Here you will find lesson ideas for students in Kindergarten. They have been organized so that each experiment relates to a New Generation Science Standard. In cooperation with your classroom teacher, the experiments you choose, will cultivate a love of STEM subjects. Some of the lessons you will find here have been previously taught by RESET volunteers. If you create something new, please share with sherri.kohr@gmail.com so that your ideas can be added to the RESET experiment list. With ALL lessons, always attempt to:

- Teach concepts in multiple ways; Choose activities that reinforce learning goals
- Make things hands on & avoid power points!
- Include real life examples as you connect concepts to learning goals

The Next Generation Science Standards

There is no doubt that science—and, therefore, science education—is central to the lives of all Americans. Never before has our world been so complex and science knowledge so critical to making sense of it all. When comprehending current events, choosing and using technology, or making informed decisions about one's healthcare, science understanding is key. Science is also at the heart of the United States' ability to continue to innovate, lead, and create the jobs of the future. All students—whether they become technicians in a hospital, workers in a high-tech manufacturing facility, or Ph.D. researchers—must have a solid K–12 science education.

Through a collaborative, state-led process, new K–12 science standards have been developed that are rich in content and practice and arranged in a coherent manner across disciplines and grade levels to provide all students an internationally benchmarked science education. The Next Generation Science Standards are based on the *Framework for K–12 Science Education*

https://www.nextgenscience.org/get-to-know

A few details about the Next Generation Science Standards

- Every NGSS standard has three dimensions: disciplinary core ideas (content), scientific and engineering practices, and cross-cutting concepts.
- Scientific and Engineering Practices and Crosscutting Concepts are designed to be taught in context – not in a vacuum. The NGSS encourage integration with multiple core concepts throughout each year.
- The NGSS are standards, or goals, that reflect what a student should know and be able to do— they do not dictate the manner or methods by which the standards are taught.

The lesson ideas found below are merely suggestions of experiments that can be taught in a particular grade or unit of study. RESET will work closely with you, the volunteer, and the classroom teacher to choose experiments and activities that meet the needs of the students.

PS – Physical Science; LS – Life Science;
ESS –Earth & Space Systems; ETS – Engineering Design, Technology and Application Science

KINDERGARTEN

K-PS2-1 Motion and Stability: Forces and Interactions

Plan and conduct an investigation to compare the effects of different strength or different directions of pushes and pulls on the motion of an object.

EXPERIMENT
TITLE: PUSH AND PULL

SUBJECT AREA: Physical Science

OBJECTIVE: Teach about the forces of push and pull and explain about a "fair trial".

SUMMARY: Young children have experience with wind moving objects, but may never have had a chance to notice and wonder. Students will make and record observations. Students will ask questions about what they've observed in personal experiences. Teacher will model how to record observations.
Help students make connections between their observations of the phenomenon and the patterns and cause-and-effect relationships they notice in the investigations

GRADE: Kindergarten

VOCABULARY:
Push
Pull
Scientific trial

SET UP: Class should be divided into groups of 4 with each group seated around a group of desks

PROCEDURE:

STEP 1: Give each student a straw. Ask them to blow with the straw so that the air hits the back of their hands
Then ask them to describe what they feel. You might ask: What is pushing on your hand? (What did you blow through the straw?)

STEP 2: Ask: What do you think will happen when you use the straw to blow on other objects? Why do you think so?

STEP 3: Place one of each of the additional items on each table (feather, rock, large and small beans, pencil, paper, etc.) and let your students explore blowing on the objects for a little while. *This self-directed inquiry is very important for this age group.* Then ask your students to select one of the objects and answer this question:
What do you think will happen if you blow softly on this [object]?
If you blow harder?
Let them experiment and try and make observations. If all students want to choose the same object, place additional objects on the table. After a few minutes of exploration some questions you might ask your students include,

- How do you make the objects start moving?
- How does the object move (roll, slide, or hop) when you blow on it through the straw?
- What do you notice that is similar between the object's movement with a hard blow through the straw and a soft blow? What do you notice that is different?
- Can you make the object move the same distance each time? How did you do it?

  Give students an opportunity to continue exploring if they have not tried doing one of your suggestions (move the object same distance, hard blow and soft blow difference, etc.)

STEP 4: Help students make sense of their exploration. Ask student to put all materials in the middle of the table.

- What patterns did you observe? (objects move farther when you blow harder than softer, blowing on objects make them start moving, all the objects stopped moving, etc.)
- Help students use the patterns they observed to make cause and effect connections using "When… then" statements. (For example: When I blew harder on the cotton ball, then it moved farther.)

STEP 5**:** Ask students: How could we make a fair test to find out how far the same size blow through the straw (push) moves each object? Take all answers.
For a fair test, your students could line up the objects on the table and then have one student blow with the same size push through the straw on each object, noting how far each object moves.
Depending on the age and prior experience of your students, they may use different ways to measure how far each object moved. For example, students might just use general comparisons, such as farther, less far, etc. Your students might use non-standard measurements, such as their hands or other objects. They make place a piece of tape at the blown distance and measure it with any material in the classroom such a cubes, pencils,, crayons Students might also use a ruler (as appropriate).

STEP 6: Help students recognize patterns in their data. You might ask:

- Which objects moved the farthest? What did these objects have in common? (objects that roll or had wheels moved farther than objects that slide across the table, lighter objects moved the farthest, etc.)
- Which objects didn't move very far? What did these objects have in common? (heavy objects didn't move as far as light objects).

STEP 7: Consider asking these questions to help connect the investigations back to the phenomenon.

- How is blowing through the straw like the wind blowing outside? (air can move things, sometimes the wind blows softly and sometimes it blows hard)
- What does the wind pushing on you feel like?
- Does air move things/objects when it is not windy at all? Why do you say so?

STEP 8: With any extra time, allow students to find 2 objects in the classroom and use them to create a fair trial of which object will be pushed farther by a hard blow? As you walk around the room, encourage students to explain what they see using the "when…then" format. Help students modify or improve upon their ideas of a fair test to find out how far the same size blow through the straw (push) moves each object?

STEP 9: Collect all objects and make sure the classroom is set up in its original manner.

MATERIALS:

Description	Quantity	Can be purchased at
straw (short, or cut in half)	1/student + extras	Grocery store
Feather	1/group + extras	Craft store
Cotton Ball	1/group + extras	Grocery store
Small river rock or similar item	1/group+ extras	Craft store or your backyard
Dried beans (small and large such as kidney and lima bean)	1 of each/group + extras	Grocery store
Ruler	1/group	Ask classroom teacher
Other materials in classroom		

TITLE: PUSHES AND PULLS

SUBJECT AREA: Physical Science

OBJECTIVE: Use lesson as a final lesson of unit
Students experiment with cause and effect

SUMMARY: By experimenting with a cardboard boat and dishwashing soap, students see how the soap mixes with the water to weaken attraction between boat and water pushing the boat forward.

GRADE: Kindergarten

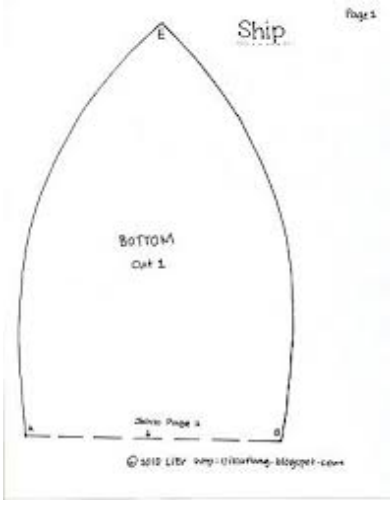
VOCABULARY:
Push
Pull
Force

CLASSROOM SET UP: Divide students into pairs or groups of 3 or 4

Background Information

In helping students be successful in the performance expectations, activities are geared to build on the inherent knowledge and experience that five-year old children have already acquired and use their knowledge in a wider range of tasks. If your lesson is a culmination to the unit, students have been given the opportunity to examine, measure, reflect upon, describe, and discuss how pushes and pulls of various objects are used to produce and control motion. Students have been asked to analyze what they have already observed, internalized, and made sense of through experience and observation. By exploring motion in a variety of settings, students are better able to think about their understanding so they can analyze and interpret observations and data, synthesize ideas, build new knowledge, and clarify their understanding. If your lesson is meant to be the final lesson in the unit, ask questions that allow students to demonstrate understanding, observation skills, and interpretation of the experience.

PROCEDURE:
Before class begins, cut out several (1/group) pieces of cardboard or foam board (approximatly 1 inch long) into a boat shape.



Then cut an inverted "V" shape into the stern (or back) of the cardboard 

STEP 1: Welcome the class and tell them today we are going to continue the discussion of push and pull and look at some properties of boats and some properties of water.

STEP 2: Hand out materials to each group of students

STEP 3: Ask one student in each group to gently place the cardboard boat in the pan of water.

STEP 4: Ask another student to carefully place 2 drops of dishwashing soap onto the water inside the cut out V at the back of the boat

STEP 5: Ask students "what happened?" "Why do they think this happened"

STEP 6: Now ask another student in the group to move the boat to the other end of the pan gently and place a small piece of soap onto the water inside the cutout V at the back of the boat. Ask: "What happened?"

STEP 7: Explain that the dishwashing liquid weakens the force between the water at the back of the boat so that now the pull of the water at the front of the boat is stronger and the boat pushes forward.

STEP 8: Ask: "Would soap be an efficient material to push a large real boat? Why? Why not?

STEP 9: Allow the students to create some of their own boats out of available materials and repeat the dishwashing soap experiment.

MATERIALS

DESCRIPTION	QUANTITY	CAN BE PURCHASED AT:
Cardboard for Boats	1 boat/group	Target/Michaels
Dishwashing soap	Small dish/group	Grocery store
Small pieces of soap	A few pieces/group	Grocery store
Shallow pans of water	1/group	Aluminum pans at grocery store
Water		Classroom Sink
Other building materials: Leaves, twigs, construction paper, cloth, whatever you choose	A few options	Classroom/Outside Art Supply store

K-PS2-2 Motion and Stability: Forces and Interactions

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*

K-LS1-1 From Molecules to Organisms: Structures and Processes

Use observations to describe patterns of what plants and animals (including humans) need to survive.

TITLE: Your Schoolyard
This lesson can take two days to complete with an optional third day activity if interested.

SUBJECT AREA: What plants and animals can we find in the local school yard. Learn how scientists collect data.

OBJECTIVE: Students will inventory the schoolyard wildlife habitats, record observations and use observations to evaluate what plants and animals need to survive in this habitat.

SUMMARY: Students will learn about the meaning of biodiversity, and create a schoolyard biodiversity checklist. As a follow up, if desired, class can create a plan to increase wildlife in the school yard and build bird feeder(s).

GRADE LEVEL: Kindergarten

VOCABULARY:
Biodiversity: is made up of two **words** "biological" and "diversity". It means the number and variety of organisms found within a specified geographic region….like the school yard.

Habitat: a place where a plant or animal can get the food, water, shelter and space it needs to live.

Ecosystem: an area that contains organisms (e.g., plants, animals, bacteria) interacting with one another and their non-living environment.

Classroom Setup:
Students will be working outside. In order to have the smallest number of children in each group (more participation this way) divide the students into the number of adults helping out. It is possible that you may need to divide the class in two groups if only you and classroom teacher are available. If a classroom aide can assist, then divide into three groups, Etc.

PROCEDURE: PART 1

STEP 1: Discuss habitats with your students. Explain a habitat is a home. Each plant and animal has a preferred habitat that provides food, water, space and shelter. A habitat can be large like a forest or as small as a crack in the sidewalk.

STEP 2: Brainstorm what sorts of things plants & animals need to survive and where those things might be found in your schoolyard. (food, water, space and shelter)
Ask the students if they can think of places around the school where animals tend to be seen (i.e. robins on the front lawn, deer in the soccer field, birds at a feeder or squirrels by a tree).

STEP 3: Explain that you will be taking an inventory (counting) of what your schoolyard has to offer to wildlife.

STEP 4: Explain that an ecosystem is an area that contains organisms interacting with one another and their non-living environment. An ecosystem can contain many habitats. Think about a forest ecosystem. Ask: What kinds of different habitats do you think exists in a forest? (tree canopy, tree trunk, under dead logs, within leaf litter, underground etc.). Do forest only have trees? What do you find on the ground under the trees? Do the same type of animals live at the tops of the trees and under the dead logs?

STEP 5: Explain, When we measure biodiversity in our school yard, we are going to be measuring how many different kinds of plants and animals live here..

STEP 6: Explain to the students that they are going to divide into groups and that each group is going to search the school yard habitat. As you observe, let the adult with you know the different types of animals you see, the types of foods you see that the animals might eat like nuts, seeds or berries, how many different types of flowers we see in our school yard, if we see puddles or ponds or streams. We will look to see if we find any areas where animals might hide like tops of trees, burrows, places in the sidewalk. "Everybody ready to go a biodiversity hunt?" The adult leader of each group can record a running tally of the observations, using the habitat scorecard.

STEP 7: Give each adult a habitat scoreboard and a pencil. Set an amount of time to be gone and be sure to ask the teacher if there is anywhere on school grounds that you CANNOT go? Take your group and LOOK!

Habitat Scorecard

Observe your schoolyard habitat. Ask the students to tell you when they find something interesting. The adult will read out loud various items on the scoreboard and ask your students to call attention to them when they see them. Ask the students to guess or count how many flowers, for instance, they see in a small area. Record on Worksheet. The adult may need to remind students of all the items on the checklist as they move around habitat. Place a check in the appropriate box indicating the amount of each resource found in your schoolyard. Return to classroom when your time runs out!

HABITAT SCORECARD

	None	**Some**	**Many**	**Lots**
Foods:	**(0 sources)**	**(1-5 sources)**	**(6-12sources)**	**(more than 12 sources)**
Nuts, Seeds, Berries				
Other Fruits				
Nectar/Flowers				
Insects, Small Animals				
Water:				
Standing water present all year				

Standing water for part of the year				
Birdbaths/manmade water supplies				
Shelter:	**(None)**	**(1-5)**	**(6-12)**	**(more than 12)**
Rock or brush piles				
Thick bushes or brambles				
Wooded areas				
Meadows				
Dead standing trees				
Fallen dead trees				
Streams/other bodies of water				
Space:	**(None)**	**(small area)**	**(medium area)**	**(large area)**
Fields				
Meadows				
Scrub/shrub				
Wetlands				
Forests				
Streams				

STEP 7: If time permits you can go back in the classroom and tally all the leader's scorecards. If not, ask teacher to do that and share with students tomorrow.

PART TWO: NEXT DAY OR NEXT WEEK:

STEP 1. Back in the classroom, discuss how many species live in the schoolyard habitat; explain that this number represents your school yard species **diversity**

STEP 2: . Ask students if they think there is anything that can be done to bring more wildlife to the school habitat. Take all suggestions.

STEP 2: SAY: All those ideas are great. Today we are going to do one thing that might bring more birds to our school yard habitat. We are going to make birdfeeders.

STEP 3: Allow students to build birdfeeders, design of your choice based upon resources, time available, etc.

MATERIALS:

Description	Quantity	Can be purchased at:
Habitat Scorecard	1/group	Must be copied
Pencil or pen	1/group	Classroom
Materials for a bird house of your choice	Enough for each student to make their own	

K-ESS2-1 Earth's Systems

Use and share observations of local weather conditions to describe patterns over time.

K-ESS2-2 Earth's Systems

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

K-ESS3-1 Earth and Human Activity

Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

K-ESS3-2 Earth and Human Activity

Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*

K-ESS3-3 Earth and Human Activity

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.