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Third Grade Hands On Science Curriculum

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THIRD GRADE HANDS ON SCIENCE CURRICULUM

Project Report

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by

Douglas Ray Cornwell

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ABSTRACT

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In 2009, Washington State issued a new set of science standards. These new standards focus on building scientific literacy. With the emphasis now on scientific literacy rather than the traditional emphasis on fact memorization, many teachers must now find new ways to teach their science programs that reinforce understanding in science concepts rather than simple fact recollection. A science program that focuses on the constructivist learning philosophy and that offers students "hands on" activities as well as teacher led demonstrations is offered here to fill the role as an example of one of these new programs.

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CHAPTER I

Background of the Project

In 1983, a federal report entitled "A Nation at Risk" was published by Ronald Regan's National Committee in Educational Excellence (NCEE, 1983). This report presented concerns with the current educational field's lack of high standards and strong curriculum (NCEE, 1983). A group of bipartisan southern governors in 1986 responded to this report by coming together to create higher educational standards and decided to administer a federally funded test entitled the National Assessment of Educational Progress (NAEP) (Ravitch, 2005). By 1988, the Untied States Congress formed the National Assessment Governing Board to oversee the NAEP testing program. The following year President George H. W. Bush invited all of the state governors to an educational summit where they created six national educational goals. In the following years both President George H. W. Bush and President Bill Clinton tried unsuccessfully to create a voluntary state testing program (Ravitch, 2005).

President Bush's America 2000 program was set up and funded the creation of voluntary standards and tests (Ravitch, 2005). From this program Washington State created their set of Educational Academic Learning Requirements (EARLs) (OSPI, 2010). Although they were funded and created, congress never authorized any part of America 2000 (Ravitch, 2005).

Bill Clinton campaigned with the idea of forming national set standards and tests. After he was elected, Clinton formed a program entitled Goals 2000. Goals 2000 was passed by congress in 1994. This provided funds for every state to create academic standards and tests (Ravitch, 2005). During Clinton's 1997 State of the Union Address he spoke about forming a voluntary test for fourth grade reading and eighth grade math. The Department of Education spent 50 million dollars to develop these tests. Much like Bush's efforts, these tests were never authorized by Congress (Ravitch, 2005).

As a part of George H.W. Bush's America 2000 Washington State formed their EALRs (OSPI, 2010). These were statewide benchmarks set up to help chart and pace the learning of Washington State students. They outline what skill should be taught each and every year to ensure that all students were receiving a quality education (OSPI, 2010).

To assess these benchmarks Washington legislation put in to place the Washington Assessment of Student Learning test (WASL). The WASL test was administered to students in the fifth, eighth, and tenth grades. These tests were based on the previous year's essential academic learning requirements. At the time, Washington State students were required to pass the reading and writing portions of the WASL in order to graduate. Before being discontinued, Washington State was looking to add the requirement of passing the science portion of the WASL test as a graduation requirement (OSPI, 2010).

In May 2010, Washington State discontinued using its WASL test and required students to take the Measurement of Student Progress test (MSP) in grades three through eight and the High School Proficiency Exam (HSPE) in high school (OSPI, 2010). The science portions of the WASL that were administered in fifth grade were eliminated in the new MSP test and the focus moved to reading and math; however, high school students taking the HSPE will be required to pass a science portion along with reading, math, and writing portions of their test to graduate starting in the year 2013 (OSPI, 2010).

In preparation for these new tests and standards it is important for students of all grades to be meeting grade level expectations in science, preferably with quality science lessons in both private and public schools.

Statement of Problem

Due to financial restraints placed on some private schools it would not be surprising to find that many of these institutions struggle to find affordable quality science curriculums that meet Washington State EALRs. To supplement the MSP, Washington State is going to use the WASL's science portion to assess younger students' science comprehension (OSPI, 2010). At this time, however, private schools are not required to take this portion of the assessment. Because of this, many private schools focus on the core subjects of the MSP test, and they choose to place their financial backing towards these subjects, leaving science as a subject that receives financial and academic consideration after the tested subjects are covered. These situations can lead to problems when the student reaches high school and has to take the HSPE which has a science portion and is mandatory for all Washington State students.

If students are not meeting grade level EALRs then it will be difficult for them to be successful on their state testing. This will lead to poor marks for the schools that these students are enrolled in on the Washington State School Report Card that is issued every year (OSPI, 2010). Also, as these students advance through their academic careers the science teachers in the higher grades are assuming that the students in their classes have a certain amount of base knowledge in the areas they are teaching. Without this base knowledge these students are a step behind their peers

If a school does not have a set curriculum there are problems that might arise. For example, several new teachers may walk into a classroom and find that there is a collection of science lessons. Many new teachers plan their science curriculum just to find out that are repeating science areas that have been taught in previous years. Sometimes they have no lesson in their grade levels set EALRs, and find out that they are covering areas that should be covered in other grades (McClellan & Sneider, 2009). Another problem that comes up is that the science concepts being taught are not diverse enough. They might be teaching the same concept such as life cycles or dinosaurs repeatedly.

Another problem that often arises, especially in some private schools is that many teachers who have been teaching for many years fall into a comfortable area of science that they do not want to move away from. They have developed a science curriculum that they really like, and know how to teach it very well. It is not surprising that they may not want to abandon it for something they might not be as comfortable with. Trying to convince them that they need change their curriculum might not be a very popular idea with senior teachers. Schools need to make sure that their students are receiving an in depth science education that meets all grade level EALRs (NRC, 1996).

Purpose of the Project

The purpose of this project is to offer a third grade science curriculum that revolves around three units that will meet all third grade science EALRs. These lessons will be taught with the Constructivist learning model. They will include a mix of hands on and demonstration labs. These lessons will be created with diverse classrooms in mind. It will also include assessment instructions for all of the units. It will meet the needs of gifted, struggling, multicultural, and socioeconomically diverse students and classrooms.

Significance of the Project

Only one in three tenth graders in Washington State passed the science WASL in 2007 (OSPI, 2010). It is hoped that if elementary schools better align themselves with the state set EALRs, more students will be prepared for the HSPE science assessment. Also, when the new state testing has a science portion, more parents will become more involved with their child's science education. If a school is not aligned with the science EALRs, there may be a major dispute between schools and parents.

If Washington State wants to encourage more of its students to become successful in the subject of science, they need to look at what is happening at the elementary level. This project will meet the needs of private Christian schools who are looking for a plan to put them on the right track to meeting Washington State EALRs. It is also hoped, when in place, it will help the students, parents, and teachers all have a better map to follow to help everyone become more successful.

Limitations of the Project

. The curriculum portion of this project is only written for third grade students in a private Christian school. Also, it only meets Washington State grade level EALRs, and may not fit other states' requirements.

Definitions of Terms

The following terms will be used throughout this project presentation. These educational terms are defined here to help readers understand the text.

Constructivism: "An approach to teaching based on research about how people learn. Many researchers say that each individual "constructs" knowledge rather than receiving it from others. People disagree about how to achieve constructive learning, but many educators believe that students come to understand abstract concepts best through exploration, reasoning, and discussion" (Lexicon of Learning).

Curriculum: "A written plan outlining what students will be taught (a course of study). Curriculum documents often also include detailed directions or suggestions for teaching the content. Curriculum may refer to all the courses offered at a given school, or all the courses offered at a school in a particular area of study. For example, the English curriculum might include English literature, literature, world literature, essay styles, creative writing, business writing, Shakespeare, modern poetry, and the novel. The curriculum of an elementary school usually includes language arts, mathematics, science, social studies, and other subjects" (Lexicon of Learning).

Essential Academic Learning Requirements (EALRs): "Essential Academic Learning Requirements are Washington's content standards and provide broad achievement indicators for the state, districts, schools, and individual students. The EALRs describe the learning standards for Grades K–10 at three benchmark levels; elementary, middle, and high school" (OSPI).

Washington State Assessment of Student Learning (WASL): "The Washington Assessment of Student Learning is a criterion-referenced test that measures students' performance against performance against set standards. The WASL, for example, measures whether students have learned specific skill, concepts, facts, and ideas found in Washington's academic standards (EALRs), not how they have performed against *fellow* Washington students or their peers nationally. By using a combination of multiple-choice, short-answer, and essay question, the WASL allows for a deeper assessment of important skills and knowledge found in the state standards" (OSPI).

Project Overview

Chapter one lays out a number problems that elementary teachers might have when entering a classroom with no set science curriculum or a curriculum that fails to meet Washington EALRs. The purpose of this project is to provide a possible solution for those schools looking for a third grade curriculum that does meet grade level EALRs. Chapter two reviews literature as to why these EALRs are in place, and why it is important that schools follow these new guidelines. It also reviews different teaching styles that have been found to be beneficial in teaching elementary science.

CHAPTER II

THE PUSH OF SCIENCE AND MATH EDUCATION THE MID 1900'S

In the early part of the 1900's scientists and engineers were hard at work creating the tools and instruments that would go on to drive science and engineering development throughout the century in the United States (Mukhopadhyay, 2008). Many would argue that scientists and engineers won World War II for the allies (Toppo, 2004). It seemed that America had a world class science education system in place. Although there had been plans made to make improvements, it was not until October 4, 1957 when Russia launched Sputnik that the American science education program got kicked into high gear (Toppo, 2007). This event pushed for major funding towards the United States' math and science programs. The next year, 1958, despite public fears that federal funding in schools might lead to federal control, congress passed the National Defense Education Act (Toppo, 2007). This act pumped a billion dollars into America's schools so that its students could get the education they needed to compete with their Russian peers (Toppo, 2007). This also marked the federal government's entrance into the American educational system (Toppo, 2007).

In the late 1960's through the early 1980's America started seeing a dip in Standardized Aptitude Test (SAT) scores. This reached over a forty point drop in mean scores from 1967 to 1980 in both verbal and math SAT sections (Humanities Indicator, 2007). This drop in score prompted many in the education world to start the move towards education reform.

The National Assessment of Educational Progress

In 1963, the United States' Commissioner of Education felt that America would benefit from a national test that would show the educational progress of its students at a local and state level. At the time many Americans feared that federal intervention in education would weaken the states' ability to run an effective education program that met each state's diverse needs. In response to this, the plan was altered to just be a general national sampling rather than a wide spread test for all students. The NAEP became this test. Although it started from private funding, by 1971 it was fully supported by the federal government. The NAEP began regularly testing different grades at various public schools to chart America's schools progress towards meeting its goal. Then they released a report detailing the data that they received. This report is most commonly known as the "Nation's Report Card" (HSLDA, 2002).

"A Nation at Risk" and Education Reform in the Late 1900's

In 1983, a federal report was released by the National Committee on Excellence in Education (NCEE) to then President Ronald Reagan. This committee was an eighteen member panel made up of educators as well as professionals from the private and public sectors (NCEE, 1983). The report was entitled "A Nation at Risk: The Improvement for Educational Reform." The risk that the report spoke of was what they saw as major flaws in the United States' educational system, and what they felt would happen to America if it failed to keep up with other global powers in educating their children. The committee cited many lacking areas within America's educational system. Among these criticisms the committee found two of the main flaws were the lack of strong proven curriculums and high educational standards for students (NCEE, 1983). Another rather large issue facing America as laid out by the committee was the continual drop in SAT scores seen through the later part of the sixties through the early eighties. The report cited the fact that at that time verbal scores had sunk over fifty points and mathematics had dropped by forty points on average. The authors of "A Nation at Risk" went on to make thirty eight recommendations that covered five major areas in need of improvement. Those areas were fiscal support, content, time, teaching, and standards and expectations (NCEE, 1983).

In 1986, a group of bipartisan southern governors including Bill Clinton, democrat from Arkansas, Jim Hunt, democrat from North Carolina, Richard Riley, democrat from South Carolina, and Lamar Alexander, republican from Tennessee, in response to the report decided to take steps to improve their states' educational systems by taking under consideration the areas of improvement that the National Committee in Educational Excellence suggested. These governors set out to create their own set of educational standards. They chose to test their students in order to track their states' progress towards reaching these new goals. They agreed to use the National Assessment of Educational Progress (NAEP), a federally funded test to chart their students' progress towards meeting their standards and maintaining educational progress (Ravitch, 2005). From this group of governors came a set of influential men who would go on to further shape America's educational system for many years.

The Charlottesville Education Summit and America 2000

In September 1989, newly elected President George H. W. Bush held a summit where he met with the National Governors' Association, which was made up of the fifty state governors, in Charlottesville, Virginia to discuss ways of improving America's educational system (Ravitch, 2005). After seeing the success that many of the southern states were having after responding to the suggestions made in "A Nation at Risk," President George H. W. Bush and the other governors chose to form the National Education Goals Panel. They went on to construct six goals for America's students that were later added to by congress to make eight total federal education goals for all American students (Ravitch, 2005). Five months later the National Education Goals were released to the public.

These goals stated that by the year 2000:

1. All students will start school ready to learn.
2. The high school graduation rate will rise to at least ninety percent.
3. All students will become competent in challenging subject matter.
4. Teachers will have the knowledge and skills that they need.
5. U.S. schools will be first in mathematic and scientific achievements.
6. Every adult in America will be literate.
7. School will be safe, disciplined, and free of guns, drugs, and alcohol.
8. Schools will promote parental involvement and participation (NCREL, n.d.).

These eight goals were meant to push America's students to the front of global education. In July 1990, the President announced they would be releasing an annual report on the progress of the nation and states toward meeting the eight goals. This program was entitled America 2000, and although funded and fairly well supported the congress never authorized any part of it. Many states used the standards created to help support and focus their state's educational plan (Ravitch, 2005). In 1991, President George H. W. Bush named Lamar Alexander, one of the southern governors who pushed for education reform and goals, his Secretary of Education. He continued to fight for reform until the end of his term with President Bush in 1993 (Ravitch, 2005).

Goals 2000

Two more of the southern Governors who pushed for education reform went on to continue to shape education reform policy. Bill Clinton, the democratic governor from Arkansas, went on to win the Presidency in 1993. He appointed another governor from their small group to be his Secretary of Education. He chose Richard Riley, the democratic governor from South Carolina, to continue to help push their national goals forward into the future with the guidance of the National Education Goals Panel. Riley made a few changes to the already established set of goals that had been created, but kept much of it the same as America 2000 (Robinson, & Schwartz, 2000). Riley's updates to the goals were as follows,

By the year 2000:

1. All children will start school ready to learn.
2. The high school graduation rate will increase to at least ninety percent.
3. All student will leave grade four, eight, and twelve, having demonstrated competency over challenging subject matter including English, mathematics, science, foreign language, civics and government, economics, the arts, history, and geography, and every school in America will ensure that all students learn to use their minds well, so they may

be prepared for responsible citizenship, further learning, and productive employment in our nation's modern economy.

4. United States will be first in the world in mathematic and science achievement.

5. Every American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

6. Every school in the United States will be free of drugs, violence, and unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning.

7. The nations teaching force will have access to programs for continued improvement of their professional skills and the opportunity to acquire knowledge and skills needed to instruct and prepare all American students for the next century.

8. Every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children (NCREL, n.d.).

Another part of this act would have made funds available for states to create their own sets of standards and funding for tests, but like America 2000 his efforts were turned down by congress (Ravitch, 2005). By keeping much of the responsibility for education reform at the state level and by not departing too drastically from the last administrations education plan Riley hoped to please both democrats and republicans and win congress's support (Robinson, & Schwartz, 2000). Unfortunately, like America 2000, Goals 2000 was never passed through congress (Ravitch, 2005).

No Child Left Behind

In 2001, President George W. Bush signed the bipartisan No Child Left Behind education reform act (NCLB) (Ravitch, 2005). Along with President George W. Bush, Massachusetts' democratic Senator Ted Kennedy had a large part in guiding NCLB through congress. A main focus of this legislation was standards based education reform. It was the focus of this act to set high academic standards and produce measurable goals that would improve America's education system (OSPI, 2010). They did this by having states form their own set of educational standards then requiring an annual test that was administered to measure student achievement and to ensure that all students were obtaining appropriate grade level progress (OSPI, 2010). This was required of all states and it was their responsibility to chart their students' progress and make that information available to the public. All this was done to bring a new level of accountability to America's educational system (Ravitch, 2005).

The National Science Education Standards

In 1996, the Nation Research Council (NRC) published a set of National Science Education Standards. Theses national science standards were a tool to measure the quality in science education (NRC, 1996). They focused mainly on the quality that they found in the following areas: the quality of student performance, the science programs ability to effectively teach students, the level of support programs available to science teachers and programs, and the effectiveness of assessment practices and polices. The vision of this project was to move the United States' science education program and students towards a unified national system that utilized high expectations to increase the level of performance in America's students (NRC, 1996). These standards focused children's science education away from memorizing facts and towards a more inquiry based program where students built knowledge from experiences (NRC, 1996).

There were four principles that guided the development of these standards. These principles are the following:

- Science is for all students.
- Learning science is an active process.
- School science reflects the intellectual and cultural traditions that characterize the practice of contemporary science.
- Improving science education is part of systematic education reform (NRC, 1996, p. 19).

The first principle was of great importance because it implied that all students were capable of being successful science students. Every student should have equal opportunity to become scientifically literate regardless of age, sex, ethnic or social background, or disabilities. Furthermore, no student should be discouraged or excluded from the opportunity to acquire scientific literacy (NRC, 1996). The main idea behind this first principle was that given the chance all students were able to understand science (NRC, 1996).

The second principle states that in order to create successful science learners the students must be active participants in their learning (NRC, 1996). "Learning science is something students do, not something that is done to them" (NRC, 1996, p. 2). This means that students must engage in science mentally and physically to optimize their learning. "Emphasizing active science learning means shifting emphasis away from teacher presenting and covering science topics" (NRC, 1996, p. 20). This is accomplished through inquiry based projects and investigations that utilizes teacher instruction and peer driven exercises to create new knowledge and bridge prior knowledge (NRC, 1996).

The third principle lays out the ground work for students to truly identify what exactly science is and how it is used. It also creates boundaries to what science does not do. It also helps students see how science interacts in the natural world around them and how it contributes to their culture (NRC, 1996).

The fourth principle points out the need for national, state, and local initiatives to complement each other, and includes a wide range of science education components. These components should include student, teachers, parent, schools, textbooks, teacher support programs, college and universities, scientists, businesses, and legislators (NRC, 1996). Only after considering the entire scope of science will any true and lasting reform be possible.

From these principles the national standards were formed. The council then constructed four underlying goals that they wanted students to achieve after utilizing the standards. They are as follows,

School science programs should educate students to be able to:

- experience the richness and excitement of knowing about and understanding the natural world;
- use appropriate scientific process and principles in making personal decisions;

- engage intelligently in public discourse and debate about matters of scientific and technological concern; and
- increase their economic productivity through the use of knowledge, understanding and skills of the scientifically literate person in their careers (NRC,1996)

These goals define a scientific literate public (NRC, 1996). "Scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. It also includes specific types of abilities" (NRC, 1996, p. 22). By utilizing scientific literacy it is hoped that individuals will be able to see and solve scientific questions that they see around them in everyday life (NRC, 1996).

With these principles and goals in mind in 1996 the National Research Council created the National Science Education standards. The first set of standards dealing with the teaching of science and how it should be approached.

Teaching Standard A:

Teachers of science plan an inquiry-based science program for their students. In doing this teachers:

- Develop a framework of year-long and short term goals for students.
- Select science content and adapt and design curricula to meet the interest, knowledge, understanding, abilities, and experiences of students.
- Select teaching and assessment strategies that support the development of student understanding and nurture a community of science learners.

- Work together as colleagues with in and across disciplines and grade levels" (NRC, 1996, p. 30).

Teaching Standard B:

Teachers of science guide and facilitate learning. In doing this teachers:

- Focus and support inquiries while interacting with students.
- Orchestrate discourse among students about scientific ideas.
- Challenge student to accept and share responsibility for their own learning.
- Recognize and respond to student diversity and encourage all students to participate fully in science learning.
- Encourage and model the skills of scientific inquiry, as well as the curiosity, openness to new ideas and data, and skepticism that characterize science" (NRC, 1996, p. 32).

Teaching Standard C:

Teachers of science engage in ongoing assessment of their teaching and of student learning. In doing this teachers:

- Use multiple methods and systematically gather data about student understanding and ability.
- Analyze assessment data to guide teaching.
- Guide students in self assessment.
- Use data, observations of teaching, and interactions with colleagues to reflect

on and improve teaching practice.

- Use student data, observations of teaching, and interactions with colleagues to report student achievement and opportunities to learn to student, teachers, parents, policy makers and the general public (NRC, 1996, p. 37-38).

Teaching Standard D:

Teacher of science design and manage learning environments that provide student with the time, space, and resources needed for learning science. In doing this teachers:

- Structure the time available so that students are able to engage in extended investigations.
- Create a setting for student work that is that is flexible and supportive of science inquiry.
- Ensure a safe working environment.
- Make available science tools, materials, media, and technological resources accessible to students.
- Identify and use resources outside of school.
- Engage student in designing the learning environment (NRC, 1996, p. 43).

Teaching Standard E:

Teachers of science develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning. In doing this teachers:

- Display and demand respect for diverse ideas, skills, and experiences of all students.
- Enable students to have a significant voice in decisions about the content and context of their work and require students to take responsibility for the learning of all members in the community.
- Nurture collaboration among students.
- Structure and facilitate ongoing formal and informal discussion based on shared understanding of rules of scientific discourse.
- Model and emphasize the skills, attitude, and value of scientific inquiry (NRC, 1996, p. 45-46).

Teaching Standard F:

Teacher of science actively participate in the ongoing planning and development of the school science program. In doing this teachers:

- Plan and develop the school science program.
- Participate in the decisions concerning the allocation of time and other resources to the science program.
- Participate fully in the planning and implementing professional growth and development strategies for themselves and their colleagues (NRC, 1996, p. 51)

In addition to these the NRC has also published five other sets of standards that covered many aspects of science educational programs including professional development for science teachers, assessment in science education, science content, science education programs, and science education systems (NRC, 1996). It was through the use of all of these standards together that the NRC felt the United State's science students and science programs would move America to be leaders in the world and would help shape a generation of scientific minds. It was also hoped that every American would have stronger scientific literacy skills (NRC, 1996).

The American Association for the Advancement of Science and Project 2061

Another group that was a large influence on the National Science Standards, scientific literacy, and science education reform is a group known as the American Association for the Advancement of Science (AAAS) (Caldwell& Kopal, 2004). This group was a collaboration of scientists, mathematicians, and technologists. They saw many flaws in American kindergarten through twelfth grade science and math curriculums. One area of improvement that they saw as being critical to good science education was the need for quality science text books. Members of Project 2061 continually evaluate math and science text books in order to see varying quality of school materials (AAAS, 1989). In 1989, Project 2061 members of the AAAS came together and created a book called *Science for All Americans*. One of the focuses of this book was to simplify scientific language and present it in a way that was relevant to students' lives. *Science for All Americans* closely adheres to the National Science Education Standards. Many see this book as the cornerstone of science education reform (Project2061, 2010).

"Project 2061 began its work in 1985—the year Halley's Comet passed near Earth. Children who were just starting school then will see the return of the Comet. What scientific and technological changes will they also see in their lifetime? How can today's education prepare them to make sense of how the world works; to think critically and independently; and to lead interesting, responsible, and productive lives in a culture increasingly shaped by science and technology?" (Project2061, 2010, para).

Washington State Academic Standards and Testing

During George H. W. Bush's America 2000 program, Washington State published its first set of Essential Academic Learning Requirements (EALRs). These were a set of learning benchmarks that detailed where Washington State students should be at the end of each academic year (OSPI, 2010). Piloted in the late 1990's, Washington State released the first Washington State Assessment of Student Learning (WASL) test to chart progress being made in the different academic fields by testing students on their mastery of the EALRs. It was also hoped to help improve teachers' ability to meet their students' academic needs (OSPI, 2010).

In 2001, in order to meet the requirement of NCLB's state testing, Washington State made some adjustments to the WASL, so it could fill the role of that mandatory state exam (OSPI, 2010). Washington State continued to make adjustments to its EALRs and WASL test to try to better meet the needs of students and more accurately assess them. The next set of revisions for the WASL came when it was trying to be expanded to test other subjects such as science (OSPI, 2010). After many years of struggling to make the WASL a successful gauge of student learning, in 2010 it was discontinued (OSPI, 2010). It has sense been replaced by two separate tests. At the high school level it has been replaced with the High School Proficiency Exam (HSPE), and in the elementary level with the Measurement of Student Progress test (MSP). The current MSP test does not offer a science portion, so the state has decided to keep the elementary science portion of the WASL as the states' measuring tool for that subject (OSPI, 2010).

Washington State Science EALRs

In June 2009, Washington State's office of public instruction released a new set of science standards. The new science EALRs were changed to reflect the science community shift towards scientific literacy (McCellan & Sneider, 2009). In years past the science EALRs were written in a way that laid out what basic facts were to be presented to students and what grade level they should be introduced. The new EARLs were presented in a way that outlines what general science concept they are addressing then goes on to state content standards and performance expectations (McCellan & Sneider, 2009). The content standards lay out what the students should gain mentally and understand after the material has been presented. The performance expectation lays out what the student should then be able to do physically in support of their science knowledge (McCellan & Sneider, 2009). For example, if the general science concept is the solar system an example of a content standard may be that a student should understand that there are eight planets that orbit the sun, and a performance expectation might be that the student will be able to name all eight planets in order starting with the planet closest to the sun and continue out until they reach the furthest planet from the sun.

Throughout these new standards it is easy to see the influence from the NRC's

National Science Education Standards and Project 2061. This is very apparent while reading the new criteria that Washington State has put into place in forming these new science standards. First they have stated that all standards must be essential to keep the standard to a manageable size that meets the need of their students without weighing them down with too many ideas (McCellan & Sneider, 2009). The hope is that the students will attain a deeper knowledge of the essential concepts. Next, the standards must be clear to the learner (McCellan & Sneider, 2009). It should be presented in a way that does not entirely rely on scientific vocabulary. This mirrors much of the thought process that is present in National Science Education Standards and *Science for All Americans*. By reducing unnecessary science vocabulary that may be difficult for students to understand and placing the focus on key science concepts it makes the subject matter easy for all students to grasp (McCellan & Sneider, 2009). Also, one of the new criteria is that the standards should be specific that students will know what they should be learning and what they will be expected to do (McCellan & Sneider, 2009). This will help the children better focus on their job as students and recognize where their understanding is lacking and if they may need further explanation in order to accomplish their learning goal. The next criteria is that the standards should be rigorous (McCellan & Sneider, 2009). They should pose a challenge, but they should be appropriate to grade level work and prepare students for the next level of expectations. Lastly, the standards should be relevant (McCellan & Sneider, 2009). This concept once again comes straight from the National Science Education Standards, *Science for All Americans*, and the constructivist education theory in general. Students should see the relevance of what they are learning and how to apply it to their lives in the world around them. Washington Science standards directly cite that this idea is prevalent in the National Science Education Standards (McCellan & Sneider, 2009). This just goes to show what an impact the standards have had on the new state standards. Along with National Science Education Standards, Project 2061 is cited numerous times in the science EALRs (McCellan & Sneider, 2009).

"Hands On" Science Education

In the 1800's there was much debate over science education and how it should be introduced to students (Ruby, 2001). Some experts at the time felt that science education should not be taught until students reached higher grade levels, and primary education should only consist of language arts, reading, and mathematics (Ruby, 2001). Opponents of primary science education at the time argued that by teaching science at an early age students would be deprived of time needed for the core subjects (Ruby, 2001). They also argued that the best way for young minds to acquire and retain knowledge was through memorization (Ruby, 2001). Proponents of primary science education argued that it was important to student development because many science principles related to their every day life. For example, basic health knowledge would help young pupils make wise health decisions, and animal and horticulture would be beneficial to better farming practices (Ruby, 2001).

By the 1900's most educational professionals had made science part of their curriculum; however, regarding the theories on how to approach teaching the subject was very much still a focal point of debate (Ruby, 2001). Most educational professionals believed that lab studies were essential to student understanding (Ruby, 2001). At the secondary level, many incorporated labs to facilitate learning. However, in the primary level, traditional textbook learning was still the commonly used method (Ruby, 2001).

In the mid 1900's many science professionals started promoting the use of the "hands on" approach to teaching scientific concepts to students in younger grades (Ruby, 2001). When talking about "hands on" science, most educators were referring to classroom based scientific exploration, most commonly through observations and based on activities that were performed by students (Ruby, 2001). "Hands on" is mostly used to describe elementary level scientific exploration where many higher level scientific "lab" equipment is not available or safe for younger students to use (Ruby, 2001). One of major focuses of "hands on" science is to make student into a self efficient science learner by having them do much of the experiments on their own (Carter, Carter, & Stottile, 2001). This helps them build knowledge by experiencing the scientific process on their own (Carter, Carter, & Stottile, 2001). This builds self esteem, self reliance, inquiry science skills, general interest in science, and the ability to better understand the scientific process (Carter, Carter, & Stottile, 2001).

In 2001 Carter, Carter, and Stottile, studied a group of middle school students who participated in a set of hands on science projects (Carter, Carter, & Stottile, 2001). They were studying the relationship of hands-on science education and student achievement, student development, and self-efficacy in middle school students (Carter, Carter, & Stottile, 2001). They tested students who had taken part in a hands-on science program that was presented by "Science on Wheels" (Carter, Carter, & Stottile, 2001).

"Science on Wheels" was a program presented by the Toyota Motors company in association with the National Science Teachers Association (NSTA) that provided a traveling hands-on science lab that visited schools and presented lessons (Carter, Carter, & Stottile, 2001). After this program visited a school the students were tested on their understanding of the subjects taught (Carter, Carter, & Stottile, 2001). They found that they had a significantly higher understanding and achieved higher assessment marks. In addition, they had more interest in the subject, and became more active learners (Carter, Carter, & Stottile, 2001). They also found that these learners were better able to verbalize their learning (Carter, Carter, & Stottile, 2001).

The Negative Aspects of a "Hands On" Science Curriculum and Possible Solutions

With this push for "hands on" science learning why aren't more schools switching to this model? There seems to be two main reasons why schools do not adopt these types of programs. The starting of and maintaining a hands-on science program can be of immense cost and time (Rosenquist, Shavelson, & Ruiz-Primo, 2000).

To start a "hands on" program for the first time means purchasing science equipment for individual students and making kits for each area of scientific study. For small districts and private schools where money can be a huge factor in curriculum adoption this can be the coffin nail in instituting hands-on science programs. It should also be noted that many times after the kits are used they must be refilled with items that can not be reused. In contrast, although at the initial purchase science text books are expensive, they can be used year after year without further expense to the school. Many organizations see the positive effect that hands-on types of programs offer, so it is common for these entities to offer grants to schools to make these programs a more feasible option. For example, The Bill and Melinda Gates Foundation offers millions of dollars a year for struggling schools to purchase computer and science equipment (gatesfoundation, 2010). The Gates Foundation is just one of many who actively support elementary science education. Other organizations are the above mentioned Toyota Motor Company which offer the Toyota Tapestry Grant (NSTA, 2010), the MJ Murdock Charitable Trust (murdock-trust, 2010). Schools can find many of these organizations quickly with a simple internet search.

Another reason hands-on programs are often not used has to do with time restraints (Rosenquist, Shavelson, & Ruiz-Primo, 2000). To present "hands on" labs takes up much of the teachers' preparation time. When thinking about the time it takes to set up the equipment before the lesson is taught, the time needed for the students to conduct the experiments, the time it takes to clean up afterwards, and also the time to restock kits after they have been used, it is not surprising to see why some teachers do not care for this style of science curriculum. What teachers need to weigh is the amount of understanding gained from presenting material in a way that builds self constructed knowledge and the extra time needed to facilitate it (Rosenquist, Shavelson, & Ruiz-Primo, 2000). .

One option that may answer both of these problems is the use of computer simulated labs (Rosenquist, Shavelson, & Ruiz-Primo, 2000). Rosenquist, Shavelson, and Ruiz-Primo's 2000 study of computer simulated hands-on labs showed that students still gained higher understanding from the substituted labs however they scored lower than actual hands-on lab activities. They still had a higher understanding than traditionally taught science students (Rosenquist, Shavelson, & Ruiz-Primo, 2000). Also, the elementary subjects did much better than the higher level students on computer simulated labs (Rosenquist, Shavelson, & Ruiz-Primo, 2000). These programs can be purchased once then used again and again. They also eliminate much of the set up , break down, and restock time. Although these simulated labs are not the best science models they seem to be more effective then the traditional text book only curriculums (Rosenquist, Shavelson, & Ruiz-Primo, 2000).

Assessing "Hands On" Curriculum

One issue that many teachers face when presenting "hands on" curriculum is how to effectively assess learning. "Hands on" science is a much different style of teaching compared to traditional text book teacher driven curriculum. In the past assessment traditionally came from paper and pencil tests like multiple choice, short answer, and essay questions. "Hands on" science uses a wider array of skills and higher thought processes, so in order to truly assess the knowledge gained through this system teachers must use assessments that cover a broader range of skills (Alternative Assessment and Technology, 1993).

Performance based assessments are a promising way of assessing complex thinking because they require the learner to verbalize what they have learned as well as demonstrate the processes that they have been studying (Alternative Assessment and Technology, 1993). This style often requires more understanding of a concept than the average paper and pencil tests that are traditionally used (Alternative Assessment and

Technology, 1993). This form of assessment goes beyond just having students recall memorized facts and forces them to understand the process that lies behind those facts (Alternative Assessment and Technology, 1993).

Oral presentations are another way that higher level learning can be demonstrated because once again the students are having to tell the instructor in their own words what they have learned (Alternative Assessment and Technology, 1993). These can also be in paired or small group formats to further promote peer to peer learning styles (Alternative Assessment and Technology, 1993). If one student is struggling with a difficult concept he/she may be able to gain a better understanding if he/she works with a peer who can verbalize his/her thought process using language or examples that he/she understands (Alternative Assessment and Technology, 1993).

As mentioned before, there are a number of computer simulations that have been created to simulate "hands on" science labs (Alternative Assessment and Technology, 1993). These programs often have assessments built into them that actively assess them while they are performing the simulation and assessments after they have completed the program (Alternative Assessment And, 1993).

Portfolio assessments are also a tool that gives the educator a more well rounded grasp of student learning by compiling many different styles of assessment (Alternative Assessment and Technology, 1993). When using this style of assessment teachers can use many types of assessments and chart many different areas of knowledge (Alternative Assessment and Technology, 1993). By testing many different areas of knowledge using different types of tests, educators can more accurately assess how well their students have acquired the skills and information that have been taught (Alternative Assessment and Technology, 1993).

Parental Involvement

Many studies have shown a positive relationship between parental involvement and higher performing students (Sheldon, n.d.). Studies have found that students with families who involve themselves in their education tend to have higher grades and standardized test scores as well as lower drop out rates (Jeynes, 2005). In addition to this, it is the important for teachers to encourage parental involvement in schools and classrooms.

It is important to stress to school families that they have a vital role in their student's education, and their involvement will be a valuable tool to the school and their student's success. They need to know that there are many ways to be involved in their children's education. For example, they may choose to volunteer in the school, become part of the parents club or PTA, they can keep close communication with teachers and staff, or just be active in their student's academics to help find areas of need (Jeynes, 2005).

Many critics of parental involvement suggest that many working class parents will not be able to volunteer in their student's classroom or be proactive in meeting with teachers because they will be working during class time (Sheldon, n.d.). Another common issue with parents volunteering in the classroom is that sometimes there is a language barrier with some parent who may not be fluent in English or may not feel comfortable communicating solely in English (Sheldon, n.d.). This may lead to a lack of diversity, be it socioeconomic or ethnic in parent volunteers which can disadvantage students (Sheldon, n.d.).

One way to remedy this is by creating many ways in which parents can become involved in classroom activities and their student's education. Rather than using a "cookie cutter" parent involvement activity, open it up so that there are many different way to have parent volunteers in class (Sheldon, n.d.). Also by being flexible with scheduling and meeting times can be beneficial to parents who have difficult schedules and want to discuss their student's progress (Sheldon, n.d.). Parents who have difficulty with communication due to language barrier issues may find it helpful to work in groups with parents or students who are bilingual (Parental Involvement In, n.d.).

Having a diverse group of parents participating in classrooms can be a valuable tool to both educators and students (Sheldon, n.d.). This process can provide students with strong role models and real life examples of the positive effects of education (Sheldon, n.d.). Studies have found most students benefit from these types of programs; however, Latino and African American students have been shown to have greater positive effects from parental involvement than other ethnic groups (Jeynes, 2005). This shows that the impact of parental involvement crosses racial, cultural, and ethnic lines, and helps to produce high achieving pupils (Jeynes, 2005).

Multiculturalism

In the NSES, the NRC states the importance for all students regardless of background should feel comfortable and capable in a science classroom (NRC, 1996). The constructivist theory also relies on the belief that in order for students to build knowledge they must make it relevant to their own lives. Students must be taught that there is no one demographic of society that makes up the science community (NRC, 1996).

It is important for science teachers to introduce their students to a broad range of scientists (Multicultural Science Education, n.d.) This includes men and women of different races, belief systems, social backgrounds, and disabilities (Multicultural Science Education, n.d.). Many time students have a preconceived notion that scientists are primarily made up of old white men and many students may feel that science is not an area of study for those outside of this demographic (Madazo, n.d.). This could not be further from the truth. The NRC states that one of the most important underlying factors in student success in science is their understanding that they are indeed scientists (NRC, 1996). One of the major goals of multicultural education is to provide an equal opportunity for all students to learn and to see their future potential (Madazo, n.d.).

Summary

The research shows that science has been an important factor in America's educational system. In addition to this, Washington State has insured that its students will stay on the cutting edge of science education with introduction of its new science standards (McCellan & Sneider, 2009).

Although there are many teaching styles in science education, many professionals are pushing towards the adoption of "hands on" curriculum as being one of the best ways to successfully teach science to young learners. More and more of the science education community is focusing on having students learn the process of science rather than the rote memorization of facts, and it is this new view that will help move American science students into a more competitive role in becoming leaders in the realm of science achievement in the world.

CHAPTER III

BACKGROUND OF PROJECT

In 2009, Washington State released a new set of science standards for its kindergarten through twelfth grade students (McClellan & Sneider, 2009). Students will be routinely tested in science to ensure that they are meeting grade level expectations (OSPI, 2010). It is important that children are being taught the lessons that meet the new standards so that when they are tested they can have a high level of mastery. This project was created for third grade teachers so they have a curriculum that meets the new science standards for their students. Many of the lessons in this project are presented in "hands on" labs where students use their own observations to help them construct knowledge.

Project Development

This project came about when a newly hired third grade teacher entered a classroom where there were no available science texts or organized science curriculum. In addition to this, the former teacher was not meeting state standards, but instead she was teaching science concepts that she was familiar and comfortable with rather than what was expected by the state. In order to remedy this situation the new teacher decided to start fresh and build a science curriculum that met state requirements. Another factor was the fact that there were no available text books and being that the new state standards had a focus toward scientific literacy, the new teacher decided to present the lessons using hands on labs. The new Washington State standards are offered in two year blocks so the new standards were split with the second grade teacher. The science lessons in this project meet all the standards for second and third grade level science EALRs. This project was created to help teachers find a creative "hands on" option for meeting Washington State standards. It was also created to be cost effective for those schools whose budget does not allow much extra funds for science.

Project Implementation

This curriculum was written for third grade students, but with some minor changes may be used in a second grade class as well. The new Washington State science standards are presented in a two grade block. The lesson plans in this project cover all of the second and third grade standards. The second and third grade teachers must split the standards between the two grades, so all concepts will be taught and all standards met. Some of the lessons and units can be taught in a day. Some lessons in this project are stretched out over the course of weeks in one case over the course of many months. It is important that teachers read lessons and plan out their time accordingly. Some of the lessons in this project require the students to recall information that they learned in a previous unit. This will require the teacher to make sure that the students are familiar with vocabulary and concepts from earlier lessons. If the lesson requires information from another unit it will be noted in the procedure portion of the lesson plan. Most of these lessons do require some preparation time, but they have been designed to take a half hour or less to set up. These lessons were also designed to be carried out with little cost to the school or teacher. Most of the materials can be found around an elementary school or purchased for very little and used over repeated years.

CHAPTER IV

DESCRIPTION OF PROJECT

In 2009, Washington State released a new set of state science standards (McClellan & Sneider, 2009). These new standards require teachers to teach concepts that previously were not required in their grade level (McClellan & Sneider, 2009). This will require teachers to reevaluate their science units and make changes so that they meet the new state standards.

This project was created to help teachers find lessons that meet the state standards. The lessons in this project were created to be "hands on" lessons. This means the students will gain knowledge from self-made observations. In addition to this, the students will carry out much of the lab work themselves. This style of learning requires the students to be more than passive components in the learning process. It requires them to use higher level thinking skills that have been shown to increase comprehension, self-efficacy, and interest in science learners (Carter, Carter, & Stottile, 2001).

The new standards are focused more on scientific literacy rather than rote memorization of facts (McClellan & Sneider, 2009). They also contain new performance expectations in addition to content standards (McClellan & Sneider, 2009). All of these standard expectations have been met in this project. The first three science EALRs revolve around application, inquiry, and systems knowledge which help strengthen students' scientific literacy skills (McClellan & Sneider, 2009). They are used as part of the different lessons and not necessarily encompassed as individual lessons; however, one lesson is set aside that directly focuses on student application and inquiry skills. This was done to give the students a deeper understanding of these important skills.

EALR four directly relates to specific content standards. The other lessons in this unit each directly relate to the separate content areas that have been provided in EALR four. Some of these concepts are covered in one lesson while others are stretched over multiple lessons. All of these lessons require students to be active participants in the classroom science discussions.

These lessons, although geared toward third grade students, may be used in a second grade classroom with little or no changes. This was done so that the entire second and third grade shared EALRs could be met through this project. Many lessons in this project use skill from other subjects, such as journaling and art, to help the learner better express their gained knowledge. This is done to help students who may struggle with standard paper and pencil test along with those who are second language learners. It is the author's hope that these lessons will show all students that they can be capable and successful science learners, in addition to building a better understanding of the scientific process.

CHAPTER V

SUMMARY

This project was created for Washington State third grade teachers who are looking for a science curriculum that meets state standards, or are looking for "hands on" lessons to use in their own curriculum. These lessons meet all second and third grade science EALRs. They are presented in a way that challenges students to pull from their own prior knowledge and observations to construct new knowledge. These are "hands on" lessons that were created to help remedy some of the issues that many teachers face when implementing "hands on" science lessons. They are presented in a way that is very low cost, primarily using items that can be found in most elementary schools. They have also been created to have minimal preparation time. At the end of this curriculum the students will have met state standards and be ready for the next year's science EALRs.

Conclusions

At the conclusion of this curriculum, teachers should have a group of students who have met all of the third grade science EALRs. It is hoped that the students will have more confidence and a stronger understanding of the concepts that they have learned because they have participated in these lessons using a higher level thought process. The "hands on" lessons have given the students a much larger role in their learning. It is hoped that by becoming more active learners the students will have a higher level of self-efficacy and more interest in the subject of science. With this new level of confidence, comprehension, self-efficacy, and interest in science the students will go on to be stronger and more successful science learners.

Implications

Some teachers may not be used to presenting lessons with this level of student participation and interaction. It may be hard for them to let go of the reigns a little bit in class discussions. It may be equally hard for them not to readily supply the students with correct answers, rather than letting them come up with it on their own. For many years elementary science was a teacher driven process. With "hands on" science and the scientific literacy movement, the teachers approach must change. This change can be difficult for teachers who have taught for many years using a different style and felt that they have been successful

Another issue for teachers may be the splitting up of the science EALRs. Washington's science EALRs are presented in two grade blocks this means that the second and third grade teachers of the school must agree on which grade levels will address certain EALRs. This may mean that teachers might have to present a science unit that may be difficult for them.

Some student may not be used to being such a large part of their science education. The may be reluctant to participate in class discussions for many reasons. Many students are reluctant to let others know that they are having difficulty understanding something or that they have further questions about a concept. They can sometimes feel that they are the only ones not understanding what is being discussed, so they might keep that to themselves. Also many times students will be afraid of giving the wrong answer, and rather than contributing and being embarrassed they do not participate at all.

Recommendations

If a teacher is not used to teaching "hands on" lessons this can be a major change to there classroom. Teachers must allow students to work out difficult problems without supplying the class fast answers. One of the major components of the constructivist theory and "hands on" learning is having students build knowledge. Part of that is having them figure out tough concepts on their own. It can be hard for teachers to see their students struggling with a concept, but by going through the process of thinking through a problem students build a much stronger understanding than those who have it supplied to them with no thought needed on their part.

Another recommendation for this curriculum is to have the second and third grade teachers plan ahead of time which lessons each grade will introduce. The teachers should do their best to match up lessons the teachers' strengths. A strong line of communication between teaches would also be helpful. If a certain concept did not quite go over as well as anticipated in second grade it may need to be revisited in third. If desired other science concepts can be taught to students these standards are just the ones that the sate requires, but teacher should not feel that these science concepts are the only ones that can be taught in their classrooms. Many students love science and the more they are exposed to it the stronger their interest may become.

When teaching science to students it is important for them to know questioning the world around them is one of the things that make a good scientist. Many students are afraid to admit they do not know something or that they do not understand something. Science learners should know that is the beginning of the scientific process. There are things in the world that people do not understand and scientist work to find an answer. They should also know that even if they have the wrong answer, that information is important to the scientific process. Science teacher should work hard to encourage students to share their thoughts, and they should ensure an environment that is a comfortable place to exchange ideas. By making the students less worried about being embarrassed or ostracized for providing a wrong answer, it will encourage stronger more productive class discussions. With stronger student participation and interest will hopefully create more successful science students

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APPENDIX

THIRD GRADE HANDS ON SCIENCE CURRICULUM

By

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May 2010

TABLE OF CONTENTS

LESSONS PAGE

Introduction to the Curriculum

The follow lessons were created to meet the 2009 Washington State Science EALRs. They include all of the second and third grade standards. Teachers who are interested in incorporating these lessons into their classrooms will need to split these lessons between second and third grade faculty. Although they were created for third grade students, many if not all these lesson could be used in a second grade classroom with little or no adaptations. These lessons are presented in "hands on" labs and guided classroom discussions. They have been written in a way that require little preparation time and minimal cost to teachers. All of the lessons include an assessment section. Many of these lessons require the teacher to actively include all students in classroom discussion in order to properly assess them. It is hoped that by using these lessons students will achieve a higher understanding of knowledge through self-made observations, "hands on" labs, and meaningful classroom discussions.

Force Makes Things Move

Third Grade

EALR 4: Physical Science

Big Idea: Force and Motion

Core Content: Force Makes Things Move

Standards:

PS1A: Motion can be described as a change in position over a period of time.

PS1B: There is always a force involved when something starts moving or changes its speed or direction of motion.

PS1C: A greater force can make an object move faster and farther.

PS1D: The relative strength of two forces can be compared by observing the difference in how they move a common object.

Performance Expectations:

- Give an example to illustrate motion as a change in position over a period of time.
- Identify the force that starts something moving or changes its speed or direction of motion.
- Give examples to illustrate that a greater force can make an object move faster than a lesser force.
- Measure and compare the distances moved by an object.

Unit Materials:

Balloons, paper, pencil, hockey stick, tennis ball, tether ball

Procedure:

There are three lessons in this unit that will help students understand the concept of force and the understanding that force cause things to start move, change direction, or change speed. These lessons are presented over the course of three days.

Lesson One "Pushing and Pulling":

The teacher should start by having students move their desk off to the side of the room sit in a circle. They should then take a tennis ball and roll it across the floor to one of the students then have them roll it to another student and have them keep the ball moving. During this time the teacher can introduce the term motion as being a change in position over time. An example can be pointing out that the ball was here a second ago, and now it's over there. After a while ask them how did the ball get from "student A" to "student B." Then call on a student to answer. Most likely the student will answer "student A" rolled the ball to "student B." The teacher should agree with the students and add that the ball was pushed from one person to the other. Then stop the students from rolling the ball and place the tether ball in the circle. The teacher then asks the students about ways to move this ball from person to person. The teacher should then wait for someone to suggest pulling the ball by the string. If no students offer this answer the teacher should suggest it. At this time the teacher should introduce the term force, being the pushing or pulling of an object.

Now the teacher places a ball in the middle of the circle and asks how they can move the ball without pushing or pulling on it. Many time students will try strategies like blowing on it, but it should be pointed out to them that the air they are blowing out is pushing on the ball.

Next, the teacher should have the students move their seats back and take their seats. Now the student should be introduced to the idea that all motion is caused by an object either being pulled or pushed by. Have a student stand up and walk across the room and have the kids recognize the parts of the student's body that are pushing them forward. Then teacher can lead the class in a short discussion other objects and how their movement is caused by a push or a pull. Examples can include cars, animals, sports equipment, and so on. When the teacher is satisfied with the responses they can end the discussion.

Lesson Two: "Changing Direction and Speeding Up":

The teacher should start by leading a short review of what the student learned in the previous lesson. They should stress that force is what makes objects move. The teacher then brings out a hockey stick and a tennis ball and slaps the ball forward. This demonstrates how the ball is being pushed by the stick. The teacher should then go on to explain that force can also change the direction of an object. This can be demonstrated by batting the ball back and forth from side to side.

The teacher then asks the kids if they wanted to shoot the ball at a goal during a game how would they want to do it. Take suggestions until a student offers they would hit the ball so it travels quickly or that they would hit it hard. The teacher would then go on to tell them that force is also refers to how hard they are pushing or pulling an object. The more force they put on an object will affect how fast it will move. Then the teacher can slap the ball with the stick with a lot of force pushing it quickly across the room. Although this demonstration used a hockey stick teachers could use many different types of sports equipment that are usually found in schools. For example, a soccer ball, a basketball, and so on.

Lesson Three: "Balloons Around The Room":

The teacher should prepare the room by placing balloons on each student's desk. Have the students blow up their balloons. When they have all done that then they should be instructed to let their balloons go. The balloons should fly around the room. The teachers then have them get out a piece of paper. The teacher should lead a short discussion about what they have already learned in their previous lessons. After they have reviewed the students are then asked if force is what makes things move then what pushed or pulled their balloons around the room. The teacher should take some ideas from the class. If the class is struggling to explain what they are observing, have them blow up their balloons again and this time rather than letting them sail around the room have them place their hands by the opening of the balloons so they can feel the air pushing out. Then the teacher should restate the question and see if the students can then answer. The teacher should then ask the students to blow up their balloons again and have them let the balloons go. This time after they are finished have the student draw what they observed using arrows showing where the balloon was being pushed from.

If the teacher would like to push this lesson further for higher level students they can then go on to ask the students "If the air is moving then what is pushing or pulling the air in the balloon?" If the students are having difficulties answering this question have them take the balloon in their hands and stretch it out. Then have them let go with one of their hands causing the balloon to snap to the other hand and ask them "Why did the balloon snap back like that?" A common answer will be that is stretchy. Then go on to tell them that the same thing happens when they stretch it out with air, the balloon will want to snap back to its original shape.

Another question that can expand this concept is to ask them is they can figure out how to make their balloons travel faster or farther. The teacher should then allow time for them to experiment. After they are done they can share their different ideas. If the students failed to find a way the teacher can demonstrate by blowing up a balloon to a large size then letting it fly around and having the student then attempt to explain why that produced more force.

Assessment:

The teacher should be actively watching and making sure that all of the students are participating in discussions and experiments. In addition the diagram of the students' observations should be collected and assessed to see if the students were able to identify that air was the force that was pushing their balloons.

Weather vs. Climate

Third Grade

EALR 4: Earth and Space Science

Big Idea: Earth Systems, Structures, and Process (ES2)

Core Content: Water and Weather

Science Standards:

ES2C: Weather changes from day-to-day and over the seasons. Weather can be described by measurable quantities, such as temperature and precipitation.

Performance Expectations:

- Measure and record changes in weather.
- Interpret graphs of weather conditions to describe with measurements how weather changes from season to season.

Materials:

Paper, graph paper, pencil, white board, ruler, 2 liter bottle, paper clips outdoor thermometer, graduated cylinder

Procedure:

For this lab the teacher will need to keep a running record of rain fall and temperature readings for many months. It is suggested that they start this lab at the beginning of fall and continue it until the later part of the school year. This lab should be updated daily and if possible at the same time every day to ensure accuracy. This means that the teacher will be responsible for collecting data on weekends and holidays.

Part One: Building a Rain Gauge

At the beginning of the year the teacher should tell the students that this year they will be studying weather and climate. This means the class will need to take daily measurements to help chart the weather. Then have the students give examples of different types of weather and record them on the front board. These should include examples of precipitation. The teacher should then circle those examples and introduce the students to the term precipitation. The students should understand that precipitation is water that falls from the clouds in the form of rain, snow, and so on. The teacher then goes on to tell them that in order to be accurate in our observations they will need to measure the precipitation. Ask the class how they might be able to measure the precipitation outside. The teacher then allows the class to give some ideas. Many students will probably suggest using a cup or container to gather rain. The teacher should thank the students for their input.

The instructor now should introduce the class to the idea of a rain gauge. Take out a two liter bottle and carefully cut around the part of the bottle where it has a consistent diameter. Then flip the top of the bottle upside down and place it in the bottom part of the bottle. Then using paper clips attach the two parts together. Now that the rain gauge is assembled the teacher demonstrates how the water is caught inside the bottle top half and funneled in to the lower portion. Then the students are shown how to take the top part off and use it as a funnel to pour the water into a graduated cylinder so it can be measured, and if the students are unfamiliar with how to read a graduated cylinder for measuring purposes that will also have to be demonstrated. Next, the teacher takes the class outside to find a proper place for the rain gauge, where it is protected from winds and run off from roofs and other objects explaining why these things might alter their findings. Finally the class must find a place to hang their thermometer so temperature reading can be collected. If the students are not familiar with how to read a thermometer a short lesson will be required.

Part Two: Daily Collections, Averages, and Graphing

For the rest of the school year the teacher should set aside a specific time during the day where the class brings in the rain gauge and records the outside temperature. This information should be kept in a journal by the students. After each data collection the rain gauge should be emptied. Teachers may find it helpful to assign this task as a classroom job. At the beginning of each week the students should find the week's average temperature and record the total inches of precipitation. They should also take this information and chart it on a line graph showing temperature rises and drops.

In the winter, the funnel should be taken off the rain gauge and snow should be collected in the bottle basin and measured with a ruler. These measurements should also be recorded in their journals. The funnel should be refastened in the spring when the rain returns. During these times teachers should encourage the students to make predictions and point out patterns or trends in their findings.

Part Three: Weather and Climate

In the later part of the school year, the teacher should have the students get out their weather journals and graphs. During this time the teacher should again lead a discussion about their findings. The teacher should tell the students that for a long time they have been charting their town's weather, but now using their findings they have the information they need to determine their town's climate. The student should be told that weather made up of day by day conditions. This is like their journal it is a daily occurrence, but climate is like their graphs a whole picture of the town's weather conditions as a whole. One good example might be if they had a friend who was coming to live with them for a year and they wanted to know what kind of clothes they should bring. Should they tell them just to bring shorts because it is hot in the summer? The student should say no because they will be cold when winter comes, and their friend will need a coat and warmer clothes.

Part Four: Climate Brochures

For the final part of this lesson the students will use all the knowledge they have collected in this long lab. The teacher should tell the students that they will be making a climate brochure. Ask the students if they know what a brochure is, and if they are not familiar with the idea of a brochure it should be explained to them. It might also be helpful to have a few available for them to look at. Next, the teacher should have the students get out a piece of copy paper and fold it in half. They need to then hold the paper like it is a greeting card. On the front page of their paper the students write "Fall" and in the top third of that page they should draw a picture of a fall day. On the bottom the students should be instructed to write a description of the common weather in that season as they have recorded their town. They should be told to include information like average temperatures and precipitation information. On the next page they should draw and describe the winter season, and spring season on the next page. For their back page they will need to do some predicting. Remind the students that they have not really graphed the summer months so they will need to predict what the weather will be like in that time period. They can use their graphs and their own personal observations to make these predictions. The students will need to be reminded that each individual page is not the town's climate, but the whole brochure shows the town's climate. When they are done collect the brochures for assessment.

Assessment:

This is a long lab so it is important that the teacher looks at the ongoing data collection to make sure that the students are keeping up and understanding the information. It would be smart to randomly check the students' graphs and journals to make sure they are properly recording their information. Another important part of this lab is to listen closely to the class discussions to gauge the understanding and thought processes in making predictions, and also identifying patterns and trends in the weather. The final piece of this assessment is the brochure. Students should be able to show how the weather changes from season to season, and make a logical prediction for the summer months given their observations.

Casting Shadows

Third Grade

EALR 4: Earth and Space Science

Big Idea: Earth and Space (ES1)

Core Content: Suns Daily Motion

Standard:

ES1A: Outdoor shadows are longest during the morning and evening and shortest during the middle of the day. These changes in the length and direction of an object's shadow indicate the changing position of the Sun during the day.

Performance Assessments:

- Mark the position of shadows cast by a stick over the course of a few hours, and infer how the Sun has moved during that time.
- Observe that the length of shadows is shortest at about noon, and infer that this is because the Sun is highest in the sky (but not directly overhead) at about that time.
- How shadows could be used to tell the time of day.

Materials:

Paper, pencil, clip boards, tape measure, a directional compass, a watch, utility lamp, a field, sunny day

Procedure:

Day 1:

For this lesson teachers must have a flexible time frame because it will require the students to be making scientific observations throughout the day. It also requires two days to complete. This lab will also need to be done on a day that is sunny enough for students to observe shadows. Before the student attempt this lab the teacher must find a place away from the building where the structures shadow will not obstruct the students' shadows.

At the beginning of the day, break the students up into pairs. Then hand out blank papers to every student and have them fold their papers lengthwise then widthwise so that their papers are now sectioned into quadrants. Give the students clip boards so they have something write on and take them out to the field. Using the compass show the student which directions is north and have them all face that direction. Have them spread out so their shadow is flat on the grass and not being cast on some one. Tell the students what time it is and have them write it in the top left quadrant of their paper. The students should also label the sides of the quadrant east and west. Then instruct the students to draw a picture of their partner and to include the sun and its location, and their partner's shadow and its location in that same quadrant. After the students are finished have them take the tape measure and measure their partners shadow and write that measurement next to the shadow in their picture. After the first group has finished the students trade places and the other student repeats the process.

At mid morning take the students out and repeat the process making sure that they are noting any change the position of the sun and the length of their partner's shadow. This time the students should record their observations in the upper right quadrant.

At noon take them out to repeat the process and instead of writing it in one of the quadrants. Have the student flip their paper over and draw a large picture on the back of their papers. Again, have them note sun position, shadow length, and time. Many time students will ask what they should do if they don't see a shadow. Tell them that's a good observation and have them record it for their research.

Repeat this process two more times, once mid afternoon and again at the end of the school day filling their last two quadrants on their papers and have them place them in a safe place because they will be discussing their findings tomorrow.

Day 2:

Ask the students to retrieve their observation notes they created before, and have them team up again with their partners. Then allow the class to mingle and discuss their findings with their peers. After they have had a chance to do so bring the class back together and ask them if they found anything interesting, or any patterns in their observations. Allow students to share their findings and help guide the conversation. Make sure that they are seeing the movement of the sun across the sky from east to west, and relationship between the sun's position and the shadows length and position on the opposite side. It might also be helpful to reinforce that a shadow is created by blocking the path of light. The discussion should also include how the sun dial is used as a tool to determine time by charting the suns movement through shadows. When discussing their noontime observations many might students will say that they do not cast a shadow at noon. Challenge that assumption by asking the students if their shadow is on the opposite side as the sun where would their shadow be if the sun is high above them. Another visual example that can be used is to have the students go out at noon with a sun umbrella. Have them observe to see if the umbrella is casting a shadow. When the teacher is satisfied with the classroom discussion then the assessment can take place.

Assessment:

For this hands-on lab the teacher may want to use a performance assessment. By darkening the room and having pairs of student come forward to the students should be able to recreate their observations by using a utility lamp and their partner. In order to show understanding the students must be able to verbalize the relationship of the lamp to the shadow it casts. They must also be able to show its path and know when the shadow is the shortest. The teacher will most likely need to question student while they are demonstrating their observations. In addition to this teachers will want to collect the students' illustrations to ensure that they did actively participate in the observation process.

Solving Problems

Third Grade

EALR 2: Inquiry

EALR 3: Application

Big Idea: Application (APP), Inquiry (INQ)

Core Content: Solving Problems

Standards:

APPA: Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.

APPB: Scientific ideas and discoveries can be applied to solving problems.

APPC: People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.

APPD: Tools help scientists see more, measure more accurately, and do things that they could not otherwise accomplish.

APPE: Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.

Performance Expectations:

- Design a solution to a simple problem using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.

- Select appropriate tools and materials to meet a goal or solve a specific problem and explain the reason for those choices.
- Give an example in which the application of scientific knowledge helps solve a problem
- Describe a problem that people in different cultures around the world have had to solve and the various ways they have gone about solving that problem
- Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.

Materials:

Basketball hoop, basketball, pencil, papers, various classroom or school items, hammer, pliers, wrench, screwdriver, rain gauge, ruler, thermometer, graduated cylinder

Procedure:

This unit is an exercise in problem solving and making simple tools. It is a multiple day unit that will require space and time for students to test their ideas. Although the materials state that the lesson requires one basketball hoop teachers with larger classes may find it beneficial to have accesses to multiple hoops. This would also be an excellent unit to have parent volunteers help in with supervision. This lesson deals with vocabulary and materials that was taught in the Force and Motion lab and the Weather vs. Climate lab. The teacher must introduce those lessons before teaching this lesson.

Day One:

This day is mainly a discussion day. The students will be introduced to the idea that tools help people solve problems. The teacher gets out a hammer, screwdriver, pliers, and a wrench. They go on to ask the kids if they know what these things are called. They will supply answers like the names of the different tools. The teacher should agree with them and then ask them what other name do all of these things share? Then wait until one of the students offers the word tool as a response. Thank them for their answers then set out a ruler, a graduated cylinder, a thermometer. Ask them if these items are tools? Listen to their responses. Most likely some will answer yes, and some will answer no. They should then be introduced to the concept that tools help people do jobs and solve problems.

Pick up the hammer and ask them what job does this tool do? They will most likely answer that it pounds nails. Then ask them if it is possible to pound nails with a rock? They will probably answer yes. Then the teacher can tell them that a rock can also be used as a tool, but which is better a rock or a hammer for driving nails? They will answer the hammer, so the teacher should then ask, "What makes it a better tool?" The students will probably answer that the hammer is safer, easier to use, and won't break. The teacher can then agree that the hammer is a much better tool for driving nails.

Next the teacher can pick up the thermometer and ask the class if this helps people do a job or solve a problem? Take student responses. If they are having difficulty the teacher can ask them if they know what thermometer does. The students will reply that it tells temperature. The teacher can then go on to point out that chefs need to know how hot their ovens are to cook a meal, so a thermometer is a tool. The teacher can then ask the students if it is possible to see if something is hot with their fingers. The class should respond yes. The teacher then can ask them "Which does a better job helping us determine temperature their fingers or a thermometer?" They will probably answer a thermometer. The teacher should ask them "Why is a thermometer a better tool for reading temperature then their fingers?" Possible answers maybe safety or accuracy.

Then have the students think of other tools that have been invented around the world, examples maybe, bow and arrows, printing press, computers, telescopes, and so on. The student should then be told that people from all around the world have been inventing tool to help them do jobs and solve problems for as long as their have been problems to solve. Allow a short time for question and comments then end the discussion.

Day Two:

Before the students arrive for class the teacher should take a basketball and wedge it between the basketball hoop and backboard. When the students arrive to class the teacher takes them to the basketball hoop and informs them that they have a problem to solve. The teacher shows how the ball is stuck and how he/she can not reach it to get it down. The teacher should then group the student in small groups of three or four. The students then are told that their group will need to develop a tool to get the ball down from the back board using things that can be found around the school. The teacher then takes the students back to their classroom. The teacher should then remind students that in an earlier unit they learned that in order to get something to move they must use some form of force either a push or a pull. Now they should be allowed to start brainstorming ideas of how they can produce force get that ball down using things that can be found around the school. After awhile the teacher should pass out papers and pencils to the groups. The groups should then be instructed to fold their paper in half. On one half of their paper the students should write and sketch what problem they are trying to solve and on the other half they should write and sketch their plan for a tool that will help them solve there problem. Teacher should tell them that it is fine if they have many ideas, because they will test them all tomorrow.

Day Three:

Today is the day where teachers may find it helpful to have some parent volunteers to help them as this is a pretty active day where some extra supervision might be needed. This is the day where students will test their tools. Before the lesson teachers might find it helpful to have the students make a list at the beginning of the day of what materials the students will need for science. Then the teacher can gather those objects during their prep periods so that they will be ready for the students in their science time. In addition, the teacher will want to also have the basketball wedged in between the rim and the backboard on both sides of the rim before the students arrive for science. If the teacher has a large class they may want to do this on multiple rims. When the students arrive they should get back into their groups and they should proceed to test their different ideas. The teacher and any helpers should circulate and observe and ask questions of the students while they are working. The teacher should make sure that everyone is participating and doing so safely. Many common student tools include broom handles, sticks, other sports balls, chairs, and step stools. After the student have had a fair amount of time take them back to class and let them regroup and talk about their results. After they have had some time to discuss their findings have them flip their design paper over from the day before and let them journal their findings for the day.

Day Four:

This day is a sharing and class discussion day. The teacher should have the students get out their paper from the last two days. The students should then be asked what tools they used and how well did they work. Let the students share their observations and opinions. The students could then be asked, "What makes one tool better than another?" Common answers maybe ease of use, quickness, and safety. Another good question maybe, "Would it be helpful to use two of the tool at the same time? For example, a chair and a broom handle." Finally, the teacher may ask them if any of them tested a tool that did not work. If they did have that happen they should be encouraged because in science finding out what doesn't work is helpful in formation in designing their next tool.

Assessment:

The teacher will collect the students drawing and journals for assessment. The journal and drawing page should be complete with a statement of their problem a suggestion for a tool to remedy that problem, and a reflection to their findings. In addition to this the student participation in the class discussion and in the tool testing process should also be considered in the final grading.

The Life of a Superworm

Third Grade

EALR 4: Life Science

Big Idea: Structures and Functions of Living Organisms (LS1)

Core Content: Life Cycles

Standards:

LS1B: Animals have life cycles that include being born; developing into juveniles, adolescents, then adults; reproducing (which begins a new cycle); and eventually dying. The details of the life cycle are different for different animals.

Performance Expectations:

- Describe the life cycle of a common type of animal

Materials:

Zophobas morio larvae (superworm), a container with a lid with air holes, some form of fruit or vegetable, paper, pencil, magnifying glass, heat lamp (optional)

Procedure:

This is a lab where students can observe the life cycle of an insect from the larvae stage through adulthood. The zophobas morio is the scientific name for what is commonly known as the super worm. They are most commonly used as food for pet reptiles. They can be purchased fairly inexpensively at almost any pet shop. If cared for they will eventually turn into darkling beetles. This will be a journaling exercise for the students. The teacher will place the super worms in a container that has a lid with small air holes. Also, the teacher should place a slice of fruit or vegetable in the box for the worms to eat. The worms will also get their moisture from the food. The teacher should have their students fold a piece of paper length wise then width wise and then darken the folds on both sides. Now their paper should have eight squares on it. Have the student observe the super worms with magnifying glasses and every few days they should draw a picture of the worms' growth and body changes and place them in the squares. In less than three weeks the worms will turn into darkling beetles. If the worms are changing slowly the process can be sped up by warming the shelter. The worms survive best if they are kept a 70 to 80 degrees Fahrenheit any warmer or colder then that may slow their growth. A smart place to leave them is by a window where they can be warmed by the sun. After about three week the students should have journaled the super worms growth and life cycle from larvae to adulthood. Weekly classroom discussion should be held during the journaling time period to let the students share their observations. Other discussions can be held as the super worms' bodies change that detail the different changes in appearances that other animals go through in their life cycles. In addition to this the teacher may want to supplement this unit with the reading of *Charlotte's Web* by E.B. White. In that book the author also describes the life cycle of a spider. When the worms have become beetles they can be released into the wild.

Assessment:

The students should be assessed on their journal entries. They should have made observations that show the insects growth noting size and body changes. In addition to their journals, they should have been active participants in classroom discussions and activities.

Energy Cookies

EALR 4: Physical Science

Big Idea: Energy: Transfer, Transformation, and Conservation (PS3)

Core Content: Forms of Energy

Standards:

PS3A: Heat, light, motion, electricity, and sound are all forms of energy.

APPD: Tools help scientists see more, measure more accurately, and do things that they could not otherwise accomplish.

Performance Expectations:

- Use the word energy to explain everyday activities.
- Give examples of different forms of energy as observed in everyday life: light, sound, and motion.
- Explain how light, sound, and motion are all energy.

Materials:

Kitchen area that has a work space and an oven, cookie dough, a rolling pin, cookie sheet, cookie cutter

Procedure:

This lesson will introduce the students to many different forms of energy. It requires an oven to demonstrate heat energy. Some prior arrangements will most likely need to be made to ensure that the class's time in the kitchen will not interfere with an of the kitchen staff's schedules.

Start the class by asking the students if any of them knows what energy is. They will most likely have some answer that involves electricity. The teacher should inform them that they are right, but it is much more than just electricity. They should then be given the concept that energy is the ability to do work. Tell them that energy is all around us in light, sound, motion, heat, and electricity. The teacher should then instruct them that all living things need energy to survive. They should ask the class where humans get their energy. The teacher should then wait until the students provide an answer that involves food. Then the teacher should agree and tell the students that their bodies turn food into energy that they then use to work and play. Next, the students should be asked about where plants get their energy. The teacher should remind them that plants are living things. They have the job of turning carbon dioxide that animals produce into oxygen, and that requires energy. This may be a new concept for them so if they are having difficulty finding the correct answer the teacher may supply it to them. They should know that plants get their energy from the sun and they use that energy to produce oxygen and grow.

Then the teacher can focus on a form of energy that many students may not have thought of before. The teacher should then ask the students how they can tell what other people are saying to them. The teacher should then wait for the students to offer an answer that involves hearing. Then the teacher should ask them, "What does it mean to hear something?" The teacher can then go on to explain how sound waves travel through the air and into their ears. Then the sound waves bounces off of their eardrums making them vibrate, and their brains interpret those vibrations and tell the body what is being said.

Then the teacher may return to they idea of electric energy. Have the students look around the room and identify items in the room that use electric energy. They should then be told that these items use electricity to do many jobs. Also, it can be pointed out that many of these items turn electricity into other forms of energy like light, heat, sound, motion.

Then the teacher should take the class to the kitchen. Then the students should be encouraged to find more items that use electricity and what work the energy is doing. While they are doing this the teacher should get out the cookie dough and the rolling pin. They should then turn on the oven asking the kids what job does an oven use electricity for. They will most likely answer baking or cooking. Then the teacher should ask for volunteers and choose one or two of the students to wash their hand and come forward. They should be asked to take turns and roll out the dough. While they are doing that the teacher should ask the student if the volunteers are doing work. They will answer yes. Then remind the students that they are using energy. Then ask the students if the rolling pin is doing work. They will say yes. Then ask the volunteers to stop rolling out the dough. Then ask the student if the rolling pin is doing work now. Then wait for them to say no. Then ask them well where did the rolling pin get its energy from. The teacher should then wait for a student to offer an answer involving the volunteers. Tell them that they are correct. The volunteer are using motion and that is another form of energy. Then have each student wash their hands and come up and cut out a cookie using the cookie cutter. The teacher should point out that they are using energy to cut out their cookies. Then place all of the cookies on the cookie trays and bake them. Have the students watch the cookies firm up and bake. Inform them that heat is another form of energy. It is baking the dough and making it firmer. When the cookies are done take them out of the oven return to the classroom and serve them. Ask the kids about what their bodies are going to do with the food they are eating. They should know that it will be turned into energy. Agree with them and let them finish eating.

Assessment:

The assessment in this lesson is mostly done through active participation in the classroom discussion and activities because the students will not be turning anything in. The student should be able to answer questions in the discussion and show that they understand the material.

Bean Farmers

EALR 4: Life Science

Big Idea: Structures and Functions of Living Organisms (LS1)

Core Content: Life Cycles

Standards:

LS1A: Plants have life cycles that include sprouting, growing to full size, forming fruits and flowers, shedding seeds (which begins a new cycle), and eventually dying. The details of the life cycle are different for different plants.

Performance Expectations:

- Describe the life cycle of a common type of plant (e.g., the growth of a fast-growing plant from seed to sprout, to adult, to fruits, flowers, and seeds).

Materials:

Bag of dry kidney beans, water, planting cups, potting soil, tray, paper towels, a sunny place area of the class room, paper, pencils, colored pencils, ruler

Procedure:

This will be a multiple week observational lab, where students will be journaling the life cycle of a plant. The teacher will need a sunny window area where the plants can be left safely. It should also be noted that the beans that are purchased for this lab that are not used can be used in later years, but the older the beans are the less likely they will be to germinate.

The teacher should start by passing out a bean to every student. The teacher should then ask the students if they have ever seen this item before. Many of the students will probably know that they are beans because they have eaten them at home. The teacher should then tell the kids that farmers use beans as seeds for their bean crops and the class will be farmers for the next few weeks and they will be growing their own bean plants. Then the teacher can ask the students what thing plants need to grow. The teacher should then listen to responses and they should wait until they have heard answers involving sun light, water, and soil. The teacher should thank them for their answers and proceed to pass out paper towels to each student. Inform them that plants do need sun light, but when they are first planted seeds are usually underground. The teacher should have them fold their paper towels around the bean, and place them on a tray. Then the teacher should demonstrate to the students how to water their bean. They should also tell them that if they over water their bean it can kill the plant. The students should see that the paper towels are damp and not soaking in a puddle. Then the students should then be instructed to get out a piece of paper and fold it lengthwise then again widthwise. They should then open the papers and darken the creases on both sides of the paper. The students should be informed that this will be their plant journal and they will be making entries every few days to chart the growth of their plants. In the top left square, ask the students to draw a picture of what their bean looks like today, and write a short description. This will be the journaling format for the rest of the lab.

Every few days the students should add to their journals about their beans' rooting process noting growth and changes. For the remainder of the lab the beans should be placed in a safe sunny area of the room, and lightly watered everyday. When the beans have sprouted strong roots the teacher should have the class move their beans into planting cups with potting soil. The teacher should have the students make a hole with their finger, insert their beans, and cover them with soil. After they have planted their beans, the cups can be returned to the sunny area of the room. The teacher can also point out that the soil they used is full of nutrients to help feed the seeds. For the next few days the students will not be able to see their beans, and that should be noted in their journals. The teacher can ask the students if this means that their beans are done growing. Have the students discuss what is happening with their plants and what will happen next.

In a few days the beans' stalks should sprout through the soil. For the next few journal entries have the students carefully measure the stalks and note any leaf growth in their journal entries. This is a good time for the teacher to introduce plant vocabulary such as stalks, leafs, and roots. A short discussion of the functions of these parts of the plant would also be beneficial to the students.

After the all the plants have sprouted and the students have had time to journal the process the teacher should then give each student a bean plant and encourage them to plant them in their own gardens. From time to time the teacher should ask the student what happened with their plants. Some plants will probably have died and a discussion can go on to why that happened. Also some of the plants will have lived and those students can be asked about the continued growth of their plants.

Assessment:

The students' journals should be collected and used for proof of knowledge gained by the students. Another part of the assessment should be based on student participation. The student should be able to describe the plants life cycle and growth.

Family Resemblance

Third Grade

EALR 4: Life Science

Big Idea: Biological Evolution (LS3)

Core Content: Variation in Inherited Characteristics

Standards:

LS3A: There are variations among the same kinds of plants and animals.

LS3B: The offspring of a plant or animal closely resembles its parents, but close inspection reveals differences.

Performance Expectations:

- Give examples of variations among individuals of the same kinds of plants and animals within a population
- Compare the offspring of a plant or animal with its parents, listing features that are similar and that are different.

Materials:

Student family pictures, student pet pictures, roses of different colors and size, paper colored pencils, pencils

Procedure:

This lesson will introduce the students to the concept that plants and animals of the same species will share characteristics, and visual differences. A day or two before performing this lesson the students should be asked to bring in family photos and photos of their pets. Some students may not have pets at home, so the teacher may want to have pictures of common pets with varying characteristics for those students.

The teacher should start off by laying out some roses of various colors and sizes. They should ask the students if they know what these flowers are called. Most students will know that they are roses. Then the teacher should ask the question them "If they are all the same flower then why are they all different." For example, some are white, some are yellow, some are large, and some are small. A common response may be that they come in many different sizes and colors. The teacher should agree and point out that even though they are different in many ways they are also share many things that are similar. Then the teacher should have the student find similar characteristics in the roses. For example, some answers may include the characteristics like thorns, stems, petals, scent, and leaves. The teacher should agree and tell the kids that plants, like people, come from a family and they share characteristics, but they are all unique.

Then the teacher should have the students get out their photos of their pets. Then the teacher should group the students by placing them in groups that from the same animal families, for example, students with cats in one area, students with dogs in another area, and so on until they are all in a group. Then the students should be given time to compare pets. The students should look for similarities and differences. After a while the teacher should go around and have each group share their findings. The teacher should ask if any to animals in a family look exactly the same. The student should recognize that even though they look similar, no two animals are exactly the same. Then the teacher should ask the students to return to their desks.

The student should now be instructed to get out their family pictures. The teacher should then have them look at the members of their families and look for common shared traits. They will most likely point out hair color, eye color, freckles, skin color, height, and other easily observed similarities. The teacher should also point out other things that they might share with their parents that are not observable in pictures like personality, sense of humor, and talents. He teacher should then point out that none of their family member look exactly alike even if they are twins and the students should be asked to find differences in their family's appearance. Then teacher should have the students take out a piece of paper. On the paper the teacher should have the students imagine that they are going to have a new brother or sister. The teacher should instruct them draw a picture of how their "new sibling" might look, and have them circle and label traits they may share with their family.

Assessment:

This lesson is assessed in two ways. The students' "new sibling" pictures should be collected. The students should be able to describe some of their family traits that they share. This lesson's should also be assessed on the students' participation. The student should know that they share many characteristics with their parents, but they are not exact copies. They are a combination of both parents and they have unique qualities as well.

Fossil Families

Third Grade

EALR 4: Life Science

Big Idea: Biological Evolution (LS3)

Core Content: Variation of Inherited Characteristics

Standards:

LS3C: Sometimes differences in characteristics give individual plants or animals an advantage in surviving and reproducing.

LS3D: Fossils are often similar to parts of plants or animals that live today.

LS3E: Some fossils are very different from plants and animals that live today.

Performance Expectations:

- Predict how differences in characteristics might help one individual survive better than another.
- Observe fossils and compare them to similar plants or animals that live today.
- Conclude from fossil evidence that once there were species on Earth that are no longer alive.
- Given pictures of animals that are extinct, describe how these animals are different from animals that live today.

Materials:

Pictures of various dinosaurs and fossils, picture of mammoth fossils, picture of an elephant

Procedure:

This is a classroom science discussion that accompanies the "Family Resemblance" lesson. It deals with many of the same concepts and is recommended to be presented after that lesson. This is a discussion and not a lab, so assessment will be based on class participation. It is the responsibility of the teacher to ensure that all students are actively participating in order to gauge understanding. Also the materials require many fossil, dinosaur, and animal pictures. These can be found easily with a web engine search.

The teacher should start this lesson by asking the students if they know of any types of animals that used to be on Earth that are no longer here. The teacher should then wait and listen to responses until they hear an answer about dinosaurs. The teacher should then go on to explain that they are right. The teacher should then ask the class if they know the term for a group of animals that no longer exist. The teacher should then take answers until they hear the term extinct, if the class is struggling to name the correct term the teacher my supply it after a sufficient amount of time has passed. The teacher should go on to tell the kids that man different types of animals have become extinct over the years, not just dinosaurs.

The teacher should then ask the students if they have ever seen or know someone who has seen a real live dinosaur. The students will answer no. Then the teacher should ask "Then how do scientists know that they ever existed?" The students have probably heard of fossils and will offer that as an answer. If they do not know the term fossils and only answer bones then the teacher should supply them that term. The teacher should agree that many sets of fossils have been found all over the world, and these bones tell scientists a lot about the dinosaurs they belonged to. For example, scientist can look at the size of the dinosaurs' bones if they find. If the bone they're looking at is very thick they know that it probably had to support a lot of weight from the dinosaur's body, or it was surrounded by strong muscles. The teacher should then look at their pictures of fossils and dinosaurs to see if they have a picture that illustrates this concept. The most pronounced area where they are likely to find an example of that is in the dinosaurs' legs. Also, scientists look at the dinosaurs' skulls. From those skulls they can tell what that dinosaur ate. If a dinosaur had sharp teeth and a thick jaw bone, scientists know that they most likely ate meat. The teacher should then go on to ask the class why having sharp teeth and a thick jaw would mean that these dinosaurs ate meat. The teacher should then let the class discuss this idea. If they are have a hard time reaching a conclusion the teacher can supply that sharp teeth would help the dinosaur chewing meat and bones and a thick jaw bone suggests that they had strong jaws for crushing bones. The teacher can then go on to tell the students that scientists also found dinosaurs with flat teeth and they could tell that they ate plants because their teeth were perfect for mashing plants. The teacher should then have the students run their tongues over their own teeth and describe what kind of food a scientist might think they eat.

The teacher should now move on to telling the kids that many things have become extinct over the years not just dinosaurs. The teacher should then show them the picture of the mammoths' fossils and ask them what animal do these bones belong too. Some students may already know that they are mammoth bones, but some students may believe that these are elephant bones. The teacher should tell the students that these bones belong to the elephants' great grandpa. The teacher should then show the students a picture of a mammoth. Then the teacher should go on to explain that the mammoth lived long before the elephant, but they are members of the same family. Remind the students that we get many of our traits from our families. The teacher should then go on to have the student identify some similarities between mammoths and elephants. For example they may point out trunks, tusks, large ears, and so on. Then the teacher should point out that even though elephants and mammoths are similar they also have many different traits. Then the teacher should have the students find differences between the mammoths and elephants. For example, they may point out difference in body size, difference in tusk size, amount of hair, and so on. The teacher should point out that the mammoth lived in a time when it was much colder and his hair helped him survive. The teacher should point out that many animals have special traits that help it survive, like the chameleon and its ability to change color or the giraffe and its long neck. The teacher can then have the kids also share some other animal traits that help it survive in the wild.

Assessment:

This lesson is mostly a supplementary discussion to the life science "Family Resemblance" lesson. The through this discussion all of the listed standards and performance expectations will have been meet if all students have been actively engaged in the discussion and participated in the class questions.

Properties of Matter

Third Grade

EALR 4: Physical Science

Big Idea: Matter; Properties and Change (PS2)

Core Content: Properties of Matter

Standards:

PS2A: Objects have properties, including size, weight, hardness, color, shape, texture, and magnetism. Unknown substances can sometimes be identified by their properties.

PS2B: An object may be made from different materials. These materials give the object certain properties.

Performance Expectations:

- List several properties of an object.
- Select one of several objects that best matches a list of properties.
- Sort objects by their functions, shapes, and the materials they are composed of.
- List properties of common materials.
- Compare similar objects made of different materials
- Compare two objects made of the same material but a different shape and identify which of their properties are similar and different.

Materials: brown paper bags, pencil, dry erase pen, white board, cotton ball, golf ball, tennis ball, ceramic plate, paper plate, slips of paper

Procedure:

This lesson will help student look at different objects and identify their properties. For this lesson the teacher should split the class into three groups containing a diverse selection of students. Teacher ahead of time should place the cotton ball, golf ball, and tennis ball into separate brown paper sacks, and staple the bags shut. Then the teacher should pass out one bag to each group and tell them to leave them stapled and that they will be used later.

The teacher should hold up the ceramic plate in front of the class. The teacher should ask the class if they know what the item is. The students should answer a plate. Then the teacher should hold up the paper and ask the students if they know what this item is. The students should then answer a plate again. The teacher should then ask "If they are the same thing why are they so different?" The teacher should then go on to point out many of the differences in the two plates. For example, the ceramic plate is hard and the paper plate is flexible, the paper plate is light and ceramic plate is heavy, and so on. The teacher should go on to tell the class that these two items may share the same name and function, but they have very different properties. The teacher can then define the term properties to the students as a set of characteristics that describe an object. The teacher can then ask the class if the two plates share any properties. Common answers the students might give are size, shape, color and so on.

The teacher should hold up a plastic spoon and a plastic fork, and ask the students to describe the properties. The teacher should allow time for the students to name as many properties as they can. After they are finished the teacher should point out that these items share many of the same properties then ask the students if they perform the same function. The student should see that even though they are made out of similar materials they perform different functions.

The teacher should then hold up a pencil and ask the students to list the different properties the pencil has. The teacher should give the students a chance to share and write their responses on the board. Many of the answers will focus on the wooden shaft of the pencil. After all the students have had a chance to respond the teacher should go down the list to see is each property does indeed describe the pencil. The teacher should also take this time to point out the pencil is made up of different parts and each part has different properties. For example, one answer may be that the pencil is hard. The teacher should show that most of the pencil is hard, but then point to the eraser and show that it is different. It is soft and rubbery. This can be repeated with many of the properties such as color and shape. Then the teacher should ask the class if their properties described the pencil. They should be assured that they did describe the pencil, but this pencil like many things it is made up of many different materials and each material has it own properties.

The teachers should then pass out the slips of paper to each group and have them open their bags. The students should then look in their bags and write down the properties that their object has on their paper slips. The teacher should then give the student time to discuss and fill out their slips. During this time the teacher should be circulating and making sure all students are participating. They should be told to keep their item a secret. Then the teacher should go around and pick up the slips and put them in a paper bag. The teacher should tell the students that they are going to play a game. The teacher will then instruct the students to stand up then and to remain standing until they hear a property that does not describe their item, and then they must sit down. The teacher should let the students know that the last group standing is the winner. The teacher then reaches into the bag and pulls out a slip at random and reads the property to the class. Many properties listed will describe multiple groups' items. For example, one property may be that the object is round. That property is shared by all three groups so they all stay standing, but the next property may be fuzzy and the golf ball group would have to sit. Play this game over a few times so the kids have an idea of what properties the other groups' items have. Then at the end of the game have each group list off the properties their group's item has, and have the other two groups guess what that item may be. At the very end of the lesson the teacher should have each group show the class their item and the teacher should point out that many students were able to guess the other teams' items with out seeing them. Many of them should be able to come up with a good guess just from hearing about the items' properties. They should know that sometimes scientists have to try to figure out what something is by it properties. At the end of the lesson the teacher should collect their items and slips for assessment.

Assessment:

The teacher will look at the different slips to make sure that the students have a firm understanding about different items properties. Some of the assessment will be based on student participation and class discussion. The teacher must be sure that all students are contributing in class and that they have an understanding of how to identify the different properties of materials.

Unit: Wonderful Working Water

Third Grade

EALR 4: Earth and Space Science, Physical Science

Big Idea: Earth Systems, Structures, and Processes, Matter: Properties and Changes

Core Content: Water and Weather, Properties of Materials

Standard:

PS2C: Water changes state (solid, liquid, gas) when the temperature of the water changes.

PS2D: The amount of water and other liquids left in an open container will decrease over time, but the amount of liquid in a closed container will not change.

ES2A: Water plays an essential role in Earth systems, including shaping landforms.

ES2B: Water can be a liquid or solid and can go back and forth from one form to another. If water is turned into ice and then the ice is allowed to melt, the amount of water will be the same as it was before freezing. Water occurs in the air as rain, snow, hail, fog, and clouds.

Performance Expectations:

- Predict what will happen to a sample of liquid water if it is put into a freezer (it will turn to ice) and if it is put into a pan and heated on the stove (it will turn to steam or water vapor).
- Predict what will happen to a small quantity of water left in an open container overnight.

- Predict what will happen to a small quantity of water left in an open container overnight.
- Explain where the liquid water goes when the amount decreases over time.
- Identify where natural water bodies occur in the students' local environment. Show how water has shaped a local landform.
- Describe the various forms and places that water can be found on Earth as liquids and solids.
- Predict that the weight of a sample of water will be nearly the same before and after it is frozen or melted. Explain why the weight will be almost the same.

Materials:

Plastic water bottle, felt pen, boil pot, freezer, jars, jar lid, sand paper, bricks, can of soda pop, globe, a map of Washington, water, papers, pencils

Procedure:

This lesson will deal with terms and ideas that were introduced in the lesson "Properties of Matter." It is suggested that this lesson be taught after properties of matter, so that the student have the vocabulary and prior knowledge needed to complete the lessons in this unit. This unit involves two lessons that both include water and stretch over the course of three days.

Day One:

The teacher should start out by placing a cold can of soda out in the classroom where the students can see. Then the teacher should ask if the students remember what the word property means in science. The teacher should then wait and take answers until a student offers an answer that includes describing the characteristics of an object. The teacher should then take out a jar of water and ask the students if they can identify some of the propertied of water. Then the teacher should take some time and listen to the class's answers. After everyone has had a chance to offer an answer. The teacher should ask the students if water always has the same properties or is there any time that the properties of water can change. Most students will know that when you freeze water it will turn into ice, but some may not know that when water is heated it turns into water vapor. If these two answers are not given the teacher should supply these answers. The students should then be introduced to the idea that by changing the temperature of a substance some substance's properties can be changed.

Next, the teacher should get out the boil pot and plug it in. Then they should pour the water from the jar into the pot. They should then introduce the students to the concept that little tiny drops of water are all around us in the air that can't be seen. When water is warmed it becomes water vapor. When this vapor cools it turns back into water drops. The teacher should then walk over to the can of cold soda that has been placed out in the room. The teacher should then tell the students that when the can was removed from the refrigerator it was dry. Now the teacher should walk around the class and show the class that there is condensation on the can. The teacher should tell the students that the water that is on the can was up in the air around them and when the water vapor touched the cold can they turned back into water drops. By this time the boil pot should be staring to boil. The teacher should call the class up carefully to look at the water in the boil pot. The teacher should then ask the class which part of this pot is the hottest. The students should identify that the bottom of the pot is the hottest where the heating coil is. Then the teacher should have them look at the bubbles forming at the bottom of the pot. The teacher should tell the students that those bubbles are water vapor and they are bubbling up to the top of the pot and going into the air, and they will stay there until they cool down and become water drops again. Then the teacher should unplug the pot and have the students take their seats.

Now the teacher should change direction and tell the students that they are going to look at the other change in properties that water goes through. The students should be asked if they know what happens when water cooled way down. The teacher should take answers and wait until a student offers the answer that water turns to ice. The teacher should then ask the students if they know how cold the water has to be to freeze. If the students are struggling to find the right answer the teacher should supply it to them. The teacher should then get out a water bottle that has bee filled to the brim with water and capped. The teacher should tell the students that tonight they are going put the bottle in the freezer. The teacher should then ask for predictions for what they think will happen to the water. The teacher should give time for all students to give their predictions. Then they should walk down to the kitchen and place the bottle upright in the freezer. Then the class should go back to the room. The teacher should tell them that they are also going to observe two water containers after being left out all night. One of them will have a lid and the other will be open. The teacher should take a felt pen and mark the water levels on the outside of the jars. The teacher should then take prediction to what the students think will happen. The students should then be asked to get out a piece of paper and write down their predictions, so they won't for get them tomorrow. After the students have all had a chance to write down their predictions the teacher should end the lesson.

Day Two:

The teacher should start the lesson by taking the students down to the freezer and removing the bottle. The bottle should show signs that the water has expanded the bottom will most likely be pushed out, and the bottle may have even split. The teacher should ask the kids to look at the water bottle and ask them if they notice anything different about the water. Most of the will respond that the water is frozen. If none of the students mention the expansion. The teacher should bring it to their attention. The students should be reassured that no one added any water in the night. Then the teacher should ask the students what happened to the water. The teacher should then wait until a student offers an answer about the water getting bigger. The students should then be should be introduced to the concept that when water is frozen it expands. The students should then be asked to make prediction to what will happen if the ice is allowed to melt.

The students should then go back to class and check the jars of water. The one that is open should have had the water level drop. Ask the kids if they notice anything different about the open jar. The students should see that the open jar's water level is below yesterday's line. Then the teacher should show the class the closed jar. It will have the water at the same level. Ask the students why did the open jar's water get lower and the closed jar's water stay the same. The teacher should allow the students time to brainstorm ideas. Another helpful question is "Where did the jar's water go?" If they are still struggling the teacher may want to have them think back to another time the class has seen water escape out of a container. The students should start to catch on that the water has evaporated. The teacher should then have the students take out their prediction papers from the day be fore and add to them today's findings in words and drawings. After the students have had time to write the teacher should collect their papers and keep them for assessment.

Day Three:

The lesson should star out with checking the bottle from yesterday's lesson. The students should see that the water level has returned to the original size. The teacher should point out that water expands when it is frozen and returns to normal levels when it changes back into a liquid.

The teacher should tell the students that today they are going to see how water changes the Earth. The students should be asked if they know any place near by that have natural bodies of water. The teacher should then allow the students to share their locations. These will probably include oceans, river, lakes, glaciers, and so on. The teacher can then show the students these areas on a map of Washington State. The teacher may even wan to point out that Washington is a costal state and the southern border is formed by the Columbia River. The students should then be told that water has had a very important role in shaping the world. The teacher should then show the class the globe. The student should be shown the most of the Earth is covered by water. They should also see that the North and South Poles are covered with ice. The teacher can then ask the students if they know what a valley is. If the students are unfamiliar with that term the teacher may describe it to them. The teacher should then go on to tell the students that most valleys were cut by water and water also shapes the shapes rocks that it touches.

The teacher should then take the class outdoors. The class should be placed into groups of three or four. The students should be told that today they are going to be a river and they are going to be making valleys and smoothing out rocks. Ask the students if they have ever heard the term erosion. If they are unfamiliar with the term the teacher should tell them that is the wearing down of rocks by wind and water. The teacher should describe to the students that as the wind blows across the ground it pick up little pieces sand and dirt. The teacher can ask the students if they have ever had dirt blow into their eyes during a dust storm. The teacher should go on to explain that the same thing happens in rivers little pieces of sand and rock drift with the flow of the river. As these little pieces move they rub along the rocks. The teacher should hand each group a brick and each student a piece of sandpaper. The teacher should tell the class that they are going to be the river and their sand paper is the little rocks that they pick up along the way. They are going to rub their sand paper along their brick. The students should take turn rubbing the brick down its center and over its sharp edges. Pretty soon they will start to make a valley and they will round the edges. The teacher should also point out that the dust they are making will also get picked up by the current of the river and rub on rocks. After all the students have had a chance to "erode" their brick the teacher should take them back into the classroom. Once back in class the teacher should tell them that water has been eroding Earth for as long as it has been moving around. Also, the teacher should let the students know that ice helps erode rocks as well. The teacher should explain that water will seep into a crack in a rock and when it freezes the water expands and that makes the crack bigger. Eventually it will split the rock. The teacher should have the students journal using words and pictures to show what they learned about water and erosion during this lesson. After they have had time to write down their thoughts the teacher should collect the papers for assessment.

Assessment:

The teacher will need to look at the students' predictions and findings from their papers they completed the first two days. The papers should show that the students understand that when water is heated or cooled it will change properties. They should also note that water expands when it is frozen. They should also know that open water will evaporate and turn into water vapor. The students' journals for the erosion lesson should show that they understand that water shapes the land. That the movement of the water combined with the sand and rock rub the land and carve it into valleys. This lesson should also be assessed on the classroom discussions. The students should be actively participating in discussion and activities to demonstrate knowledge gained.

Ecosystems

Third Grade

EALR 4: Life Science

EALR 1: Systems

Big Idea: Ecosystems (LS2)

Core Content: Changes in Ecosystems

Standards:

LS2A: Ecosystems support all life on the planet, including human life, by providing food, fresh water, and breathable air.

LS2B: All ecosystems change over time as a result of natural causes. Some of these changes are beneficial for the plants and animals, some are harmful, and some have no effect.

LS2C: Some changes in ecosystems occur slowly and others occur rapidly. Changes can affect life forms, including humans.

LS2D: Humans impact ecosystems in both positive and negative ways. Humans can help improve the health of ecosystems so that they provide habitats for plants and animals and resources for humans over the long term. For example, if people use fewer resources and recycle waste, there will be fewer negative impacts on natural systems.

SYSA: A system is a group of interacting parts that form a whole.

SYSB: A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.

SYSC: A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.

SYSD: Some objects need to have their parts connected in a certain way if they are to function as a whole.

SYSE: Some objects need to have their parts connected in a certain way if they are to function as a whole.

Performance Expectations:

- Give examples of simple living and physical systems. For each example, explain how different parts make up the whole.
- For each example, explain how different parts make up the whole.
- Explain how the parts of a system depend on one another for the system to function.
- Explain why the parts in a system need to be connected in a specific way for the system to function as a whole.
- Identify ways that similar parts can play different roles in different systems
- Identify at least four ways that ecosystems support life
- Describe three or more of the changes that occur in an ecosystem or a model of a natural ecosystem over time, as well as how these changes may affect the plants and animals living there.
- Explain the consequences of rapid ecosystem change
- Explain the consequences of gradual ecosystem change

- Describe a change that humans are making in a particular ecosystem and predict how that change could harm or improve conditions for a given type of plant or animal.
- Propose a plan to protect or improve an ecosystem.

Materials:

Paper, pencil, picture of a car, colored pencils

Procedure:

This lesson is a two part lesson. The first day is when the students discuss what a system is and the second part discusses ecosystems and how they can change. This lesson will take two days to complete.

Day One: Systems.

The teacher should start out asking the students if they have ever heard of the word system before. The teacher should then allow time for the students to offer answers. The teacher should then go on to give then the definition that they will be using in this lesson. The teacher should tell them that a system is a group of parts that work together and form a whole thing. The teacher should also explain that every piece of a system has a job. The teacher can then go on to tell the students that living bodies are systems. Each part of a human being's body is made up pieces that perform a task. The teacher should then choose different parts of the body and have the students identify their roles in the body. For example, the teacher may ask the student what sort of things do we use our mouth for, and the student will answer eating, breathing, talking, and so on.

The teacher can then go on to ask the students if a mouth by itself is a body or a whole. The student should answer that it is only part of the body. The teacher should then ask the students "Can the mouth breathe by itself?" The student should know the mouth needs the lungs in order to breath. The teacher should then point out that many parts of a system rely on other parts. The teacher should then move on and ask the students if a system can function if it is missing parts. The teacher should then wait and let the students offer their ideas. One example the teacher may give is "If some one is born without eyes can thy still survive. The students should answer yes. The teacher should agree with them and then ask them "They can, but they will have to adapt other body parts to help make up for having not having eyes. What adaptations will this person need use to help them along?" The teacher should allow time for the students to answer. If they are struggling to with this concept the teacher may give the students some adaptations. For example, the teacher might talk about the person learning to use their fingers to read Braille, caring a cane, using a guide dog, and so on. The teacher can then ask the students what "If some ones heart quits working? Can that person still live?" The student will answer no. The teacher should then point out that if some parts of a system fail to work then the whole system can shut down.

The teacher should then hand out a picture of a car. The teacher should tell the class that a car is a system too. The teacher should then ask the students circle parts of the car that have to be working in order for the car to run. They should circle things like the tires the engine the steering wheel. Then the teacher should have the students put a box around the parts of the car that if absent the car would still be able to function. They should box things like the bumpers, doors, windshield, trunk and so on. The teacher should then collect these papers for assessment.

Day Two: Ecosystems

The teacher should start off by reviewing the term system with the students. They should remember that a system is a group of parts that work together and make a whole. The teacher should then tell the class that today they will be studying another type of system called an ecosystem. The student should be told that an ecosystem is a group of parts that work together to provide living things an environment they can survive in. For example, the town they live in is an ecosystem. They are provided with the things they need to survive like food, water, air, and waste removal. If they didn't have these things it would be difficult to survive in this town.

The teacher should ask them if they know of any other ecosystems, if the students are struggling to come up with any the teacher can provide some. For example, the teacher may suggest forests, oceans, lakes, streams, and so on. The teacher should then ask, "What sort of creatures might rely on these ecosystems to survive?" The teacher should then let the students brainstorm different plants and animals that might live in those ecosystems. The teacher should then go on to point out that the plants and animals that live in those areas are also part of the ecosystem. The teacher should then give an example of a food chain. The students should see that the animals rely on other animals and plants for food, and the plants need their waste of the animals to feed them.

Then the teacher should ask the students what would happen if there was a change in their ecosystem like snow, fire, a flood, or climate change. The students should know that it can be dangerous to the population of living things in that area, the teacher should also point out that these changes effect the ecosystem for a long time. Some of these things can happen very quickly like a flood or fire, and some take time to change like the climate change.

The teacher should also tell the kids that some changes can help the life in the ecosystem. For example, snow provides water for the plants and animals, and small fires can clear dead brush form an area.

The teacher can then go on to explain to the class that some changes in an ecosystem can be manmade for example, clearing a forest for building houses, mining natural resources, and pollution. The teacher should point out that these can be negative changes for an ecosystem, but there are many thing humans can do to make positive changes. The class should then be allowed to discuss ways that they can make positive changes in an ecosystem. Possible ideas may be picking up litter, driving less, planting trees, and recycling.

The teacher should then pass out paper to the kids. The teacher should instruct the kids to draw on one side an ecosystem that is experiencing negative changes that are manmade and natural. They should include life forms that would inhabit that ecosystem and how the changes are effecting them. When they are done they should flip their papers over and draw the same ecosystem, but this time they should show the ecosystem experiencing positive changes that are manmade and natural. When they are finished the teacher should collect these drawing for assessment.

Assessment:

This lesson should be assessed on the students system papers from day one, ecosystem drawings that the students completed, and the classroom discussions. The students should know what a system is and how changes can affect it both positive and negatively. The students should be able to identify many different ecosystems, and identify the different parts that make it function. The teacher should be sure that all students are actively participating in the classroom activities and discussions. This knowledge should be demonstrated both through the drawings they have made and their contributions to the class discussions.