

The Earth as an Apple

Subject: Science

Level: 1-12

MATERIALS: 1 apple, 1 knife, plate, damp towel

OVERVIEW

One of our most valuable resources in agriculture is land and water. This demonstration will show just how important these resources are to everyone.

OBJECTIVES

- To demonstrate the amount of land area available for the production of food and fiber
- To demonstrate water availability and quality for urban and agricultural uses.

PROCEDURE

1. Begin by explaining that the apple represents the planet Earth. Slice a whole apple into 4 quarters (4 equal sections).
2. Explain that three-quarters of the apple represents all of the water on the planet. Set these 3 quarters aside.
3. The remaining one-quarter represents all of the land area found on the planet. (25% of Earth's surface)
4. Cut this quarter in half. Explain that half of this quarter represents all of the area where food will not grow like the Polar Regions, the desert, swamps, steep and Rocky Mountains. Put this piece aside.
5. Take the other half and cut it into 4 equal parts. Explain that 3 of these pieces will need to be set aside because they also represent areas not suitable for food production. These pieces stand for areas that are too wet, too cold, and too rocky or the soil quality is too poor. These pieces also represent all the land area that is covered up by cities, towns, highways, houses, schools, malls, and any other developments covered by land.
6. The remaining section represents 1/32 of the original apple. Peel away the skin. Explain that the core of the Earth is not used for producing food. The skin of this piece represents the crust/topsoil of the Earth where all of the food is produced.
7. Discuss this tiny piece of the apple. Ask questions like:
 - What is happening to this remaining land?
 - What is happening to world population and how is it connected to the amount of land area?
 - Should conservation of the land be a necessity in the present? The future?
8. Take the 3 quarters that were set aside in the beginning of the activity. These 3 quarters of the apple represent all of the water on Earth.
9. Cut one of the three remaining quarters in half. Explain that 2 ½ quarters represents salt water and the remaining ½ quarter represents fresh water.
10. Cut the remaining one half of the quarter into 3 equal pieces: One piece represents the unusable fresh water locked in the polar ice caps; one piece represents unusable fresh water that is polluted; one piece represents pure, treated and reclaimed water.
11. Set aside the 2 pieces representing the unusable water.
12. Take the remaining piece (1/3 of 1 quarter) and cut it into 10 pieces. The pieces are represented in the following way:
 - 2 pieces = water for industry
 - 2 pieces = water lost through leaking pipes, waste and misuse
 - 1 piece = water available to the whole world for drinking, cooking, bathing, laundry, dishes, washing your car, etc.
 - 5 pieces = water for agriculture, pure and reclaimed.

VARIATION OF DEMONSTRATION

To turn this demonstration into a hands-on activity, provide students with paper apples and scissors. Students will follow the demonstration, cutting their paper apple as instructed. Students should also label the pieces.

GRADE LEVEL EXPECTATIONS

Pre-K: Science

30. Distinguish between areas of Earth covered by land and water (ESS-E-A2)

First Grade: Science

36. Locate and compare the relative proportions of land and water found on Earth (ESS-E-A2)

Second Grade: Science

37. Compare bodies of water found on earth (e.g., oceans, seas, lakes, rivers, glaciers) (ESS-E-A2)

38. Explain why most of the water on Earth cannot be used as drinking (potable) water (ESS-E-A2)

Third Grade: Science

60. Explain how renewable and nonrenewable resources can be replenished or depleted (SE-E-A4)

Fifth Grade: Science

48. Determine the ability of an ecosystem to support a population by identifying the resources needed by that population (SE-M-A2)

49. Identify and give examples of pollutants found in water, air and soil (SE-M-A3)

Sixth Grade: Science

46. Identify ways people can reuse, recycle and reduce the use of resources to improve and protect the quality of life (SE-M-A6)

Eighth: Science

51. Analyze the consequences of human activities on global Earth Systems (SE-M-A4)

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Water, Water...Everywhere?

Subject: Science

Level: 1-8

MATERIALS: 1 gallon jug of water, measuring cup, measuring spoons, clear plastic cups, eye dropper

OVERVIEW

Water covers three-fourths of the Earth, but only a small percentage is available for human consumption. As population grows, water efficiency and conservation become more important. This demonstration shows the amount of water available for human use.

OBJECTIVES

- To identify the major uses of water and understand the limited amount of water available
- To explain the importance of water conservation

BACKGROUND KNOWLEDGE

Earth is known as the water planet. Approximately 75% of the Earth's surface is covered with water. Water is one of the most important natural resources. Water on earth is found in all 3 of its states: liquid, gas and solid. Water travels in a cycle called the water cycle or Hydrologic cycle. The amount of water remains constant. In fact, the Earth has the same amount of water now as when it was created. The amount of water available to all living things (humans, animals, plants) depends on how its quality is maintained. Everyone has the responsibility to conserve water and protect its quality.

PROCEDURE

1. Introduce the lesson by asking students how they use water each day. Discuss their answers and record them on the board.
2. Brainstorm other uses of water, industrial and agricultural. Record on the board as well.
3. Ask the students where fresh water comes from. (rain, snow, rivers, lakes)
4. Hold up a gallon jug filled with water. Tell them that this represents all of the water on the Earth. Adding blue food coloring to the water makes it easier to see.
5. Measure and take out 5 tablespoons of water from the gallon of water and place it in one clear container. Label this 2% polar ice caps or glaciers.
6. Measure and take out 2 tablespoons of water from the gallon of water and place it in another clear container. Label this container .62% groundwater.
7. From the gallon of water, take 1/8 teaspoon and place in a container labeled 0.008% inland seas/salt lakes.
8. Take out another 1/8 teaspoon of water and place it in a container labeled 0.009% freshwater lakes.
9. In the two remaining containers, place one drop of water in each. Label one 0.001% atmosphere and one 0.0001% rivers/streams.
10. The water remaining (97.2%) in the original gallon represents the oceans. What is available as freshwater for human use is the combination of groundwater, freshwater, lakes, and rivers and streams (2 tablespoons + 1/8 teaspoon + 1 drop).
11. Discussion on the following:
 - Where is the least/most water?
 - Which source is the least/most usable by living things?
 - Which source is most readily available?
 - How can you and your family conserve water at home?
 - What can farmers do to conserve water from plant and animal use?

EXPLORATIONS AND EXTENSIONS

Break students into groups of 3 – 4. Have the groups brainstorm ways to conserve water. Next, each group should create a Public Service Announcement skit or poster advertisement encouraging people to conserve water. The skits/posters should include conservation tips as well as explain the importance of doing so. Students could also create a power point presentation or a brochure.

Have students create a graph depicting the portion of the earth's surface that is covered by land and water.

Explain the water cycle.

GRADE LEVEL EXPECTATIONS

First Grade: Science

36. Locate and compare the relative proportions of land and water found on Earth (ESS-E-A2)

Second Grade: Science

37. Compare bodies of water found on earth (e.g., oceans, seas, lakes, rivers, glaciers) (ESS-E-A2)

38. Explain why most of the water on Earth cannot be used as drinking (potable) water (ESS-E-A2)

Third Grade: Science

60. Explain how renewable and nonrenewable resources can be replenished or depleted (SE-E-A4)

Fifth Grade: Science

50. Describe the consequences of several types of human activities on local ecosystems (SE-M-A4)

Sixth Grade: Science

46. Identify ways people can reuse, recycle and reduce the use of resources to improve and protect the quality of life (SE-M-A6)

Seventh Grade: Science

39. Analyze the consequences of human activities on ecosystems (SE-M-A4)

Eighth Grade: Science

23. Explain the processes of evaporation, condensation, precipitation, infiltration, transpiration and sublimation as they relate to the water cycle (ESS-M-A10)

24. Investigate and explain how given factors affect the rate of water movement in the water cycle (ESS-M-A10)

LESSON DEVELOPMENT RESOURCES

Lesson adapted from Space Agriculture in the Classroom, www.spaceag.org and the Virginia Ag in the Classroom program, www.agclassroom.org/va.

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Watershed and Envirosnacks

Subject: Science

Level: 3-8

MATERIALS: Graham Crackers – *Bedrock and permeable soil layers*; Chocolate spreadable cake frosting – *Soil (Adhesive Agent)*; Chocolate kisses – *Mountains (2 or 3 per student)*; Chocolate chips – *Hills (may use various size chips)*; Green sprinkles – *Grasslands*; Green tree nonpareils – *Forests*; Tube of blue icing – *Lakes/Streams and Ground water*; Small marshmallows – *Clouds*; Blue sprinkles – *rain*; Optional: white sprinkles to represent snow and white tube of icing for snow on mountain tops

OVERVIEW

In this lesson students will learn about watersheds and the water cycle. Students will construct a watershed/water cycle model.

OBJECTIVES

- Identify natural resources
- Create a model of the water cycle
- Describe watersheds and surrounding environments

BACKGROUND KNOWLEDGE

A watershed is the area of land that water flows over or under on its way to the lowest point such as a stream, river, lake or ocean. The water in a watershed comes from rain, snow, sleet, ice or irrigation and in a continuous cycle. The water travels over the surface and across farms, fields; forests, suburban lawns; city streets or it seeps into the soil and travels as ground water. Watersheds come in many different shapes and sizes and can be affected by many different activities and events. Everyone lives in a watershed and influences what happens in your watershed, good or bad, by how you treat the natural resources.

PROCEDURE

1. Begin assembling the envirosnack by breaking the graham cracker in half along the perforation. Squeeze a small amount of blue icing around the outside edges of one half of the cracker. Place the other half of the graham cracker on top. This represents layers of bedrock and permeable soil layers with ground water. As each part of the watershed is created, be sure to discuss that part in relation to the water cycle.
2. Spread the chocolate frosting on the cracker. This is your topsoil (infiltration).
3. Add the chocolate kisses and chips for mountains and hills as desired (surface runoff).
4. Sprinkle with the green sugar crystals for grasslands (erosion control/transpiration).
5. Place the green tree nonpareils to create a forest (erosion control/transpiration).
6. Squeeze the blue icing to form mountain waterfalls, streams, rivers and lakes (surface water/evaporation).
7. Sprinkle with blue sugar crystals to represent the rain. May use white to represent snow (precipitation).
8. Add marshmallows for clouds (condensation).
9. Now enjoy your envirosnack and eat.

Caution: Always check for food allergies before students eat anything in the classroom.

EXPLORATIONS AND EXTENSIONS

Question students about the affects of water on the environment. Include scenarios dealing with drought, flood, and erosion. Discuss methods for erosion prevention.

LESSON DEVELOPMENT RESOURCES

Virginia Ag in the Classroom Program, Watershed and Envirosnacks activity, www.agclassroom.org/va

Kansas Foundation for Agriculture in the Classroom, What in the World is a Watershed? Activity, www.ksagclassroom.org

GRADE LEVEL EXPECTATIONS

Third Grade: Science

48. Identify examples of the processes of a water cycle (ESS-E-A3)
60. Explain how renewable and nonrenewable resources can be replenished or depleted (SE-E-A4)

Fifth Grade: Science

46. Identify and explain the interaction of the processes of the water cycle (ESS-M-C6)
50. Describe the consequences of pollutants found in water, air and soil (SE-M-A3)

Sixth Grade: Science

46. Identify ways people can reuse, recycle, and reduce the use of resources to improve and protect the quality of life (SE-M-A6)

Seventh Grade: Science

39. Analyze the consequences of human activities on ecosystems (SE-M-A5)

Eighth Grade: Science

23. Explain the processes of evaporation, condensation, precipitation, infiltration, transpiration, and sublimation as they relate to the water cycle (ESS-M-A10)
24. Investigate and explain how given factors affect the rate of water movement in the water cycle (ESS-M-A10)
50. Illustrate possible point and non-point source contributions to pollution and natural or human induced pathways of a pollutant in an ecosystem (SE-M-A3)
51. Analyze the consequences of human activities on global Earth systems (Se-M-A4)

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Water Cycle Bracelets

Subject: Science

Level: Pre-K through 8

MATERIALS (per student)

- 12 – 14" piece of leather cording (pipe cleaners work great for younger students)
- 1 small yellow pony bead = sun
- 1 small clear pony bead = water vapor
- 1 small gray pony bead = clouds
- 1 small sparkling clear pony bead = rain
- 1 small white pony bead = snow
- 1 small brown pony bead = erosion
- 1 small dark blue pony bead = oceans
- 1 small sparkling blue pony bead = lakes
- 1 small sparkling brown pony bead = puddles
- 1 small green pony bead = plants
- 1 small light blue pony bead = ground water

PROCEDURE

Water Cycle Bracelets are a fun activity that uses beads to represent the water cycle (hydrologic cycle).

1. Explain to the students that each colored bead represents the various stages of the water in the Earth's systems.
 - Sun (Yellow) – the sun is the source of all energy and powers the water cycle
 - Water Vapor (clear) – the part of the water cycle where water is suspended in the air
 - Clouds (gray) – condensed water vapor still in the air
 - Rain (sparkling clear) – moisture from clouds falls to earth as a liquid (precipitation)
 - Snow (white) – moisture falling as a liquid in its frozen state (precipitation)
 - Erosion (brown) – rain causes erosion where soil particles are suspended in the water run off
 - Oceans (dark blue) – Moisture evaporates from the oceans by the sun's heat and is carried around by the Earth's winds
 - Lakes (sparkling blue) – collects water from streams and where water also evaporates into the atmosphere
 - Puddles (sparkling brown) – rainwater collects in low spots, streets, sidewalks and also collects pollutants. Puddles evaporate or run off
 - Plants (green) – take in water through roots and evaporate water into the atmosphere through leaves (transpiration)
 - Groundwater – (light blue) – water that collects below the surface
2. Tie a knot at one end of the cording.
3. Have the students string one of each colored bead on their bracelets. They may string them on in any order they wish.

EXPLORATIONS AND EXTENSIONS

Add English Language Arts to the lesson by having them write a story or poem about the water cycle on their bracelet.

GRADE LEVEL EXPECTATIONS

Pre-K: Science

26. Describe weather and its daily changes (PK-CS-ES2) (ESS-E-A4)

Kindergarten: Science

1. Ask questions about objects and events in the environment (SI-E-A1)
30. Distinguish between areas of Earth covered by land and water (ESS-E-A2)

First Grade: Science

1. Ask questions about objects and events in the environment (SI-E-A1)
2. Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1)
37. Illustrate how water changes from one form to another (ESS-E-A3)

Second Grade: Science

1. Ask questions about objects and events in the environment (SI-E-A1)
44. Give examples of how the Sun affects Earth's processes (e.g. weather, water cycle) (ESS-E-B5)

Third Grade: Science

48. Identify examples of the processes of a water cycle (e.g., evaporation, condensation, precipitation, collection of runoff) (ESS-E-A3)

Fourth Grade: Science

58. Draw, label and explain the components of a water cycle (EDD-E-A3)

Fifth Grade: Science

46. Identify and explain the interaction of the processes of the water cycle (ESS-M-C6)

51. Describe naturally occurring cycles and identify where they are found (SE-M-A-7)

Sixth Grade: Earth & Space Science

46. Identify ways people can reuse, recycle, and reduce the use of resources to improve and protect the quality of life (SE-M-A6)

Eighth Grade: Earth & Space Science

23. Explain the processes of evaporation, condensation, precipitation, infiltration, transpiration and sublimation as they relate to the water cycle (ESS-M-A10)

24. Investigate and explain how given factors affect the rate of water movement in the water cycle (ESS-M-A10)

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A Handy Measure

Subject:	Mathematics
Grade Level:	1-4
Duration:	One class period
Materials:	Masking tape yardsticks construction paper scissors

Overview: Students will be introduced to the standard method used for measuring horses.

Grade Level Expectations: Mathematics: Measurement

First Grade

22. Select appropriate non-standard units for linear measurement situations (e.g., sticks, blocks, paper clips)(M-2-E)
23. Compare the measure of objects to benchmarks (M-2-E)

Third Grade

25. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter, area, capacity and weight/mass (M-2-E)

Second Grade

17. Select and use appropriate tools and units to measure length, time, capacity, and weight (M-2-E)
18. Use non-standard units to cover a given region (M-2-E)

Fourth Grade

22. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter, area, capacity, and volume (M-2-E)(M-1-E)
24. Recognize the attributes to be measured in a real-life situation (M-2-E)

BACKGROUND

Horses helped settle the “New World,” and they are still important today. In 2009, horses became Louisiana’s largest animal industry. Horses are measured in units called “hands”. One hand represents four inches (4”). Early horse traders found it was easier to use their hands to measure horses than to carry around measuring sticks. They would count hand-widths from the ground to a horse’s withers, the highest part of its back, between the shoulder blades. A horse is generally about 14.2 hands – 14 hands plus 2 inches – or taller. Anything shorter than that is considered a pony. Though the origins are ancient, a “hand” is still the unit of measurement for horses used by modern horse owners today.

KEY VOCABULARY

- Height** – the highest part or point
- Horse** – a large hooved grazing domestic animal that is used to carry or draw loads and for riding
- Measure** – to find out the size, extent or amount of
- Width** – the measurement of the short or shorter side of something
- Withers** – high part of the horses back, between the shoulder blades.

REFERENCES:

Lesson adapted from:

Virginia Ag in the Classroom, “A Handy Measure” lesson;
www.agclassroom.org/va

Oklahoma Ag in the Classroom, “A Handy Measure” lesson;
www.agclassroom.org/ok

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Lesson Procedures

1. Begin by discussing length and width. Along the wall, measure 14 hand-widths and 2 inches from the floor. Place a piece of masking tape to mark the height. Explain to the students that the tape represents the usual height of a horse. Label the tape.
 2. Divide the students into pairs to measure each other's height. One student should stand with their back against the wall while the other marks the height with a piece of masking tape. Have students label each piece of tape with his/her name.
 3. Have students measure their heights using a yardstick. Record the data.
 4. On a piece of construction paper have students carefully trace their hands. Have students estimate how many hands they think will be necessary to measure their height. How do the widths of most students' hands compare with the average 4-inch width of an adult man's hand?
 5. Have students trace and cut as many hands as needed to measure his/her height.
 6. Allow students to tape hands to the wall from floor to tape marker to visually display their heights.
 7. Discuss whether or not students' predictions were correct.
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Explorations and Extensions

Have students estimate the length, width, and height of classroom objects using hands or inches. Then have them test their predictions.

Have students use their feet to measure the perimeter of the classroom. Graph the measurements on the board. Compare to the actual measurement in feet, yards, meters, etc.

Horse Cents

Subject:	Mathematics and English Language Arts
Grade Level:	3-4
Duration:	Two 45-minute class periods
Materials:	Horse Cents worksheet Pencil

Overview: Students will mathematically explore the costs associated with owning a horse.

Grade Level Expectations: Mathematics

Third Grade

8. Recognize, select, connect, and use operations, operations words, and symbols to solve real-life situations (N-5-E)(N-6-E)(N-9-E)
9. Know basic multiplication and division facts, and turn-arounds, including multiplying by 10s(N-6-E)(N-4-E)
11. Add and subtract numbers of 3 digits or less (N-6-E)(N-7-E)

Fourth Grade

11. Multiply 3-digit by 1 digit numbers, 2 digit by 2 digit numbers and divide 3-digit numbers by 1 digit numbers, with and without remainders (N-6-E)(N-7-E)
12. Count money, determine change, and solve simple word problems involving money amounts using decimal notation (N-6-E)(N-9-E)(M-1-E)(M-5-E)

Grade Level Expectations: English Language Arts

Third Grade

22. Write compositions of two or more paragraphs that are organized with the following: a central idea, a logical order, supporting details that develop ideas, transitional words within and between paragraphs (ELA-2-E1)
23. Incorporate grade-appropriate vocabulary and information when writing for an intended audience and/or purpose (ELA-2-E2)
28. Write legibly in cursive or printed form, using standard margins and demonstrating appropriate spacing of letters, words, sentences and paragraphs (ELA-3-E1)
29. Use standard English punctuation, including: commas to separate phrases in a series
31. Write using standard English structure and usage, including: avoiding run-on sentences, using verbs in the future tense, making subject and verbs agree in sentences with simple and compound subjects and predicates (ELA-3-E3)
33. Spell grade-appropriate words (ELA-3-E5)

EXPLORATIONS & EXTENSIONS

Students will develop budgets for their own maintenance. Make sure they include food, clothing, transportation and entertainment.

REFERENCES:

Lesson adapted from:

Oklahoma Ag in the Classroom,
“Horse Cents” lesson;
www.agclassroom.org/ok

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Grade Level Expectations: English Language Arts, continued

Fourth Grade

20. Write compositions of at least three paragraphs organized with the following: a clearly stated idea, an introduction and conclusion, a middle with supporting details, a logical order and transitional words and phrases that unify points and ideas (ELA-2-E1)
 21. Organize individual paragraphs with topic sentences, relevant elaboration and concluding sentences (ELA-2-E2)
 27. Write legibly in standard cursive or printed form, indenting paragraphs, using standard margins, and demonstrating fluency (ELA-3-E1)
 28. Use standard English punctuation, including apostrophes (ELA-3-E2)
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BACKGROUND INFORMATION:

Budgets are an essential part of everyday life. Parents budget their money in order to pay the bills each month. Store owners budget their money to pay their employees and keep merchandise in the store. Farmers must budget to pay for seed to plant, maintenance of equipment, feed for their animals and other expenses.

Just keeping one animal can cost a great deal of money, especially if it is a large animal, like a horse. Planning and budgeting come first. The purchase price of the horse is only the beginning. Maintenance of the horse

often costs more. Maintenance includes feed, hay, veterinary care, tack and grooming supplies, just to name a few.

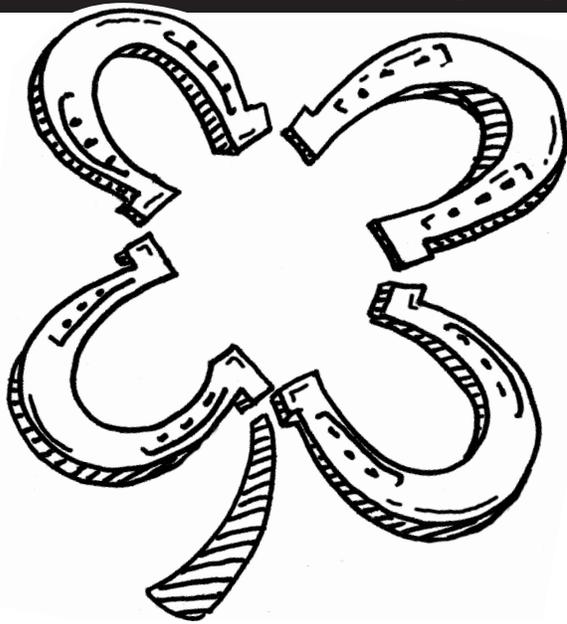
For someone who loves horses but can't afford to own one, there are several alternatives. Some people lease horses. Leasing is cheaper than purchasing, but the maintenance costs are still there. Taking riding lessons at a stable is another alternative. With this option all you have to pay for are the lessons. Most stables either charge per hour or per lesson.

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Lesson Procedures

1. Discuss basic information about horses. What should you consider before buying a horse?
2. Have students complete the worksheet to determine the estimated total annual cost of owning a horse.
3. Lead a brainstorming session on the pros and cons of purchasing a horse, leasing a horse or taking lessons.
4. Each student will choose one option: purchasing a horse, leasing a horse, or taking lessons. Write at least two paragraphs with logical explanations for his/her choice.
5. Lead a discussion in which you brainstorm ideas for cutting costs.

LUCKY HORSESHOES



Materials

- Horseshoe cutout (one per student – can be made of construction paper, craft foam or wood)
- Miscellaneous decorative items: stickers, markers, rhinestones, glitter, sequins, etc.
- Glue

DIRECTIONS

Background:

Every athlete needs a good pair of shoes. The type of shoe an athlete wears depends on the sport he or she plays. Basketball players wear rubber-soled sneakers to give them traction. Golfers wear shoes with spikes to give them traction on grass golf courses. Bowlers wear shoes with slick soles to reduce friction.

The same is true for equine athletes – horses. The type of shoe a horse needs depends on the sport in which it will be involved. Horseshoes are available in a wide variety of materials and styles, developed for different types of horses and the work they do. Common materials are steel, aluminum and plastic. There are specialized shoes made of magnesium, titanium or copper.

A horse needs new shoes every six to eight weeks. Trimming and shoeing is a regular and very important part of caring for a horse. A standard horseshoe is

made of steel and has a groove in which the farrier inserts nails to hold the shoe to the hoof. A farrier is the person who puts shoes on a horse.

Horses in the wild do not have shoes, but most domestic horses need shoes for several reasons. The hoof is made of horn, much as the human fingernail and grows hard, tough and flexible. In nature, the horse walks and grazes continuously over a wide variety of surfaces, which keeps its feet worn smooth, even hard, like a callus. In domestication, the horse doesn't cover as much ground on a daily basis, so the hooves harden much less and are more vulnerable to injury. In addition, the added weight of a human, pack load or cart can cause horses' hooves to wear more quickly than those of wild horses.

Horseshoes are also used to enhance the horse's performance in athletic competition. The

shape, weight, and thickness of a horseshoe can significantly affect the horse's gait. Farriers trained in hot shoeing can make custom shoes to help horses with bone or muscle problems in their legs.

Horseshoes are considered a good luck charm in many cultures. The horseshoe should be used (not new), found (not purchased) and hung where it can be touched. Hang it with the ends up, though; the luck is contained in the shoe and can pour out through the ends.

Directions:

1. Each student should have a horseshoe replica. It may be made of construction paper, card stock, craft foam, etc.
2. Students should decorate their lucky horseshoe. A variety of decorative items may be used such as: paint, markers, rhinestones, glitter, etc.

Horseshoe Pattern

