitat. Students will research native wildlife and will incorporate language arts skills when observing and keeping journals of the wildlife activities and patterns. They will incorporate social studies skills when researching the area, they will incorporate math skills when measuring to build birdhouses and nesting boxes and when measuring the designated area, and they will incorporate the objectives from the Foss Curriculum, as this is generally a science curriculum. Students will work outside using hands on activities when the weather permits. They will engage in indoor supplementary activities during the winter months such as research of plants and wildlife, construction of forms of shelter, providing signage of medicinal plants and types of wildlife, (birds, insects, and small mammals.) They will review the process of photosynthesis using text, and the Internet. Students will be striving to meet the “Standards” required in the areas of science, social studies, math, and language arts. In science they will be introduced to areas and projects that will meet no. 1, 2, 4, 5, 6, 7, 8, and 9 of the science standards with a concentration on standard no.6. In the area of communication, they will be provided opportunities to meet standards no. 1,2,4, 5, 8, and 9. The math standards will focus on areas 2, 4, 5, 6, and 7. . A more extensive explanation of the standards can be found in the appendix at the end of this unit.

## ***Strategies***

September-October

### Getting Started:

This unit will be developed on a monthly basis. Some months will be busier than others with more projects and activities. Some projects may overlap from month to month and some may be revisited many times. The activities will be developed to provide students the opportunities to meet the guidelines when following the steps of a scientific method. In the beginning the students will tackle three very important projects that will set the habitat in motion. The students will be asked to identify and state problems when dealing with mapping, soil samples, and the beginning knowledge building of native plants. They will gather information on these issues, state a hypothesis, design an experiment, make observations and record data, organize and analysis data and state a conclusion. These methods will be on going throughout the months that it takes to bring this unit to fruition. The first project will be mapping the area. Students of all ages are capable of drawing maps. Many varieties of maps can be created once the area to be used has been measured. Depending on the grade level, students can create picture maps, 3-D maps, maps with overlays, or they may simply draw a picture of the area. At all age levels, this activity will increase the student's awareness of the area. It will also increase their map making and observation skills. Chapter 3: Mapping the School Yard from "Homes for Wildlife" has great activities that can be utilized for more hands-on ideas. Once the students have measured and mapped out an area, they will then look at the type of soil that their habitat provides. Students will be introduced to the types of soil such as clay, sand or loam. They will identify which type of soil they have, and they will then be trained to use The LaMotte Morgan Soil pH testing kit to determine the pH balance of the soil. They will then use Internet sources along with the LaMotte Soil Handbook and a variety of nature handbooks and texts to begin determining which plants will do best in this soil or what supplements need to be added to the soil to achieve the desired type of soil. Students will test many areas of the habitat and will make observations as to any differences in soil pH of a given area. What are the pH balances of areas that have a high evergreen population as opposed to an area that has mostly deciduous trees? Students will then begin to learn the subtle differences between a natural habitat and a simple garden. While both provide beauty and function as a source of food and shelter for much wildlife. Students will look at the benefits of providing native plants as a more natural way to enhance the area and the area's wildlife. They will be introduced to invasive non-native plants and will take a look at some of the problems that they present. Students will be provided with many resources such as field guides, textbooks and web sights that will provide them with the information they need to identify the wildflowers native to our area.

These activities will also provide the necessary components to allow students to meet the standards of the FOSS Science Curriculum at many grade levels. In 5<sup>th</sup> grade the elements of Variables are met when students look at factors such as sun vs. shade, water vs. drought, invasive species vs. non invasive

species and so on. They will look at Levers and Pulleys when using some garden tools, and they will study Mixtures and Solutions when looking at the soil and the pH balance. The fourth grade may integrate the use and study of water from the FOSS, while third grade can incorporate the FOSS standards of Measurement, Physics of Sound, and Earth Materials. In second grade we look at our habitat as well as the FOSS when studying Air and Weather and Insects. Grade one will learn more about Balance and Motion and New Plants, while kindergarten will be supplemented in their FOSS curriculum when looking at Trees and Animals Two By Two. Students will also meet the science standards by looking at Science as an Inquiry, Structure and Function, Diversity and Adaptation, Population and Ecosystems, Understanding about Science/Technology, Population, Resources, Environment, Nature of Science, and Properties and Changes.

November

*Native Plants:*

This unit is a continuation of the previous months activities. The students will first review the parts of a plant; they will dissect a flower, looking at all of the components. They will classify and compare flowers, shrubs, and trees. They will revisit the process of photosynthesis, and they will research the difference between a native flower and a non- native or introduced species. During this unit the students will continue to increase their ability to use resources such as the Internet, library books, seed catalogues and field guides while conducting their research. They will increase their classification and comparison skills, as well as their observation and descriptive writing skills. They will be provided opportunities for problem solving and an increased awareness of environmental education issues. Students will spread this information into other subject areas such as language arts, math, science, and environmental education. In FOSS, the areas of Water, Earth Materials, New Plants, and Trees will be discussed.

December

*Identifying and developing a habitat:*

A habitat is the arrangement of food, water, shelter, and space suitable to animal's needs. Humans have these same needs in common with all other living creatures.

This unit will focus on the elements necessary to produce a healthy, functioning habitat. Students will identify the four necessary elements. They will increase their background knowledge and their vocabulary development will increase as well. They will develop a word bank that will become meaningful as the habitat continues to develop. They will also be able to apply this new vocabulary as the project unfolds. They will discuss the differences of how they acquire the elements necessary for

survival as opposed to how animals obtain these elements in nature. Students will look at the elements that they have in their habitat. Are there any areas lacking? What is the food source? Is there sufficient cover to raise young? What are the forms of shelter? How can we provide additional shelter? Additional food? Is there a water source? How can we provide one if not?

Students will focus on the FOSS curriculum when looking at variables that may affect a Habitat. They will look at the importance of Water, Earth Materials, and Insects. They will Focus on Science Standards such as Science as an Inquiry, Populations and Ecosystems, Diversity and Adaptations, Populations, Resources, Environments, Science as a Human Endeavor, and Properties and Change. Students will also be provided with opportunity to analysis information and apply it to a real- life situation. They will be able to classify, compare, describe, observe and research.

January

*Plants Used as Medicines:*

Where do medicines come from? How did the Native Americans and early settlers know that they could use plants for medicine? How did they know which plants cured which illnesses and which ones were poisonous? This unit will look at the importance of maintaining the native wildflowers that exist in our region by studying their medicinal significance. Students will look at plants as more then a food source for birds and insects, they will look closer at the variety of uses that plants can provide. They will have an opportunity to visit a Nature Reserve at Frick Park to meet parks manager David Jet for an extensive tour and explanation of the sites expansive medical garden. Students will look forward to taking this trip in the spring and will revisit the information learned in this unit before embarking on that trip.

Students will increase their ability to use: Science as an Inquiry, they will look at Life Cycles of Organisms, Structures and Functions in Living Systems, Populations and Ecosystems, and Diversity and Adaptations of organisms. Students in grade 4 will touch on FOSS standards of Ideas and Inventions, and Water, while grade five will look at Variables, and Mixtures and Solutions. The students will have an opportunity to identify and state a problem, they will gather information and make relations to daily living, make observations and record data, organize and analyze data and state conclusions.

February

*Habitats in Winter:*

During the winter months many components of a habitat quiet down and go to sleep or travel on until spring returns. However, the students are wide-awake and eager for spring to arrive to begin the habitat adventure. In this unit students will have the opportunity to identify the characteristics of animals in winter. They will learn that some animals migrate, some hibernate, some gather food all summer to survive, and some, like deer, must hunt for their food. They will learn about the habits of animals in winter and the ways that they cope for survival. They will research information, collect and gather data and record their findings. They will problem solve when looking at variables that may change an environment such as losses of space due to human development.

Students will follow the standards by looking at Populations and Ecosystems, Diversity and Adaptations, Risks and Benefits, Science as a Human Endeavor, Properties and Changes, and Nature of Science. They will follow the FOSS curriculum when looking at Variables, Earth Materials and Air and Water. Students will take a winter hike to look for any signs of life. They will be required to collect and organize data and to record data in their journals. They will use their comparison skills in the spring and early summer when they look at the habitat again. They will then study the changes that have taken place in the habitat by looking at the same variables that they looked at in the winter months.

March

*Signs of Life:*

March can often come in like a lion and out like a lamb. Students will be getting eager to get outdoors and get started with the habitat development. This unit will provide activities that may be done indoors in the beginning of the month, as well as activities that will lead the students outdoors as the weather becomes warmer. This will be a time of great exploration and discovery. Students will have resources that they have gathered from the previous months activities to aid in their background knowledge of a habitat and its components, they will have their checklist of life signs to add to and to note the differences from one season to the next.

The students will meet the required science standards by using Science as an Inquiry, Populations and Ecosystems, Diversity, and Ecosystems, Understanding about Science/Technology, Population, Resources, Environment, Science as a Human Endeavor, Nature of Science, and Properties and Change.

April

*Breaking Ground:*

This is the time for students to actually start some of the more physical aspects of the habitat development. By this time the students, as well as the faculty and parent and community volunteers

should be geared up and ready to work. Students will again survey the designated area. They will complete checklists to determine if there is food, water, shelter, and space that is necessary to a healthy habitat. Students will continue to add information and data to their habitat survey of animal signs, they will look at a time line and review the information that they have learned thus far. Students will again check the pH balance of the soil. They will begin physical clean-up of the area such as removing dead leaves or branches, raking the area, removing any additional debris.

Students will meet the FOSS requirements when focusing on Tree, Animals Two by Two, Air and Weather, Earth Materials, Measurement, Water, Mixtures and Solutions, and Variables. They will also meet the science standards of Science as Inquiry, Populations and Ecosystems, Science as a Human Endeavor, and Properties and Change.

May

#### *Planting the Habitat:*

The ground is ready, the soil has been tested and the debris removed. The plants have arrived; the tools are waiting to be used and the students, faculty, and parents are ready to begin. This unit will bring students of various grades levels and abilities together to form a common goal. Through this project the students will learn that hard work, determination, dedication, and team- work can transform an ordinary space into a living, growing ecosystem full of life and bio-diversity.

Students will go from textbooks and Internet resources to actual hands-on outdoors activities. They will focus on the FOSS curriculum while looking at Trees, Animals Two by Two, New Plants, Measurement, Earth Materials, Water, Mixtures and Solutions, and Variables. They will focus on the science standards such as Populations And Ecosystems, Science as a Human Endeavor, Nature of Science, and Properties and Change.

June

#### *How Has Your Garden Grown:*

June is the time to sit back and reap the rewards of successful implementation of your native garden. But we will only sit for a moment. These last few weeks of school will be spent on watering, weeding, and watering some more. Students will have time to observe plant growth. They can continue to gather data, and to make observations and record them in their science journals. Students will use this time to relate information that they have learned to produce signage of the native wildflowers, especially the medicinal species. They will work on making sure that volunteers are in place for summer watering tasks. They will work on making neighbors and community members feel welcomed. They will

encourage them to take ownership in the habitat's development by hosting an Open House Garden Party. Parents and community members will be invited to an end of year celebration and dedication of the new native garden. Schedule times for watering chores, weeding, and dead heading, will be posted and volunteers will be organized for the summer months. Students will be encouraged to acts as stewards of the grounds to make sure that it stays free of vandalism. They will be encouraged to continue to observe the growth of the flowers during the summer, as well as any bird or animal behavior that they may observe. Students will be reminded that this is not the end of the habitat, but actually the beginning of a refuge for endangered native plants and the vast variety of insects, birds, and small mammals who thrive on their existence.

Through out this entire unit students have been given many opportunities to meet the goals and standards set both nationally and district wide. This unit, like most others will provide students with a focus on Populations and Ecosystems, Science as a Human Endeavor, Nature of Science, Science as an Inquiry, and Properties and Change. It will also focus on the FOSS curriculum when looking at Trees, Animals, New Plants, and Air and Water, Measurement, Earth Materials, Ideas and Inventions, Water, Variables, and Mixtures and Solutions. As in many curriculum units, skills are often varied and Standards are met in many areas. The following content standard can also be found within this entire unit. These standard will be listed in detail in the appendix at the end. The Content standards, in addition to the ones already stated in the objective section of this unit, are: Communications: 1, 2, 6, and 7 and Citizenship: 4, 7, 8, and 10.

### ***Classroom Activities***

September-October

Getting Started:

The following segment of the Curriculum Unit will focus on teaching methods developed to successfully implement the activities needed to create a natural habitat in a given area. This unit will continue to strive to meet the curriculum standard guidelines provided to help students achieve at their highest potential. This unit will continue to provide opportunities for students to follow the scientific method necessary for a successful science curriculum.

Mapping the Area: No matter what size your habitat area, it must be measurable and observable. Students will begin the lesson on day 1 looking at a variety of maps while still in the classroom. They will look at aerial maps, road maps, tourist's maps, and trail guides. They will discuss the need for maps and they will look at the keys that go along with them. Students will discuss what properties the given area already has. What type of vegetation already exists and can we identify

it? Students will discuss physical features such as flagpoles or water fountains; does the traffic of people to these types of areas cause a problem? What are possible solutions? The students will look at an enlarged base map of the area together in class. They will discuss additional factors such as sunlight, landforms, drainage, wind and soil. Students will be informed that on day 2 they will take a closer look at the soil and its pH level. If time is remaining, students will be instructed that they will go outside and make a map of the area using one of the methods that was discussed earlier in class. This activity can be used for all grade levels with modification made by the teacher in charge. Working with learning support, I have a variety of age and ability groups. Students from different grade levels will interpret land in map form in different ways. It is more important to allow students to create the map as they see it, rather than trying to get them all to do the same kind of map. (Marilyn Wyzga-Homes for Wildlife). Provide paper with clipboards (A great alternative to clipboards is to have your students cut an 8x13 square from a cardboard box. This can be great for a mini lesson on recycling and reusing materials, students are provided with a rubber band to help hold paper on the "write-upon"). Provide pencils for sketching and tell students that they will have limited time for a rough sketch of their map. Students will return to the class and review some of the properties that they were looking for, physical features, sunlight, water, etc. Instruct students that day 2 will be just as exciting as today. Offer extra credit if students would like to elaborate on their map. Challenge students to see if they can remember all of the properties that may affect the map. Encourage writing about the experience.

On day 2 the students will begin inside. Look at any maps that may have been done for extra credit. Review the properties of the habitat; explain that all habitats need food, water, shelter, and space. Use the student's interpretation to add details to the enlarged base map in the classroom. Take a look at the base map. Did we cover all of the areas? A chart should be displayed for students that list the properties needed for the habitat as a checklist to see if all variables were covered. Students will later create a legend to go with the chart for easier identification. Instruct the student that today is going to be a very active day and we need cooperation to cover everything that needs to be done. Explain to the students that we will be going outside to do three things, measure the space given, collect soil samples, and elaborate on mapmaking techniques. Divide students into groups depending on the size of your class. Six students would be provided with measuring tape and "write-upons" to record the size of the area. These students would measure the whole area, but with a partner, each team would measure a different area (previously staked out by the teacher) rotating to the next so that we have three sets of numbers to compare and validate. Provide another group of six with small film containers and spoons. Instruct these three teams to gather soil from a given area. Break mapmaking groups into four groups of four. One group will be instructed to map the areas that are very sunny and those that are shady. This will provide information when looking at what types of plants to choose for an area. Another group will map vegetation and identify if they are trees, bushes, shrubs, or plants. The third group will map the general form of the land. They will show areas that may have a rise or fall. They will make notes so that the class can decide if this area is unsafe or difficult to maintain. They will also mark areas where water may tend to collect and areas that are usually dry. Are there any natural water sources such as creeks or ponds? The fourth map-making group will identify any physical features that

may be in the habitat. Are there any existing benches, tables, water fountains, and flagpoles? It is important to know if this area gets a lot of traffic that may cause harm to delicate seedlings. How can students prevent others from walking in the flowers? How can they keep them on the path? These open ended probes will be explored along with many other questions that are sure to arise as this unit progresses.

If you have remaining students who have not yet been assigned a project, you may instruct the remaining students to work in small groups to begin developing a legend for the physical properties found in the habitat. Another small group may take charge in developing a legend for the physical property checklist referred to in the earlier part of day 2's lesson. Next have a box provided to deposit maps, soil samples and measurements. Gather the students to the area of the habitat and instruct them to pick up some soil in their hands. Discuss with students how the soil feels as they rub it back and forth between their fingers. Explain that there are three types of soil that we will look more closely at in the classroom. Tell students that this is just an initial soil identification process. Encourage them to determine if the soil feels slick and smooth with little grittiness, if it feels somewhat gritty and sticks together, or does it feel gritty but will not stick together? Instruct students to keep the feel of the soil in mind when going back into the classroom. Have students wash hands to go to their seats. Use the chalkboard or overhead projector to display 3 columns that define the three types of soil and their properties. \*Clay Soil: slick and smooth with little or no grittiness, when dry may have a floury feeling and will form hard persistent clods. \*Sandy Soil: predominately gritty without sticking together will be free of any clods when dry. \* Loamy Soil: moderately gritty soil that will stick together. Loamy soil will have a component that feels like flour, it will have clods that can be sliced cleanly with a shovel (Prairie Nursery-2002 Catalog & Growing Guide). Have students look at the properties that identify the soil types, determine together what type of soil is in our habitat. At this time you may also discuss ways to improve soil especially if it is sandy or clay like. Discuss adding organic matter such as compost and dead leaves; develop a mini lesson to discuss determining what organic matter is and the benefits of using it. Tell the students that in the next lesson they will be looking at the pH balance of the soil. Challenge students to find out what pH is before the next session for extra credit.

Day 3- begins with a quick review of the base map in the classroom. Review yesterday's activities and why they were important. Add additional details to base map. Review the properties of the three types of soil. Review our findings for our soil. Ask students if any one has found out what pH means. Create a pH K-W-L chart on the board; students will list what they know about pH balance, what they want to know, and finally what they have learned about pH balance. Fill in the "What I Know" part first from last night's assignment. Provide additional background knowledge to students using blackboard, overhead or informational poster, which gives the information that states that pH is a measure of acidity or alkaline of a material, liquid or solid. pH is represented on a scale of 0-14 with 7 representing a neutral state. 0 would be the most acidic, and 14 the most alkaline (Project Learning Tree Environmental

Education Activity Guide). What does this mean? Depending on grade level, the definition would be broken down into small definable parts. Once the definition is clear let's make some predictions about our soil. Students will then validate their predictions by taking small samples of soil and working in groups of 4, will utilize the LaMotte Soil Model Kit to test the pH balance of their sample. Students will first observe the teacher using the LaMotts Soil kit before engaging on their own. Students will then continue to work in small groups of four to complete this activity. Students will look at the K-W-L chart and fill in the "What I've Learned" area; they will also take time to ask questions for the "What I Want to Know" section. Students will be encouraged to find the answers to some of the questions as an extra credit assignment.

Day 4- the students will begin the day with a review of the pH K-W-L chart, they will fill in additional sections as knowledge builds and questions arise. Students will engage in activities revolving around pH properties. The students will then work together to create a definition for a garden and a natural habitat. Students will begin a Venn diagram web, which will look at the similarities and the differences between the two. The original definition will be revisited and revised as more information is gathered. Students will spend 2 to 3 class periods researching native plants of western Pa and surrounding areas. They will utilize field guides, hand guides, text books, wildflower catalogues, and they will be given a vast source of Internet resources that they may visit to obtain the information necessary. Students will be given a worksheet with headers that will remind them to look at variables such as: Soil Type, Bloom Time, Sun or Shade, Plant Height, and Planting Time. They will be introduced to the many resources that we have right here in Western Pa such as: The Western Conservancy, Pittsburgh Parks Conservancy, Audubon Society, National Wildlife Federation, Carnegie Library of Pittsburgh, The Botanical Society of Western Pa., and The Phipps Conservatory and Botanical Gardens to name a few. Students may draw pictures of the wildflowers that they have chosen or they may cut pictures from catalogues if there is an excess. (Some nurseries may be able to give you some of their outdated catalogues).

Day Five: Students will spend additional classes categorizing plants using the variable worksheet as a guideline. Students will decide what areas plants should be planted in (sun/shade/soil). Where flowers should be placed in relationship to height, what months do they bloom? Will they plant in the fall or the spring? Students will begin deciding on the bulbs that should order for fall planting.

November

Native Plants:

This segment of the curriculum will also focus on the necessary elements for creating a natural habitat while implementing the standards of science as well as environment and ecology standards. It will also focus in on some of the elements found in the FOSS Curriculum to provide the students with a variety of activities needed to meet the required standards.

**Photosynthesis:** Photosynthesis is the process by which green plants manufacture simple sugars in the presence of sunlight, carbon dioxide and water. Photosynthesis is necessary for plants to survive and to reproduce.

**Day One:** Begin this session with a look at the importance of photosynthesis. Students will look at pictures of plants, they will discuss various parts. Discuss the elements needed for a plants survival such as water, sunlight, and soil. Develop experiments with planting seeds eliminating one of the variables. Compare those plants to seeds planted with all of the necessary variables. Provide students with worksheets to further reinforce the concept of photosynthesis. This will be an on-going project. Students can record data in their science journals, they can state hypothesis, design their experiment, gather, organize, analyze and state a conclusion.

**Day Two:** Students will then take a closer look at the plant species in their area. Explain the differences between trees, bushes, and flowers. Provide students with pictures of native trees, bushes, and flowers. Ask them to distinguish and categorize the chosen plants. Once an understanding of the differences has been assessed, have the students take a closer look at the parts of a plant. Students will dissect a flower and be asked to identify and label the various parts. Students will discuss the purpose of each part of the plant.

**Day Three:** Use the chalkboard or overhead projector to write the words native and non- native. You may use a Venn diagram to show the similarities and the differences of the two species. In the middle you may list such features such as provide beauty, provide oxygen, provide food for birds and insects, provide cover for small mammals, birds, and insects, require the process of photosynthesis, require food, water, and sun to survive. On either side you may want to provide information needed for background knowledge. On the native side, you may write: Plants, trees, and shrubs that have been here in our area since the time of the Native Americans. On the opposite side, you may write: Plants, trees, and shrubs that have been introduced into this country by settlers from other countries. Have students draw a time line showing dates when the Native Americans lived alone in this country continuing on to the time when settlers first started arriving. Display pictures of both native and non-native species, read descriptions, including time frames that the plants were recorded. Have students determine which plants are native and which are non-native. As an extension, have the students research and report on one additional native and one additional non-native plant species. At this time you should discuss the problems that have happened with some non-native species. Discuss the problems with invasive species, explaining that invasive species are species that grow so rapidly that they often overtake an area killing or displacing a native species completely. Most non-natives have no natural enemies so they spread rapidly and take over entire landscapes.

Day 4 and Day 5: Give students the opportunity to research plants that are native to our region and to begin making decisions on what to choose for the school habitat. Provide students with field guides such as A Golden Guide of Trees and Golden Guide of Wildflowers. Students will have access to Internet sites such as The Lady Bird Johnson Wildflower Center, The Pennsylvania Native Plant Society, and National Audubon Society to name a few. An extensive Internet Site listing will be included in the Appendixes. An appendix will also be provided with a listing of local seed resources. Companies that deal mainly with native plants are beginning to grow in popularity; these companies may provide catalogues that the students may use as resources with their research. Students will also have access to the school library for additional resources for their research. Students may earn extra credit by visiting the local neighborhood library to find additional resources. Students will be required to provide specific information about the plant that they are researching. Use your computer skills or utilize a student's skills by creating a chart that the students will be required to fill in. These are the headings for each column: Name of Flower, color, height, bloom time, and native, non-native. Students can then refer back to the maps of the habitat and chose flowers that are compatible to sun as well as those compatible to shade. Discuss why taller plants might do better as background plants, talk about why having plants that bloom at different times would be beneficial. Students may then use the information that they have researched as well as a copy of the area map to create their own individual "ideal" habitat. These habitats may be displayed until later in the year when they will be revisited. Students will then be required to apply the knowledge acquired through research to an actual implementation of a project that will result in the beginning stages of a natural habitat.

This unit of the curriculum as well as most units has been set up as a week's lesson. All of the components of this unit may be modified to fit any time schedule. You may elaborate or expand as much as you desire. You may choose to spread these units out by devoting a particular day each week to work on your project. However you decide to implement this unit, these units will provide you with a baseline and additional resources to be successful.

December

Identifying and developing a habitat:

Discuss with the students all of the steps that you have followed thus far to create your Habitat. Brainstorm the activities that have been done up until this point. (Mapping, soil Samples, native flowers identification.) Tell students that these are all necessary steps to begin the creation of a native habitat. But what is a habitat? Write the word habitat on the board and brainstorm some things that are needed to have a habitat. Provide students with the definition of a habitat. Provide definitions of other vocabulary words that they will need to gain an understanding of as the growth of the habitat continues. The following words will be necessary for the students to have as part of their vocabulary and background knowledge. A list of these words with their definitions will be listed in the appendix at the end. The words to know are: habitat, environment, ecosystem, native, non-native, invasive, biodiversity and niches, Talk to the students about the fact that to have a successful habitat it must provide four essential elements. Have the students think about the things that they need to survive. Can these be

the same needs as the animals and creatures of a habitat? Identify the four elements as food, water, shelter, and space to raise their young. Have the students take a look out of the window. First distinguish the variables that will change according to the seasons. Now during winter, there may be more of a need of one element than another. How might these needs change in the spring? In the summer? Look at the vegetation and trees that already exist. Do these sources offer food? Cover? Is water being provided? Is there space enough for many species to live together comfortably? Have the students identify the elements and determine what areas may need supplementing.

Student may determine that food may be a limiting factor in the winter. They may feel that additional shelter is needed because of the winter landscape and lack of cover. Provide students with a variety of bird feeder models. Students may use plastic jugs along with coat hangers to produce one bird feeder, they may wish to make platform feeders, or simple pinecone with peanut butter rolled in seeds. A wide variety of bird feeders and birdhouses can be found on the web from Classroom Feeder Watch Activities that allow students to observe bird behavior and migration patterns are also available on this site. More information may be found in the appendix.

Remind students to put seed on the ground as well as in the feeders. Ground feeders such as the cardinal will visit your habitat if his food is accessible. Make sure that feeders and houses are high enough so that predators are not a threat. Put feeders in places that have protection from the wind and that have a lot of cover nearby.

January

#### *Plants Used as Medicines:*

Western Pennsylvania alone has a vast number of native plants that are very rich in medicinal purposes. This unit will take a look at some of these plants to gain a stronger respect for their importance and need for survival. Students will identify native plants and their medicinal purposes, they will research the many plants that grow here, and they will have the opportunity to ask open probed questions and use their research skills to gather information and record data and state conclusions.

Day One: Display pictures of native wildflowers that have medicinal purposes around the classroom. Provide pictures of plants such as Butterfly weed, Common milkweed, Cardinal flower, Bloodroot, and Black Walnut trees. (A more extensive list can be found by contacting the Frick Nature Reserve.) Have some samples of drugs and ointments from the pharmacy that have been made from these plants. Start off by asking the students what these plants and these items may have in common? Brainstorm ideas on the chalkboard. Explain to student that these plants, as well as many others, are actually used as ingredients to make the medicines that they see. Talk about how these medicines were discovered. Explain that many were discovered by accident by the Native Americans. Many were found as a result of experimentation from the Native Americans. Some trials

resulted in poisonous results and were identified through many trial and error procedures. Talk to the students about how the early Native Americans developed a vast knowledge of native plants. Discuss how they used native plants for food, shelter, and medicine. Explain how important it is for the plants to survive and reproduce to continue to supply the necessary ingredients to make the medicines that we need.

Demonstrate to students the cause and effect of maintaining native wildflowers to provide medicine. One by one begin taking the pictures of the native wildflower down from the board. At the same time remove the ointment or medications that that plant provides. Ask the students what is happening? What will happen if the extinction of these plants really would occur? Ask students to think of some ways to make sure that extinction could be prevented? Ask them to come up with some ways that we ourselves could make a difference. Have students write ideas in their journals. Have students spend remaining class time writing about some ways that they may help.

Day Two and Day Three: Begin the second day by reviewing some of the plants that are used as medicines. Ask students to volunteer their journal writings from the previous day. Record responses on the chalkboard or poster board. Take a look at the responses and ideas to save the wildflowers. Gear students toward a solution that they can take part in. Guide students to the conclusion that we can maintain these very important medicinal plants by planting them in our native habitat. They can go even further, and plant them in their own back yards in the spring.

Provide the students with names of wildflowers. Assign each student a wildflower to look up using the Internet, field guides, library books, and nursery catalogues. Pair learning support students with regular-ed students to work together on research activities. Doctor David Jet from the Frick Nature Reserve is an excellent resource, and has a vast knowledge of plants as medicines. He has graciously offered to give tours at The Frick Nature Center with a 2-week notice. He may also be available to come and speak to the class in the winter months. He is stationed at Frick Woods Nature Reserve on Beechwood Boulevard. His number is (412) 422-6538. Begin research on native plants. Allow students the remainder of this period and the next day as well to complete their research.

Day Four: Begin recording data. Use large pieces of poster board or writing paper to gather information and record the data found. Provide columns such as: \*Name of Plant. (you may wish for students to place or draw a picture of the plant in this column as well.) \* Medicinal Purposes. Provide four to five columns to list medicinal usages since many of these plants are used for many different

illnesses. \*Products that May Contain these Ingredients. This last column may be filled in as an extra credit assignment. You may have the resources to visit a neighborhood pharmacy to look at some of the ingredients listed on the medicine packages. If possible, this would be an enriching experience. Spend the remainder of the class filling in the chart. Take a look at the list, look at all of the medicines that these plants are used for. Discuss the importance of these plants. Discuss the need for these plants.

Day Five: Review the findings from the information gathered from the previous days sessions. Add any additional data that may have been found for extra credit to the chart. Read some definitions of particular plants to the students and see if they can identify the plant source. Allow students to use the chart as a reference. Have students look at their journal writing from day one. What can they add to it now after taking a closer look at these plants and the role that they play in the world of medicine?

An additional activity that may be used as enrichment is to draw an outline of a human figure on a large piece of butcher paper. Have student use their research to place pictures of plants that are designed to help specific areas of the body. For example: Butterfly weed may be placed in the head area because it was used to help fevers and headaches. Hemlock may be placed in the chest area because it helps the lungs, Redbud and Teaberry aid in stomach illness, Pin oak is helpful for gastrointestinal problems, Black walnut is used as a laxative and so on. Have the students record this data and keep it to take with them to the Frick Nature reserve in the spring. There, they can see if their findings are in agreement with the findings of Dr. Jet. They can compare their model of a human to his actual growing representation of the plants that aid our body.

February

### *Habitats in Winter:*

Animals have many different ways of coping and surviving during the winter months. This unit will focus on the variety of ways animals get ready for winter. It will provide students with the information on the variety of techniques that animals instinctively follow.

Day One: Provide students with pictures of animals such as robins, butterflies, and bats. Ask students what they may have in common. Brainstorm ideas on the board. Make columns to separate similarities and differences. Let children brainstorm for a while and then begin to lead them with some clues. Let students know that their guesses have been good, but now you want them to think about how these creatures are similar in the ways that they get ready for the winter months. What do you think they do? Allow discussion, if no one has come up with the word Migration, and then write it on the board. What is migration? Invite students to find the word in the dictionary or to use their computer skills to find the definition in Encarta. Write the definition on the board. Discuss the word; ask

why these animals may migrate? List ideas on the board. Provide books on migration from the library, assign students to work in groups of two or three to find another animal that may migrate. Allow remaining time for research.

Day Two: Quickly review the definition of migration. Add additional animals or insects to the board that the students researched the previous day. Repeat day ones activities only this time display pictures such as bear or a woodchuck. Again Brainstorm, leading students to the word Hibernation. Define word and allow discussion. Provide resources for more hibernating animals. Allow remaining time for research.

Day Three: Look at the two new vocabulary words, ask students to identify the differences between the two. Review hibernation and add additional animals from previous days research. Follow the pattern of the previous days events. Place pictures of animals such as squirrels and chipmunks. Brainstorm, leading to students to the word Gatherers. Define word and discuss. Provide resource for additional animals that gather food to get ready for winter.

Day Four: Review the three methods of winter survival by looking at the growing charts on the board. Explain to students that there is one more way that some animals survive in the winter. Invite students to brainstorm ideas about other survival techniques. Display pictures of animals such as deer, mice, and a fox. If students are unable to come up with the word, write the word Hunter on the board. Explain to students that these animals must hunt for food during the winter. Deer must hunt for shrubs and clover that has not been covered with snow. Mice must hunt for seeds and bits of food found in barns, and people's houses. Fox hunt for mice and other small mammals. You can take a moment here to touch on the concept of the food chain. Explaining the relationship between the mouse and the fox. Again provide resources for additional research of hunters. Allow remaining class time.

Day Five: Record additional data from previous day's research. Review the four methods, talk about instinct. How do these animals know what they should do? How do they know when it's time to fly south or bed down? How do they know when to come back? Provide students time for discussion and reflection. Have the students work with a partner to choose two animals from two different groups. Have students write about their similarities and differences. Invite students to share their responses with the class.

March

### *Signs of Life:*

It may seem in the beginning of March that spring is still very far away. But we know that it is right around the corner. Students will spend the beginning of the month reviewing the native plants used as medicines, they will use computers skills to make signage about the plants and their medicinal relevance. They will venture outdoors as the weather warms to look for plant and animal signs as spring approaches.

### Medicinal Signage:

This activity can be done almost any time after the introduction of plants as medicines, but it is a good activity to build anticipation and interest in the up-coming project while students are still closed inside. Students will have taken the time to decide on the plants that would thrive well in their habitat according to the type of soil and elements of sunlight and wind. They will choose as many medicinal plants possible depending on conditions and budget. If it's budget, students can work on earning money to purchase one or two new plants each year, as this will be an on-going project for years to come. Assign student partners a native plant having medicinal properties. Instruct these students to use the computer to create a signage of the information important to this plant. Students can illustrate or use pictures from catalogue to add to signage. Signage will be laminated and posted to stakes that will later be placed in the habitat to identify the species and educate observers.

### Habitat Search:

Students will explore the grounds in search of signs of habitat life. They will gather information using a Habitat Search Sheet. They will make observations, record data, organize and analysis data.

This activity can take one to two class periods. It should be done frequently through out the remainder of the school year as the habitat changes rapidly at this time of year. Encourage students to make observation on their own and to report findings to the class. Construct areas of butcher paper or poster board to begin listing or drawing pictures about the things found in the habitat, watch the growth and change inside using the charts, and outside as the students begin to spend more time in the creation of the actual habitat.

### *Habitat Search:*

Allow students to venture outdoors provided with a worksheet with the following headings: \*Animal or Sign (Please draw), \*What Does it Eat? \*Where Does it Get Water? \*Where Does It Find Shelter?, \*How Much Space Does It Need? \* List any Unhealthy Conditions, Natural or Man-made. Space should be provided for students to find two animals to gather and record data. Allow students to partner up and explore the habitat. Before coming outdoors, you should have gone over the categories with the students and discussed any questions the students may have had. Also previously review places to look for signs of life. Remind the students to look in the air for high flying or soaring birds and around plants for flying insects. In shrubs or trees for signs of eggs, nests, insects, spiders, snakes, and bird droppings. In crevices of bark for nests, beetles and other small organisms. On leaves, stems, or vines for tree frogs, insects, snails and signs of eating. Students should also be instructed to look among low plants in moss clumps for tiny animals, in grass for signs of matted bedding, or in thickets for signs of rabbits, such as droppings and broken twigs. Students will become more aware of the area right outside their window by learning how to take a closer look. Students will also learn that they can find signs of animals between plants, under rocks and in rotting logs and stumps. Students should always be instructed and reminded that everything that may have been moved for observation must be put back as close as possible to it's original finding. Students must realize that they are now stewards of this land and protectors of all who inhabit it.

April/May

### *Breaking Ground and Planting the Habitat:*

Breaking ground will mean many different things depending on the type of habitat you are creating and the amount of space that you have. Some groups may need to remove invasive species from the property, some may need to remove asphalt. Some groups may wish to prepare raised garden beds, some will have to prepare the soil and remove rocks and large roots. Whatever the job, students and volunteers should be well prepared with proper tools and instructions to have a successful beginning.

Day One and Day Two: Have students prepared to go outside to begin the actual physical labor part of the job. Review the maps made previously of the areas, discuss the elements of the map before beginning. Discuss the types of jobs that need done and assign groups for those tasks. Look at the types of tools that will be necessary to complete the job. Make sure that the students have a full understanding of how to use those tools. Have parent and community volunteers team up with a group of students to act as mentors. Discuss proper lifting techniques to prevent injury. Have students and adults practice lifting with their legs, knees bent, back straight

Begin by marking off the site that you plan to work on. Send students to their assigned jobs of weeding and dead leaf removal. (make sure students have a full knowledge of what poison ivy, oak or sumac looks like so that they may avoid it.) The students will spend about two to three days on this project depending on how much time you can allot to the project. This is something that the whole school can work on together. Older students can pair up with primary or learning support students, jobs of all ranges will be available. The students will also work on removing any large rocks or roots, and they will work on loosening the soil for the upcoming planting. Have the students choose a spot to make a rock pile with the rocks that they dig up. This pile will provide shelter for insects, toads and chipmunks.

Day Three, Four and Five: Begin these days in side with a review of the plants chosen for the habitat. Look at the map of the area and mark the spaces that the plants should be placed. Review the plants that need full sun and those who need shade. Check the map to make sure that the plants are placed properly. Make sure that all plants are clearly marked so that the students place the correct ones in the correct area. Assign groups, review tool usage, make sure students have sunscreen, water, and a first aid kit, plant on!

Once outside, gather the group together and demonstrate the proper planting technique. A hole should be dug the same depth and slightly wider than the container that the plant came in. Demonstrate how to gently remove the plant from its container and how to gently loosen the roots. Pour some water into the hole and place the plant inside. Fill in the hole with the backfill and gently pat down the soil to eliminate large air pockets. Tell the students to form a moat around the plant so that when they water it, the water will stay in the moat and go directly to the plant's root. Once the plants take root and become established, watering will not be as crucial but for now, it is very

important. Remind students to look at their plant instructions to know how far to space their plants as many species have different spacing needs. Set students and parent/community volunteers on their way to planting the habitat.

Now that the flowers and shrubs have been planted, it's time to continue and add and gather data for our observations. Provide students once again with a Habitat Search worksheet and determine if we have met the requirements of providing a healthy habitat. Have we provided food, water, shelter, space? Have we provided a variety of species so that we can help to create a greater biodiversity? Have the students fill in worksheets to later compare to the sheets from March and earlier in the season. Keep these to refer to in the fall when we look again at the changing seasons and how they effect our habitat. Have students also add the changes to the maps that they created in the previous fall. Note the changes and make predictions for the changes to come.

June

#### *How Has Your Garden Grown:*

June is the time to celebrate the culmination of a year-long project that has brought a sense of pride and ownership to our school. There is still a lot of hard work ahead of us. These first years will be crucial in maintaining the habitat. Many factors such as weeds, lack of water, and neglect will quickly turn our habitat back to its original state of overgrowth or nothingness. The students are excited now and we need to keep that excitement and enthusiasm going. Allow students time to wonder around the habitat, invite them to write from the perspective of a bird or a native plant. Encourage students to write poetry in the new setting. Place the medicinal signage in the habitat for everyone to read. Discuss future signage activities with the students for the following year. Students may wish to identify insects or birds through signage, they may wish to add signage to other common native wildflowers. Start to discuss additional plants that they would like to see in the upcoming seasons.

The development of this native habitat has touched on many essential standards across the curriculum. Through this development of ground we can witness a development of the students as well. Not only have they expanded their horizons in the areas of science, social studies, math, communications and language arts, they have also grown in the area of citizenship by learning cooperation, communication, and negotiating skills. They can now demonstrate an understanding of the various roles that they can play as citizens by participating in their school community project. Students can continue to foster those new skills by going one step further in planning an open house or garden party to dedicate the habitat. Work with students on further preparing the habitat. Have students

create field guides of the native flowers to have on display. Display maps and Habitat Searches to show the progression of the habitat. Work on making invitations to send to parents and community volunteers. Invite the Mayor, The Press, and future volunteers. Take this time to make new friends who may be interested in helping with summer maintenance. You can never have too much help. Celebrate! You deserve it!

Note:

Many activities that are related to developing a Native Garden can be found in Environmental Educational Guides such as [Project Learning Tree](#) and [Project Wild](#). These guides have extensive background knowledge and a variety of hands on activities to do with your students at all grade levels. These guides are free but they require some training to ensure proper usage of the books. If your school is interested in having an in- service after school during ESEP time you may contact Ruth Martin at Connelley Administration Center. Ruth is a certified trainer for Project Wild and Project Learning Tree. She would be willing to set something up with your school at your convenience. Ask Ruth about Act 48 credits. You can reach her at (412) 338-8016 or [rmartin1@pghboe.net](mailto:rmartin1@pghboe.net).

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#### Internet sites:

**\*All Hands in the Dirt.** A guide to designing and creating Natural School Ground [www.evergreen.ca](http://www.evergreen.ca) This site provides informational for initiating educational programs, opportunities to get involved and additional resources and links.

## **\*The National Gardening Association's Kid Gardening Page**

<http://www.kidsgardening.com/> This site is great for informing teachers and parents about gardening projects with children. Site includes recommended books for children and adults, grant opportunities, key word curriculum search, and a free on-line newsletter.

## **\*The Wild Ones**

<http://www.thewildones.org/> This site provides curriculum ideas, resource listings, on-line newsletters, and information on classroom research projects.

## **\*Journey North**

<http://www.learner.org/jnorth/> This site offers a free online program in which students can track the spring migration of various animal species. Students share their findings and ideas directly with scientists. This site also provides lesson ideas and online teacher discussions.

## **\*Classroom Feeder Watch**

<http://birdsource.cornell.edu/cfw/> This site offers a program run by Cornell University that allows classrooms to participate in ongoing research projects. Includes curriculum ideas and National Science Education Standard Links. Also includes classroom projects such as making a variety of bird feeders.

## **\*Monarch Watch**

<http://www.monarchwatch.org/> This site offers opportunities for students to participate in research projects with scientist. Learn from the great deal of information about learning about monarchs in the classroom.

## **\*The Lady Bird Johnson Wildflower Center**

<http://www.wildflower.org/> This site offers regional native plant lists, as well as educator kits, which contain plant information. Posters and classroom supplies may be purchased on this site.

## **\*National Wildlife Federation**

[www.nwf.org/habitats](http://www.nwf.org/habitats) This site provides lists of native wildflowers, birds, butterflies, trees, reptiles and amphibians.

## **\*National Audubon Society**

[www.audubon.org/bird](http://www.audubon.org/bird) This site will help identify birds of Pennsylvania and their sounds that they make. Provides bird conservation newsletter, current research, watch list information including Kids Watch list and Watch list Quiz. This site also provides a variety of links.

## **\*The PA Game Commission**

[www.pgc.state.pa.us](http://www.pgc.state.pa.us) This site provides information on state species, identifying native birds, mammals and plants. Also provides endangered and threatened lists and many links.

## **\*US Fish and Wildlife**

<http://birds.fws.gov> This site provides information on schoolyard habitats, resources, and native plants and provides additional links.

## **\*The Pennsylvania Native Plant Society**

<http://www.pawildflower.org>. This site is based in State College and offers a resource for native plants as well as plant sources for ordering seeds and supplies. This site also offers grant information and additional links.

Appendix:

Pittsburgh Public Schools have taken an extensive amount of time to develop standards in all academic areas that are developmentally appropriate for all students K-12. These standards have been developed to give both students and teachers guidelines to strive toward to be proficient in a particular subject area. The standards have been developed for each subject taught, and often times a project may encompass many curriculum areas. This project will do just that. It will cover the very important standards required through the science program along with meeting standards in the area of communications, social studies, and math and citizenship. The standards that will be met are as follows:

### **Science:**

- Standard 1 All students explain how scientific principles of chemical, physical, and biological phenomena have developed and relate to real world situations.
- Standard 2 All students demonstrate knowledge of basic concepts and principles of chemical, physical, biological, and earth sciences.

- Standard 4 All students explain the relationship among science, technology and society.
- Standard 6\* All students develop and apply skills of observation, data collection, analysis pattern recognition, prediction and scientific reasoning in designing and conducting experiments and solving technological problems.
- Standard 7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.
- Standard 8 All students evaluate the impact on current and future life of the development and use of varied energy forms, natural and synthetic materials, and production and processing of food and other agricultural products.
- Standard 9 All students demonstrate basic computer literacy, including word-processing, software application, and the ability to access the global information infrastructure, using current technology

**Math:**

- Standard 1 All students use number, number systems. And equivalent forms  
(Including numbers, words, objects, and graphics) to represent theoretical and practical situations.
- Standard 2 All students compute, measure, and estimate to solve theoretical and practical problems, using appropriate tools, including modern technology such as calculators and computers.
- Standard 4 All students formulate and solve problems and communicate the mathematical processes used and the reason for using them.
- Standard 6 All students evaluate, infer, and draw appropriate conclusions from charts, tables, and graphs, showing the relationship between data and real-world situations.
- Standard 7 All students make decisions and predictions based upon the collection, organization, analysis and interpretation of statistical data and the application of probability.

# Communications:

- Standard 1 All students use effective research and information management skills, including locating primary and secondary sources of information with traditional and emerging library technologies.
- Standard 2 All students read and use a variety of methods to make sense of various kinds of complex texts
- Standard 4 All students write for a variety of purposes, including to narrate, inform, and persuade, in all subject areas.
- Standard 5 All students analyze and make critical judgment about all forms of communication, separating fact from opinion, recognizing propaganda, stereotypes and statements of bias, recognizing inconsistencies and judging the validity of evidence.
- Standard 7 All students listen to and understand complex oral messages and identify the purpose, structure, and use.
- Standard 9 All students communicate appropriately in business, work, and other applied situations.

## ***Citizenship:***

- Standard 4 All students examine and evaluate problems facing citizens in their communities, state, nation and world by incorporating concepts and methods of inquiry of the various social sciences.
- Standard 7 All students demonstrate their skills of communicating, negotiating and cooperating with others.
- Standard 8 All students demonstrate that they can work effectively with others.
- Standard 10 All students demonstrate an understanding of the various roles they can play as citizens through participation in a community service project.