GRADE 7 SCIENCE EXPLORATIONS TO DO AT HOME

One of the three core principals of *Each Child, Our Future*, Ohio's strategic plan for education, is partnerships. The plan recognizes the collaboration between teachers and parents as the most important partnership. This document provides activities for students to complete in a home environment, allowing parents to be more closely involved in each child's mastery of science concepts. The investigations are written for a home setting using limited resources and are specifically targeted to each of *Ohio's Learning Standards for Science*.

The resources listed in this document are provided to enhance planning, instruction and learning about science. They are not mandatory. Local districts are responsible for establishing the local curriculum and identifying appropriate instructional resources. The at-home projects are intended to provide activities that can be used by teachers to assign as homework or share with parents to supplement classroom instruction. Teachers should feel free to adapt the activities to align with the local curriculum. The projects are designed with the intent that technology is not necessary; although in many cases, the activities could be extended with additional components. When possible, data can be shared in small groups or with the entire class, analyzed and discussed to deepen understandings that students uncover during these activities.

It is important to build a strong foundation in science in the early elementary years so students are prepared for understanding more complex material in the intermediate and middle grades. It is equally important to continue students' science instruction by offering more advanced courses at the high school level. This allows students to be better prepared to compete for admission to college or other postsecondary programs, as well as for increasingly technical jobs. Advanced science courses in high schools also help produce a more scientifically literate public.

7.ESS.1 The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere.

Outside option: Look around your neighborhood to identify water flow and drainage patterns, including storm sewers. Identify regions where surface water and runoff or acid rain could impact ground or surface water. Design solutions for reducing runoff in those regions.

Inside option: Build a model to represent a section of Earth's surface that includes topography and components representing soil, rock and groundwater. Use it to investigate water pathways. How do these pathways impact the land? Use picture or drawings along with written descriptions of your findings.

7.ESS.2 Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns.

Outside option: Investigate local wind patterns. Design a device to show wind direction (a simple wind vane, wind sock or flag will work). Place it in an open area. For several days or weeks, record the direction the wind blows each time it is windy. Wind direction normally is recorded as the direction the wind comes from, so air moving from west to east is called a west wind. When storms arrive, record their direction. Do the dark skies first appear in the north, south, east or west? How does this compare with the general wind directions you observe on clearer days? Try to make a general statement about the direction of global winds in Ohio.

Hint: Can't find north at your house? If you don't have a compass, phone or GPS, you can locate east by the general area where the sun rises.

Inside option: Investigate the effects of density on ocean currents. Combine water with different salinities (concentrations of salt) or different temperatures and observe currents in the water. Use cold and hot water. Add food coloring to the cold water. When you combine the waters, watch how the food coloring moves. Which is more dense, warm water or cold water? What makes you think so? Do the same experiment with different salinities. You can change salinity by dissolving various amounts of regular table salt in tap water. Use plain tap water for fresh water and combine it with salt water. Again, use food coloring in one of your samples so you can observe the motion of invisible water molecules. Try combining different salinities of salt water. Does dissolving additional salt make water more dense or less dense? What overall conclusion can you make about the effect of density on the movement of water. How does this relate to oceans?

7.ESS.3 The atmosphere has different properties at different elevations and contains a mixture of gases that cycle through the lithosphere, biosphere, hydrosphere and atmosphere.

Outside option: Each day make and record observations on the air quality outside. Is it foggy or clear? Are pollen, smoke or unusual odors present in the air? What human activities can you identify that may be affecting air quality? If an air quality report is available (found in daily weather reports), compare your observations to the air quality report. Based on your comparisons, decide if air quality issues are always observable by sight. Justify your conclusion with evidence from the reports and your personal observations.

Inside option: Investigate the effects COVID-19 responses have had on Earth's atmosphere. Review news stories that discuss changes in pollution or air quality as a result of people staying home due to COVID-19. What do the areas experiencing changes in air quality have in common? Predict how the changes impact the type and abundance of gases in the atmosphere? Identify which human behaviors have changed to cause these changes to the atmosphere. What are the short- and long-term effects? Brainstorm possible ways to maintain positive changes as business and travel returns to normal levels.

7.ESS.4 The relative patterns of motion and positions of Earth, moon and sun cause solar and lunar eclipses, tides and phases of the moon.

Outside option: Observe and record the different phases of the moon during a lunar cycle. Take pictures or draw and label the phases. Track it again over the next month. What do you notice about the appearance of the moon over the course of the month? Does it change from month to month?

Inside option: Create a model of a lunar eclipse. Use two balls of different sizes for the Earth and moon and a flashlight, cell phone or lamp to represent the sun. Where do you need to position the ball representing the moon and the ball representing Earth to prevent light from the flashlight reaching the moon? Why is the moon not visible if sunlight cannot reach it? Record your model with a picture or diagram. Can you change the model to represent a solar eclipse? Use your model to explore possible reasons we do not have eclipses every time the moon orbits Earth. What can you predict about the orbital path of the moon compared to the plane of the solar system?

7.ESS.5 The relative positions of Earth and the sun cause patterns we call seasons.

Outside option: Record the location of sunrise and sunset once each week. Be sure to check from the same location each day. Observe and record what object (house, tree, pole, barn) the sun rises and sets directly above. How quickly does the location shift? In what direction (north, south, east, west) does it shift? Does this shift continue in the same direction all year? Investigate changes before and after the winter (Dec. 21 or 22) or summer (June 20, 21 or 22) solstice if possible. What changes at the solstice? Relate your observations of sunrise and sunset to seasonal changes in Ohio. Predict whether the sunrise and sunset locations would be the same for observers at other locations on the Earth.

Inside option: Investigate the amount of light energy on different portions of Earth. You will need a piece of grid paper and a light source (flashlight, cell phone, light bulb). If you do not have graph paper, make grid paper by drawing vertical lines on notebook paper or putting grid lines on plain paper. You may need to tape more than one sheet of paper together depending on the angles and distances you choose. Shine your light straight down onto the paper from directly above. Draw a circle around the lighted area. Count the number of squares in the lighted area. Decide on a method to deal with any partially lit squares. Next, hold the light so it shines on the paper at an angle (be sure to keep it the same distance away). Circle the lit area and count the squares. Try several angles. Organize your data and look for a relationship between the angle of the light and the number of squares lighted. If the same light is spread over more squares how does that affect how well the area could be heated by the light energy? If you have a thermometer, test the heating from a light at different angles. How do these results compare with your prior experience with temperatures on a sunny day? How does the noon temperature (sun high in the sky) compare with the early morning or evening temperatures (sun at a low angle)? Try shining your light on a round surface (ball). What do you observe about light on curved surfaces? Relate this to temperatures near Earth's equator and near the poles.

7.PS.1 Elements can be organized by properties.

Outside option: Take a walk around your yard, farm or neighborhood and identify items you find that are composed of various elements. Using photos, drawings or item names, categorize your items as metals, metalloids or nonmetals. Which category has the most representatives?

Inside option: Investigate the composition of kitchen items. Compare the uses for items made from metals with those made from nonmetals. What properties of metal make it a good choice for the metal kitchen utensils, appliances or surfaces? What properties of nonmetals are helpful for the items made from nonmetals? Are there any kitchen items made from metalloids? What properties are beneficial in these items? How would you categorize the items in your kitchen according to the elements you think comprise them? What are the major differences in the purposes of the item and their composition? Summarize your findings.

7.PS.2 Matter can be separated or changed, but in a closed system, the number and types of atoms remains constant.

Outside option: What examples of mixtures and solutions can be found around the outside of your home?

Inside option: Compare the characteristics of different types of mixtures. Examine solutions (salt or sugar dissolved in water), suspensions (chalk or flour mixed with water) and colloids (milk, mayonnaise, gelatin). Can you see particles within the fluid? Can you see through the mixture? What happens to a light that is shined through the mixture?

7.PS.3 Energy can be transformed or transferred but is never lost.

Outside Option: Use everyday materials to design and construct a machine that performs a simple task in many steps. Test the machine as each additional component is added. Redesign to solve problems encountered during the testing and to reduce the loss of energy to the surrounding environment. Record any problems encountered, as well as the changes made to the machine to overcome these problems.

Inside Option: Look at a mechanical can opener and trace the flow of energy that is required to open the can. If available, compare that to an electric can opener or other kitchen device.

7.PS.4 Energy can be transferred through a variety of ways.

Outside option: Design a solar cooker and compare the cook times for multiple items (such as hotdogs or marshmallows) on a sunny day. Record the composition of each item and how that affects the cook time.

Inside option: Using action figures and toy cars, design a system with usable seatbelts. With your designed setup, explore and explain how seat belts work to keep you safe. Include in your explanation how energy is transferred through the system.

7.LS.1 Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments.

Outside option: Living things die, decay and provide nutrients to the next generation. Nature recycles organic material. Composting is one way to show how this happens. Use a bin or make a pile of yard waste and kitchen scraps such as skins from fruits and vegetables (do not include meats). Worms can accelerate the decay process. If you want the process to happen more quickly, make sure the pile gets moisture and is stirred or turned periodically. What do you notice about the pile? Record your observations. After the appropriate amount of time, use your composted material in a local garden.

Inside option: Look at your breakfast and think about the origin of one item (for example, eggs). Think about where it came from and where it got its energy. Trace the energy flow back to its original source. Do the same for your other food items. What do all the foods have in common? Think about what your body is going to do with the food. Trace your meal through your body, identifying how your body processes and uses the breakfast.

7.LS.2 In any particular biome, the number, growth and survival of organisms and populations depend on biotic and abiotic factors.

Outside option: Observe secondary succession in the temperate forest biome. Return a small patch of land to bare soil or fill a container with soil and place it outdoors. Watch the bare patch throughout the summer. What types of organisms are the first to inhabit the bare patch? Which plants grow first? What animals visit? How does this change throughout the summer? Predict what will happen to your bare patch if it is left unattended for an extended period of time. Ohio is a temperate deciduous forest biome, yet much of Ohio is no longer forested. Explain the events that changed Ohio's landscape over the past 200 years. Make predictions about changes to the biome if the human population of Ohio increases or decreases.

Inside option: Select two biomes (for example, desert and temperate forest) and compare the living and nonliving features in each. How are they the same? How are they different? Record your reflections. What if one nonliving feature, such as rainfall, was altered significantly for an extended amount of time. How would that biome change?