MICHIGAN STATE UNIVERSITY | Extension

MI STRONGER FAMILY

Inquiring Minds Want to Know

Science Activities for Young Minds

Why Science?

The purpose of "Inquiring Minds Want to Know: Science for Young Minds" is to provide ideas for facilitating science with young children so they gain important life skills and experience the excitement of science exploration.

"The capacity of young children to reason in sophisticated ways is much greater than has long been assumed. Even before they start school, children develop their own ideas about the physical, biological, and social worlds and how they work" (National Research Council, 2011).

Science engages their curiosity.

Science provides kids the opportunity to know that they can help solve the world's big problems.

Science provides practical tools for understanding everyday life.

A science facilitator's role is to encourage important life skills:

- **Critical thinking –** Ask open-ended and thought-provoking questions.
- **Problem solving –** Provide opportunities for children to develop their problem-solving skills through open-ended challenges.
- **Decision making –** Through the exploration of science, children experience the wonder of wrong answers that lead to more exploration and discovery.
- **Learning to learn –** Children self-direct their own learning because of their curiosity. They desire to understand the world they live in.
- **Creative thinking –** Encourage children to carry out their off-the-wall ideas and discover what happens. Even if the experiments fail, the process of trying something new encourages creativity
- **Communication –** Provide opportunities for children to share their discoveries through language by discussing them with peers and educators.
- **Teamwork –** Provide opportunities for children to discuss, argue and compromise as a team while they engage in science exploration.
- **Perseverance –** Failure is critical to science. When experiments do not work out as predicted, encourage children to try again and think about why it didn't work.

The scientific process for children involves observation, prediction, experimentation and interpreting the results.

Through the exploration of the world around them, children make **observations**, using their senses to discover how things interact and impact their world. They learn through these observations and begin to **predict** what might happen before they begin **experimenting** and playing with their world. Children use their observations, predictions and experiments to **interpret** how and why things happen and learn about the world.

Children learn and retain more when teaching involves actions. You can help children recognize that they are learning when they are doing by posing simple questions while they are doing science. Combining activities with questions helps children learn.

Science is:

- **Inclusive:** it is part of our daily lives – all day, every day, everywhere we go.
- **Across subjects:** it's not isolated from everything else in our lives – it crosses into all subjects. It can be found in history, geography, philosophy, dance, music, shooting sports, art and beyond.

- **Developing literacy skills:** literacy skills are integral to science – reading, writing and speaking are all essential to comprehending and communicating issues and ideas.
- **Developing math skills:** math is integral to science – sorting and classifying, estimating, counting, measuring, graphing, collecting data and analyzing.

Science is not…

- **Knowing the answers –** Science is about discovery, not about what you already know. Science is not a set of facts that have already been discovered by others. It is a process – a way of thinking and understanding the world. When you are working with young children, they may not get the correct answer, and that is fine. It is more import to encourage children to ask how and why.
- **A recipe –** Science isn't just about following a set of instructions to get the same results each time. When experiments do not work out as predicted, help children to try again and think about why they didn't work. It is tempting when working with young children to have them follow the directions and achieve the predicted results, but that is not what science is about.
- **Magic –** Science is about trying to understand why things happen. Science does create cool things that mystify your classroom. However, if you don't try to discover the science behind the magic, you are not doing science.

Science: Asking Questions, Discovering Answers

"Somewhere, something incredible is waiting to be known" (Carl Sagan). And somewhere there are children who are ready and excited to discover those incredible things.

"The whole of science is nothing more than a refinement of everyday thinking" (Albert Einstein).

It's more important to ask the questions than to give the answer!

Science is all around us. Explore it!

Inquiring Minds Want to Know

Science Activities for Young Minds

Recommended Reading

Youth can enhance their knowledge about science and the world around them in many ways. Reading for pleasure is one of those ways. It encourages young people to continue to explore their personal interests.

The books suggested here are both fiction and nonfiction titles focused on science inquiry. Each book provides an opportunity for children to read and increase their science literacy and offers opportunities to incorporate science concepts into other activities.

The books can be used to start discussions on topics currently being explored or simply for personal enjoyment. Either way, they enhance learning.

Activity Title	General topics
Bean Hunters	Animal and plant adaptation
Bouncing Bubbles	States of matter: mixtures sink and float, things that don't mix
Build a Farm	Farm design and environments
Chromatography Butterflies	States of matter: mixtures sink and float, things that don't mix
Cleaning and Shining Pennies	Acid/soap
Cleaning Teeth	Human body
Create A Critter	Animal and plant adaptation
Dancing Kernels	States of matter: mixtures sink and float, things that don't mix
Growing Plastic Beads	Water, hydration, weather, water cycle, hot and cold
Incredible Inflating Balloon	Acid/base
Launching Cotton Balls	Energy of motion/engineering/simple machines
Lava Lamp	States of matter: mixtures sink and float, things that don't mix
Make It Rain	Water, hydration, weather, water cycle, hot and cold
Oobleck	States of matter: mixtures sink and float, things that don't mix
Ramp and Roll	Energy of motion/engineering/simple machines
Soil Tubes	Water hydration, weather, water cycle, hot and cold

Problem solving and science exploration:

- **Wild Ideas** by Elin Kelsey, Owlkids Books Inc.
- **One Small Square: Backyard** by Donald M. Silver, Learning Triangle Press
- **Usborne First Illustrated Science Dictionary** by Sarah Khan, EDC Publishing
- **Usborne Illustrated Elementary Science Dictionary** by Sarah Khan and Dr. Lisa Jane Gillespie, EDC Publishing
- **Smithsonian Science: A Visual Encyclopedia**, DK Publishing

Animal and plant adaptation:

- **Just Kids: Pictures, Poems and Other Silly Animal Stuff Just for Kids** compiled by Bonnie Louise Kuchler, Willow Creek Press
- **In the Forest**, by Gillimard-Jeuesse, illustrations by Pierre de Hugo, Cartwheel Publishing
- **A Rainbow of Animals** by Melissa Stewart, Enslow Publishers, Inc.
- **Rainbow**, by Marion Dane Bauer, Simon Spotlight Publishing
- **Unbeatable Beaks** by Stephen R. Swinburne, Scholastic, Inc.
- **Green** by Laura Vaccaro Seeger, Roaring Book Press
- **Butterfly, Butterfly: A Book of Colors** by Petr Horáĉek, Candlewick Press

Farm design and environments:

- **The Secret Pool** by Kimberly Ridley, Tilbury House Publishers
- **Old MacDonald** by Amy Schwartz, Scholastic, Inc.
- **True or False: Farm Animals** by Melvin and Gilda Berger, Scholastic, Inc.
- **Trees** by Lisa Jane Gillespie, EDC Publishing
- **How Flowers Grow** by Emma Helbrough, EDC Publishing
- **The Tiny Seed** by Eric Carle, Scholastic, Inc.

States of matter: Mixtures, sink and float, things that don't mix:

- **Pop! A Book about Bubbles** by Kimberly Brubaker Bradley, Margaret Miller (photographer), Harper Collins Publishing
- **Perimeter, Area, and Volume: A Monster Book of Dimensions** by David A. Adler, Holiday House
- **Solids** by Jim Mezzanotte, Weekly Reader Early Learning Library
- **Liquids** by Jim Mezzanotte, Weekly Reader Early Learning Library
- **Gravity** by Jason Chin, Roaring Brook Press
- **Hot and Cold** by Gini Holland, Weekly Reader Early Learning Library
- **Blue Chicken** by Deborah Freedman, Penguin Group, Inc.
- **Bartholomew and the Oobleck** by Dr. Seuss, Random House
- **One Duck Stuck** by Phyllis Root, Scholastic, Inc.

Energy of motion/engineering/simple machines:

- **Stop that Ball!** by Mike McClintock, Random House
- **Drummer Hoff** adapted by Barbara Emberley, Prentice-Hall; 5th Printing edition (1967)
- **What Happened?** By Rozanne Lanczak Williams, Gwen Connelly (illustrator), Creative Teaching Press
- **Smithsonian Science: A Visual Encyclopedia**, DK Publishing
- **A House for Hermit Crab** by Eric Carle, Scholastic, Inc.
- **Roll, Slope, and Slide: A Book about Ramps** by Michael Dahl, Picture Window Books
- **Forces Make Things Move (Let's-Read-and-Find-Out Science 2)** by Kimberly Brubaker Bradley, Paul Meisel (illustrator), Harper Collins Publishing
- **Motion: Push and Pull, Fast and Slow** by Darlene Stille, Sheree Boyd (illustrator), Picture Window Books (January 1, 2004)
- **The Road Builders** by B. G. Hennessy, Simms Taback (illustrator), Puffin Publishers

Water hydration, weather, water cycle, hot and cold:

- **Hello Ocean, Hola Mar** by Pam Muñoz Ryan, Scholastic, Inc.
- **Little Cloud** by Eric Carle, Scholastic, Inc.
- **Raindrops Roll** by April Pulley Sayre, Beach Lane Books
- **Water is Water** by Miranda Paul, Roaring Brook Press
- **Hot Dog, Cold Dog** by Frann Preston-Gannon, POW! Publishing

Human body:

- **Andrew's Loose Tooth** by Robert Munsch, Scholastic, Inc.
- **My Amazing Body: A First Look at Health and Fitness** by Pat Thomas, Barron's Educational Series, Inc.
- **Brush, Brush, Brush** by Alicia Padron, Children's Press Publishing
- **Melvin the Magnificent Molar!** by Julia Cook & Laura Jana, Melvin Publisher
- **Brush Your Teeth, Please** by Leslie McGuire, Reader's Digest

MICHIGAN STATE UNIVERSITY | Extension

MI STRONGER FAMILY

Inquiring Minds Want to Know

Science Activities for Young Minds

Inquiring Minds Want to Know Contacts

The Inquiring Minds Want to Know: Science for Young Minds program was developed as a collaborative effort of the Early Childhood Education team and the Science Literacy team.

Staff members who have participated in the train-the-trainer training but have questions on any of the materials or activities are welcome to contact any team member for assistance.

Team members are also available to do local trainings if local staff members are not available to do them.

Darren Bagley
Michigan State University Extension
605 N. Saginaw St., Suite 1-A, Flint, MI 48502
bagleyda@msu.edu

Jan Brinn
Michigan State University Extension
3255 122nd Ave., Suite 103, Allegan, MI 49010
brinn@msu.edu

Kittie Butcher
Michigan State University Extension
100 East State Street, St. Johns, MI 48879
butche36@msu.edu

Tracy D'Augustino
Michigan State University Extension
320 S. State St., Harrisville, MI 48740
daugustt@msu.edu

Kendra Moyses
Michigan State University Extension
446 W. Circle Drive, Rm. 160, East Lansing, MI 48824
kmoyses@msu.edu

Dorothy Munn
Michigan State University Extension
205 S. 8th St., West Branch, MI 48661
munnd@msu.edu

Inquiring Minds Want to Know
Science Activities for Young Minds

Inquiring Minds Want to Know Resources

Science is in the world all around us and affects our everyday lives. Look for experiential learning opportunities in activities involving music, art, cooking, math, outdoor walks and more.

When planning, think about how you can help children see the science involved. You may need to do some research ahead of time so that you understand, but it can be fun for you and your children.

Your child might not be a future scientist, but you never know, so help him or her get off to a good start.

- **4-H Science Blast in the Class**, MSU Extension
  4h.msue.msu.edu/4h/science_blast
- **National 4-H Science Day Experiment**
  www.4-h.org/4-h-national-youth-science-day

4-H resources from other states to support science education for children 5-8

- **Ohio 4-H Cloverbud Connections**
  www.go.osu.edu/click
- **Wisconsin Science Activities**
  www.uwex.edu/ces/4h/set/science.cfm
- **New York 4-H Science Tool Kit**
  www.nys4h.cce.cornell.edu/about%20us/Pages/4-HSET.aspx
- **4-H Science Discovery Series #07914**
  http://www.4-hmall.org/Product/4-hcurriculum-science-discovery/07914.aspx

Science resources to support science education for children 5-8

- **WKAR and PBS Television**
  www.pbskids.org
- **Science Activities, American Chemical Society**
  www.acs.org/content/acs/en/education/resources/k-8/science-activities.html

Bean Hunters

WHAT YOU'LL NEED

- ❏ Plastic utensils (spoon, fork and knife)
- ❏ Three types of dried beans (the more varied the size, shape and color, the better). For example: garbanzos, lentils, kidneys, great northern beans, soybeans, split peas, black beans, large lima beans, etc.
- ❏ 3-ounce cup for each student
- ❏ Stopwatch timer

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Talk to the children about what all animals need to survive. The most basic survival needs are water, food, space and shelter. Explain that they will be predators – hunters – and need to catch food to survive. NOTE: With very small children, the beans have potential to be a choking hazard.

LET'S GO

1. Break the children into three groups. Give each group a different type of utensil to use. Explain to the children that they will be predators, animals hunting down their food to survive. You can give names to the creatures they will be hunting (such as "cyclops" for black-eyed peas or "green goblins" for split peas). Explain to the children that they need to capture and "eat" (put in their cup, not actually eat) enough food to survive to the next round.

   *Which predators do you **predict** will get the most food? What food do you think will be captured first?*

2. Spread the dry beans out on a table or floor (the amount of beans will vary depending on the size of your group, but provide at least ½ cup per child). Set the timer for 1 minute and let the children try to catch as many beans as they can to fill their cups. After 1 minute, discuss what the children ***observed***.

   *Were your **predictions** correct? Why did one group do better than another? What type of beans got "eaten" more? Why? Do you think anything will be different if we do it again?*

3. Students who did not get at least 20 beans (numbers might vary) have to sit out the next round. Remind them that they have an important job: they should **observe** those who survived and see if some people are more successful predators than others.

4. After the second round, have the children who were observers talk about what they **observed** first, and then have all the children discuss.

TALK IT OVER

Which tool worked the best? Why?

(For the observers) What did the most successful predator do differently that allowed him to be successful?

How do you think this is similar to what happens with wild animals in nature?

Did having fewer predators make it easier to capture the beans?

GOOD TO KNOW

Preschool:

- After the second round, ask the children to come up with different rules for the game, then compare how that changes the outcome. Examples: using one arm, wearing blindfolds, using only the non-dominant hand or having to catch two beans at once.

Upper middle and high school students:

- Use gloves, tweezers, chopsticks or other utensils.
- Vary the time spent hunting based on the age of participants. Older kids can hunt for shorter periods of time.
- Graph the number of prey captured and/or predators that survived.
- Have students use two utensils (one in each hand). They can be the same or different.

THE SCIENCE BEHIND IT

In nature, all animals require food, water, shelter and space to survive. How well an animal is adapted to its environment affects its ability to survive. Animals that can quickly adjust to environmental changes affecting water, space, shelter or food have a higher chance of surviving. The animals that survive are the ones able to react or adapt to new predators trying to eat them or deal with radical changes to their habitat. The animals that are slower to react or adapt may end up on the threatened or endangered lists. A new type of plant or animal might move into an area, and the existing life needs to change or the new ones will outcompete them. Invasive species such as emerald ash borer, sea lamprey or garlic mustard are examples of this.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- Steve Spangler website – http://www.stevespanglerscience.com/.

Bouncing Bubbles

WHAT YOU'LL NEED

- ❑ 1 cup of distilled water (or you can try tap water)
- ❑ 2 tablespoons of Dawn dish soap
- ❑ 1 tablespoon of glycerin
- ❑ Pair of inexpensive gloves or tube socks to put on your hands
- ❑ Small bubble wand or pipette (plastic eyedropper)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Make up a batch of bubble solution with the ingredients listed to the left. Making your bubble solution at least 24 hours in advance **and** allowing it to sit undisturbed will allow the bonds in your bubble solution to strengthen. You know what that means, right? Stronger bubbles!

LET'S GO

1. Using a small bubble wand, blow a bubble about the size of a baseball. If you are using the pipette instead of the bubble wand, cut the bulb off the top of the pipette, dip one end into the bubble solution, and blow into the other end of the pipette.

   *What do you **observe?** What shape are the bubbles? What color? Do they reflect images? Can you see yourself in the surface of a bubble? What do you **predict** will happen when you try to touch the bubbles with your gloved hands?*

2. Have the children blow another bubble and try to gently bounce a bubble off of your gloves.

   What happened?

3. Have the children blow another bubble and try bouncing the bubble off of your shirt or pants.

   Do some fabrics bounce bubbles better than others?

4. Blow several bubbles and have the children gently blow or fan them to keep them from hitting the ground so they pop without interference.

   Do some bubbles last longer than others? Why? Are they bigger? Smaller?

TALK IT OVER

Why do you think bubbles are round rather than other shapes?

Where do bubbles exist in nature?

Why do bubbles move through the air the way they do?

Where do bubbles go when they pop?

What is inside bubbles?

What makes a bubble pop?

GOOD TO KNOW

- Use two sheets of clear plastic (overhead sheets or page protectors). Dip both sheets and the blocks in the bubble solution, then put one sheet on a table and place the second sheet on top with small blocks between them. Then blow bubbles between them. When bubbles are about the same size as each other (uniform), they form perfect hexagons.
- Have older students explore why bubbles are round.

THE SCIENCE BEHIND IT

A bubble is air wrapped in a soapy film. The outside and inside surfaces of a bubble consist of soap molecules. A thin layer of water lies between the two layers of soap molecules, sort of like a water sandwich with soap molecules for bread. The bubble pops when it runs into something or the layer of water evaporates. Adding glycerin lengthens the lifespan of bubbles. Glycerin forms weak hydrogen bonds with water, delaying evaporation. Dry air or dry hands can still burst a bubble.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/.

MICHIGAN STATE UNIVERSITY | Extension

Inquiring Minds Want to Know

Science Activities for Young Minds

Build a Farm

WHAT YOU'LL NEED

- ❏ White plastic shower curtain or oversized poster board
- ❏ Assorted colors of permanent markers
- ❏ Magazines with photos of agriculture, farms, etc.

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Set out a large white shower curtain or oversized poster board, assorted permanent markers and magazines about agriculture.

LET'S GO

1. Have children tell you what is on a farm. *What makes it run? Why are these things on the farm? What is their purpose?*
2. Encourage them to decide what type of farm they will have. *Will their farm be specialized for vegetables, fruits, crops or livestock?*
3. Ask the children to imagine what their farm needs to look like. *How much land will they need to have? What types of buildings, roads, fences or feed equipment are needed? What is needed to keep animals safe?*
4. As the children discuss and plan how they will organize their farm, suggest looking at agricultural magazines or photos to get ideas. Ask children questions to encourage them to think about the placement of structures and roadways on their farm. *Where does the water come from? Where does it go after they are done using it (drainage)? When considering where to place roads or driveways, think about where they need to travel. What safety considerations do they need to make? Is there a busy street that could be dangerous for animals?*
5. Ask the children to draw their farm on the white plastic shower curtain or poster board using permanent markers. Encourage them to include as much detail as possible.

TALK IT OVER

Why is it important to decide how to lay out a farm?

Does it matter what type of farm it is? Why or why not?

What has to happen to the animals and plants grown on the farm before they get to the grocery store?

What things in a grocery store come from a farm?

How does the food made on the farm get to the store?

What happens to the poop from the animals on the farm?

What environmental issues might farmers need to think about?

GOOD TO KNOW

Suggest taking a field trip to a local farm or invite a farmer to speak to your group about his/her farm operation and layout.

THE SCIENCE BEHIND IT

It takes a lot of science to run a farm. Plant science, soil science, weather science, animal nutrition, animal breeding, genetics, environmental science, economics, technology, engineering for buildings and vehicles, and many others are needed to have a successful operation. Farmers carefully plan the location of animals and barns, and crop rotation to ensure a legacy of farming for future generations. The flow of water, times to plant, crops to rotate or plant together, equipment safety and animal safety are just a few of the well-researched topics studied by farmers.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- Breakfast on the Farm – a wonderful opportunity to visit a working Michigan farm and learn about agriculture. Breakfast on the Farm website – http://msue.anr.msu.edu/resources/breakfast_on_the_farm.
- Explore a farm virtually at the 4-H Virtual Farm website from Virginia Cooperative Extension – http://www.sites.ext.vt.edu/virtualfarm/.
- Information on environmental topics can be found by contacting your local Soil Conservation District. Visit the Michigan Soil Conservation website – http://macd.org/local-districts.html.

MICHIGAN STATE UNIVERSITY | Extension

Inquiring Minds Want to Know

Science Activities for Young Minds

Chromatography Butterflies

WHAT YOU'LL NEED

- ❑ White coffee filters (one/child)
- ❑ Non-permanent markers
- ❑ Eye droppers/plastic pipettes/ plastic coffee stirrer (something that allows water to drip)
- ❑ Bowl or cup for each child to hold the filter
- ❑ Water
- ❑ Chenille stems (pipe cleaners)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Put plastic tablecloths on surfaces to protect from spills. Set out markers, eye droppers/pipettes, bowl of water, coffee filters and chenille stems.

LET'S GO

1. Have each child draw a color circle in the center of his/her coffee filter with one color of marker. Time to get up and **observe**.

   What color did they each choose? Why did they choose those colors?

2. Hold the coffee filter horizontally or rest the coffee filter on a bowl so the center of the filter doesn't touch the table. Have the kids **predict** what will happen if you add a drop of water.

   What do you think will happen when you add the water? What will happen to the marker circle? Will the color spread? Will it stay the same?

3. Have the kids place one drop of water in the marker circle and **observe** the water spread. Add another drop when the water stops spreading. Repeat until you can see all the pigments that were in the marker.

   What happened when you added the water? What happened to the marker circle? Did the color spread? Did it stay the same?

4. Make more marker circles on the coffee filter and repeat the water dropping process to make fun designs.

   *Do you **predict** that different colors will spread differently? What do you **predict** will happen to the other marker circles? Did you find other colors when your color spread out?*

5. Let the coffee filter dry. Then accordion fold it from top to bottom. This creates wings for the butterfly. Wrap the chenille stem around the center of the folded coffee filter. Bend the tips to create antennae and fan out the wings to complete your butterfly.

TALK IT OVER

Why do you think we saw one color when we used the marker but many colors when we added water to the markers?

What did we do to the color when we added water? What did the colors do? Were they similar or were they different?

GOOD TO KNOW

1 to 5-year-olds:

- Be sure to use non-toxic markers and monitor children's use of the markers.

Upper middle and high school students:

- Use different brands of markers and predict if the results will be the same. Compare the results of markers of the same color but different brands.
  Would the experiment work with permanent markers? Why or why not?
- Try using various solvents with permanent markers. Try solvents such as vinegar, dish soap or rubbing alcohol. (NOTE: rubbing alcohol should be used in a well ventilated area) *Which solvent worked? Why or why not?*

THE SCIENCE BEHIND IT

Coffee filter butterflies can be used to illustrate chromatography. Chromatography is the process of separating mixtures. Many inks and markers are a combination of several different color molecules. Each color molecule is a different size and can be separated by size. This results in a separation of the colors. When the liquid is put on the coffee filter in the colored circle, it flows through the filter and dissolves the color molecules, which are moved through the filter with the water. How far various colors get carried depends on their size. The bigger the molecules are, the more slowly they are moved with the water through the filter.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/.
- Steve Spangler website – http://www.stevespanglerscience.com/lab/experiments/is-black-black.

Inquiring Minds Want to Know
Science Activities for Young Minds

Cleaning and Shining Pennies

WHAT YOU'LL NEED

- ❑ White vinegar
- ❑ Dish soap
- ❑ Lemon juice
- ❑ Ketchup
- ❑ Water
- ❑ Dirty pennies
- ❑ Shiny penny
- ❑ Paper towels
- ❑ Small bowls or cups (small plastic containers that can be covered work well)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

1. Set out clear cups or bowls with each of the following solutions: water with dish soap added, white vinegar, lemon juice and ketchup.
2. Put pennies in another bowl. Save the new shiny penny.
3. Prepare a bar graph to record children's predictions (be sure to leave the solution names off the paper until children guess what they are).

LET'S GO

1. Have each child choose one penny from the bowl of pennies. Then show them a shiny penny.
2. Ask each child to **observe** his/her penny. *How would you describe the penny you are holding? What differences do you **observe**?*
3. Show the children the bowls of solutions and explain they are going to do an **experiment** to try to make their pennies shiny again. Ask the children to make **observations** using their senses of touch, sight and smell to try to identify each solution. As you talk about what is in each bowl, ask the children to **predict** if it will clean the pennies. Have children record their prediction on a bar graph.

   *What do you **predict** is in each of the bowls? What do you **observe** about each solution? How are they different? Similar? Which solution(s) will clean the pennies? Why do you think some solutions will clean the pennies? Which solution do the most people **predict** will clean pennies? Are there any solutions that no one thinks will work? (Record the children's responses to discuss after the pennies have soaked.)*
4. Have each child submerge his/her penny in a solution. (If there is a solution that wasn't selected, put two of the dirty pennies in it

so that there is at least two pennies in each solution.) Take a break and return in 15 minutes or longer.

5. Give each child a sheet of paper towel, get the pennies out of the substance he/she selected, and wipe off their pennies with the towel.

What do you ***observe****? Do your pennies look different? Are there other solutions that you would like to try? Did your actual results match the predictions?* (Refer back to the bar graph and the children's written predictions.) Add the actual results to the bar graph.

TALK IT OVER

Encourage children to compare their pennies with pennies that had soaked in the other substances.

- *Did all the pennies come out cleaner?*
- *Did any of the substances seem to clean the pennies better?*
- *Why do you think some of the substances worked differently on the pennies?*

GOOD TO KNOW

9- to 12-year-olds:

- Complete the experiment using the same procedures but leave a couple of pennies in the vinegar and in the soapy water solutions for an hour or more. Come back and see how the pennies have changed.
- Try cleaning some pennies minted before 1982 and some that were minted after, and see the difference. The pre-1982 pennies were made with more copper, and the chemical reaction is more intense.
- Older children could also explore acids versus bases and how they work for cleaning various materials. Try fresh lemon juice versus concentrated lemon juice. Try tomato sauce instead of ketchup. (Do not mix chemicals together)

THE SCIENCE BEHIND IT

Because vinegar is an acid, it is great for breaking bonds in many chemicals, such as water mineral deposits or oxidized copper. White distilled vinegar is a strong acid and a popular household cleanser, effective for killing mold, bacteria and other germs.

Vinegar and lemon juice are acidic and will remove the copper oxide, leaving the pennies shiny. Though a soap and water solution is good at cleaning many things, it does not contain an acid and does not clean the pennies as well.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/
- Kitchen spring cleaning – part 2 – http://msue.anr.msu.edu/news/kitchen_spring_cleaning_part_2.
- Red and white vinegar cooking and household use – http://msue.anr.msu.edu/news/red_and_white_vinegar_cooking_and_household_uses.

MICHIGAN STATE UNIVERSITY | Extension

MI STRONGER FAMILY

Inquiring Minds Want to Know

Science Activities for Young Minds

Cleaning Teeth

WHAT YOU'LL NEED

- ❑ Eggs
- ❑ Tea or coffee
- ❑ Disposable cups
- ❑ Toothpaste
- ❑ Toothbrush for each child
- ❑ Paper towels
- ❑ Water
- ❑ Cola (optional)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Hard boil one white egg for each child plus some additional eggs in case some crack.

LET'S GO

1. Have each child write his/her name on a cup and put one hard-boiled egg in it. Then cover the egg with cold tea or coffee. Set the eggs on a counter to soak overnight.

   *What do you **predict** will happen to the eggs?*

2. The next day, have each child take his/her egg out of the cup and dry it off with a paper towel. **Observe** the egg for any before-and-after differences.

   Were there any changes? Describe the changes you see. Does the egg have a different texture?

3. Show the egg that was not soaked in any tea or coffee.

   What do you think caused the differences between your egg and the white one? Do you think it will get white again if we soak it in plain water? In soapy water? Any other ideas?

   The egg is stained brown just as our teeth are when we eat and drink.

4. *How do you clean your teeth? What do you think will happen if you use the toothbrush and toothpaste on your egg?*

   Have children dump the tea or coffee out of their cups, rinse them, and fill them about one-third full of water. Give each child a small toothbrush and some toothpaste. Invite children to do an **experiment** to see if brushing with toothpaste cleans their eggs. Have children brush first without toothpaste, then with toothpaste. Encourage children to brush gently.

TALK IT OVER

*Did you **observe** any changes when you brushed the egg?*

What do you think happens when you brush your teeth? Do you brush all your teeth?

Which egg would you like your teeth to look like?

What do you think would happen to your teeth if you brushed them only every other day? What if you never brushed them?

What are some ways that people clean things that get dirty? Dirty hands? Dirty dishes? Dirty pets?

GOOD TO KNOW

9- to 12-year-olds:

Instead of using purchased toothpaste, have youth mix baking soda and water to brush their eggs. Then encourage students to read toothpaste labels to see what the ingredients are.

Soak the eggs in cola overnight and observe what happens to the eggs color and texture. Talk about how soda pop might affect their own teeth.

THE SCIENCE BEHIND IT

On the outside of teeth is a protective layer of enamel, the hardest substance in the body. After eating, a sticky coating called plaque forms on the enamel of our teeth. We must brush off the plaque or it can make teeth change from white to yellow or brown. Plaque can also lead to cavities in the teeth. Tooth decay starts with the enamel, which has no feeling, but once it reaches the second layer, the dentin, it can start to cause a toothache. Cola is an acid and will react with the calcium in the egg shell causing it to soften or weaken (just like in our teeth). This experiment uses a hard-boiled egg as a pretend tooth.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/.
- *Brush, Brush, Brush* by Alicia Padron
- *Melvin the Magnificent Molar!* by Julia Cook & Laura Jana
- *Brush Your Teeth, Please* by Leslie McGuire

MICHIGAN STATE UNIVERSITY | Extension

Inquiring Minds Want to Know
Science Activities for Young Minds

Create a Critter

WHAT YOU'LL NEED

- ❏ Drawing and coloring materials (markers, crayons, colored pencils)
- ❏ Paper (for drawing)
- ❏ Photos or magazines of all kinds of animals (fish, insects, reptiles, birds, mammals)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Lay out pictures of various animals that show their adaptations (long-necked giraffes; animals with claws for climbing, defense or catching prey; animals with large eyes or ears, colors for camouflage, etc.).

LET'S GO

1. **Observe** the pictures of the various animals. *What do you* ***observe*** *about an animal that makes it the same as another animal? What makes the animal different from another animal? How might the animals' differences help them survive? Might they help it get food easier? Might they protect it from animals that might try to eat it? Might they help the animals move around better? What does looking at the animal tell you about where it might live?*

   Explain that these differences are called adaptations, and that they help an animal survive in the wild.
2. Ask the children to draw their own creatures with adaptations. Encourage them to be creative with their creatures. *What adaptations does your creature have? Why did you draw that animal? What will help the animal survive? Where might your animal live? How does it move? If it lived in another part of the world or in another environment, what different adaptations would it need? What does it eat? Why is it that color? Why is it that shape?*
3. Ask the children to group their animals. Then ask the children why they grouped the animals the way they did. (They can group them according to any number of characteristics: number of legs, where they live, whether they have feathers, color, what they eat or other characteristics discussed).

TALK IT OVER

How did you decide what kind of critter to make?

What kinds of characteristics does your critter have? Why did you choose those?

Which critter do you think would thrive in Michigan? Why?

GOOD TO KNOW

Older students:

Discuss reproductive adaptations, such as how animals might find a mate, the tradeoffs between producing a large number versus a small number of offspring, and competition for mates and nesting habitats. We've been talking about animals. Do plants have adaptations that help them survive and reproduce? Why do cacti have spines? Why do some flowers smell good?

THE SCIENCE BEHIND IT

ALL organisms need four keys things in their environment: food, water, shelter (safety) and space (for example, hunting or nesting territories). Animals and plants are adapted to a particular environment. Adaptations enable them to better meet these key needs, improving their ability to access food, avoid predators, reproduce, and resist disease and environmental stresses (such as severe weather).

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast. (This activity is similar to the "Fashion A Fish" Science Blast activity (1st - 7th grades) at 4h.msue.msu.edu/uploads/files/sbasfasionafish.pdf.)

MICHIGAN STATE UNIVERSITY | Extension

Inquiring Minds Want to Know

Science Activities for Young Minds

Dancing Kernels

WHAT YOU'LL NEED

- ❏ Any clear carbonated beverage (enough for each child)
- ❏ Water (enough for each child)
- ❏ Kernels of unpopped popcorn for each child
- ❏ Two small clear glasses for each child
- ❏ Raisins (optional) for each child
- ❏ Short pieces of dry spaghetti (optional) for each child

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Prepare two small glasses for each child. Pour at least 1 inch of water in one and 1 inch of carbonated beverage in the other.

LET'S GO

1. Distribute the small glasses of clear carbonated beverage and water, but don't tell the children what is in them.

   *What do you **observe** in each glass? What do you think is in each glass? What senses could you use to find out what is in the glasses?*

   Do you think it would be safe to taste the liquids to figure out what they are? Why or why not? Explain that it is never all right to taste something unless you know that it is safe to eat or drink.

   ***Observe** how the two liquids are alike. How are they different?*

2. Give each child several kernels of popcorn.

   *What do you **predict** will happen if you drop the popcorn kernels into each liquid? Will each liquid react the same? Why or why not?* Help children record their predictions.

   How can we find out if your predictions are right? What do you think we should do?

3. Have children drop half of their kernels into one of the glasses.

   *What did you **observe** happening to the kernels? What do you think will happen when you drop the rest of the kernels into the other liquid?*

4. Have the children drop kernels into the clear carbonated beverage.

   *What did you **observe** when you dropped the kernels into the clear carbonated beverage? What happened to the kernels? Was it the same as what happened to the kernels dropped into the water?*

   When the kernels in the clear carbonated beverage went to the bottom, did they stay on the bottom? Why do you think they came back to the top?

   ***Observe** the kernels, after they come to the top of the clear carbonated beverage. Do they stay there? What did you see happen? Why do you think the kernels fall to the bottom again?*

   *Why do you **predict** the kernels didn't pop up when you put them in the water?*

   *Were your **predictions** about what would happen correct? Why or why not?*

5. (Optional) Give each child a couple of raisins and a piece of dry spaghetti. You can also try the experiment with other small objects.

   *Do you **predict** the same thing will happen if you put a raisin in the water and in the clear carbonated beverage? What if you put a piece of dry spaghetti in the water and in the clear carbonated beverage?* Try it.

   Have children share their observations. *Were the results the same or different?*

GOOD TO KNOW

5- to 8-year-olds:

Follow the original directions with clear carbonated beverage and water. Then add additional liquids such as fruit juice or punch, tea, diet soda and caffeine-free soda. Have children predict the results with each of these liquids on the basis of what they learned in the original experiment. Then conduct the experiment with each liquid and discuss the similarities and differences.

9- to 12-year-olds:

Do all versions of the experiment. Observe and record what happens. Drop a nickel into the soda and observe what happens. Create a bar chart to record the results. Discuss any differences in results. Encourage children to select another readily available item and try the experiment. What are the similarities and differences between the things that rise in the soda and those that don't?

THE SCIENCE BEHIND IT

Making carbonated beverages involves dissolving carbon dioxide gas into a liquid under pressure. This process is called carbonation. When the popcorn kernel is dropped into the carbonated beverage. it sinks to the bottom, where carbon bubbles attach to it and lift it to the top of the beverage. The kernel floats on the top until the bubbles break, releasing the gas and allowing the kernel to fall to the bottom again. The process continues until the carbonated beverage goes flat – the carbon dioxide escapes. The carbonation bubbles attach to the surfaces of the various items. The rougher the surface, the more locations there are for the bubbles to attach.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- Steve Spangler website – http://www.stevespanglerscience.com/.

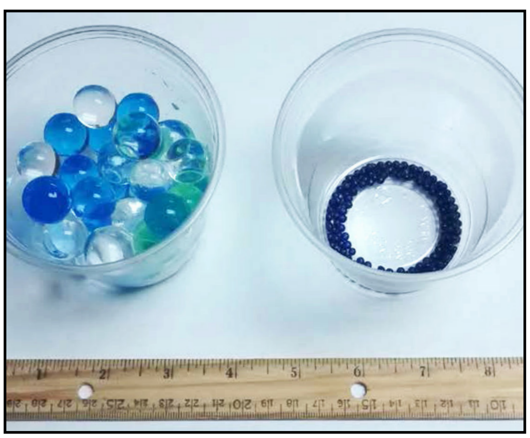
Inquiring Minds Want to Know

Science Activities for Young Minds

Growing Plastic Beads

WHAT YOU'LL NEED

- ❑ Multicolor hydrating (water) beads (also known as crystal water beads, magic water beads or water pearls), which can be found in the flower or craft areas at stores or at discount and dollar stores
- ❑ Water
- ❑ Vinegar
- ❑ Clear carbonated beverage
- ❑ Salt water
- ❑ Salt
- ❑ Small containers (1-3 ounces)
- ❑ Paper towel
- ❑ Clear container (1-2 quarts)
- ❑ Flashlight, light box or overhead projector (optional)
- ❑ Tape measure
- ❑ Ruler



WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Hydrate some of the beads by following the manufacturer's directions.

LET'S GO

1. Put some of the dry polymer beads into a container. Then ask the children to **observe** them using multiple senses (eyes and hands).

   *What do the beads feel like? What characteristics (physical properties) do they have? Do they roll? Do they bounce? Does light go through them? Are they hard? What do you **predict** will happen to the beads if you put them in water? Will they sink or float?*

2. Have the children add some water to hydrate the beads and allow them to soak. Or show them the beads that you already soaked.

   How did the beads change after they soaked in the water? Did their physical properties change? How are they different?

   *What do you **predict** will happen to the beads if you soak them in different liquids (carbonated beverage, vinegar, salt water)?*

3. Have the children try **experimenting** by soaking the beads in other liquids.

   What happened when you placed beads in different liquids? Did their physical properties change? Use the tape measure, ruler or flashlight to note changes in physical properties such as size, transparency, and translucency. *How did they change?*

   *What do you **predict** will happen if you add the beads to salt water? Do you think the results will be the same as when the beads soak in plain water?*

4. Have the children try **experimenting** by adding salt to some of the hydrated and some of the dry beads.

   What happened when you placed salt in with the beads? Did their physical properties change? How did they change?

TALK IT OVER

What would you do with the beads?

How could we use the beads?

What did you learn by observing the beads?

What did you like about growing beads?

What did you learn from growing beads that you didn't know before?

GOOD TO KNOW

1- to 5-year-olds:

Although these beads are non-toxic, some of the bigger beads might be a choking hazard.

6- to 18-year-olds:

Observe the beads in different stages of absorption under a microscope. Look into the chemistry of why the beads work the way they do. You can set up experiments to determine how much water weight the beads will absorb (see http://www.pslc.ws/macrog/kidsmac/work/index.htm).

THE SCIENCE BEHIND IT

Polymer beads work very similarly to gelatin dessert – they are super absorbent and swell to hold a large volume of water. Other applications of this principle include contact lenses, disposable diapers, silly putty and "slime". Polymers are long chains of many smaller molecules called monomers. Super absorbent polymers (SAP) are polymers with additional chemical bonds called cross-links, which hold sections of the polymer together and keep it from dissolving in water. These cross-linked polymer chains form pores similar to the holes in a sponge. When SAPs are placed in water or other liquid, the liquid molecules move into the pores and fill them up. The cross-linked polymer expands in volume as it absorbs the water.

Visit these websites for more on the chemistry of SAPs:

- http://ncsu.edu/project/chemistrydemos/Organic/Superabsorbent.pdf.
- http://community.nsee.us/concepts_apps/compu_anime/superabsorbent_polymers.swf.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/.
- Steve Spangler website – http://www.stevespanglerscience.com/lab/experiments/water-jelly-crystals-superabsorbent-polymers.

Incredible Inflating Balloon

WHAT YOU'LL NEED

- ❑ Safety goggles for each participant
- ❑ Plastic tablecloths
- ❑ Paper towels
- ❑ Funnel for vinegar
- ❑ Funnel for baking soda
- ❑ 1-cup measuring cup
- ❑ 1-tablespoon measuring spoon
- ❑ 9- to 12-inch balloons
- ❑ Empty plastic bottles
- ❑ Baking soda
- ❑ Vinegar

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

1. Decide if children will work alone, in pairs or in small groups.
2. Decide how materials will be distributed (will they come and get them, or will you have them ready for use at stations or tables?).
3. Put plastic tablecloths on surfaces to protect from spills.
4. Set out supplies and materials.

LET'S GO

1. Have children put on their safety goggles to protect their eyes. Measure out 1 cup of vinegar and pour it into each plastic bottle using the vinegar funnel. Time to **observe!** NOTE: Vinegar may sting if it gets onto a scrape or scratch on a child's hand.

   What does the vinegar smell like? What does it look like? What does it feel like? Does it feel like water or different?

2. Have the children gently stretch out their balloons a few times. Then measure out 1 Tbsp. of baking soda and pour it into each balloon using the baking soda funnel. Time to **observe!**

   What does the baking soda smell like? What does it look like? What does it feel like?

3. Now carefully cover the top of the plastic bottle with the open end of the balloon, making sure not to spill any of the baking soda into the vinegar. Be sure that the balloon is securely on top of the bottle before continuing. Time to **predict!**

   What do you think we are going to do next? What do you think will happen if we combine the baking soda and the vinegar? Why did we put the baking soda into the balloon? What is going to happen to the balloon?

4. Now lift the balloon up so that the baking soda falls into the vinegar and **observe** what happens! The mixture should fizz, bubble and expand, and the balloon should begin to fill up.

TALK IT OVER

What happened when you added the baking soda to the vinegar?

What were you able to observe in the bottle?

What happened to the balloon?

How do you think the balloon inflated without anyone blowing air into it?

*What do you think caused the **reaction** we saw?*

Did any of the baking soda disappear? Where did it go?

Could you add more baking soda to the vinegar and get the same reaction?

GOOD TO KNOW

2- to 5-year-olds:

Although the materials are non-toxic, be sure to have enough adults to help little hands measure the baking soda and vinegar.

6- to 18-year-olds:

Try the activity using different amounts of baking soda and vinegar and see if the reactions are similar or different. Try varying the temperature of the vinegar and see if that changes the reaction. *Could you add enough baking soda to cause the balloon to fly off?*

THE SCIENCE BEHIND IT

Bicarbonate of soda – baking soda, as we commonly know it – is a chemical base. This base reacts with the acid of the vinegar (its scientific name is acetic acid) and causes a chemical reaction called an acid-base reaction. This chemical reaction produces carbon dioxide gas. Gases need a lot of room to spread out, and after the carbon dioxide fills the bottle, it moves into the balloon, causing it to inflate.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/.
- Steve Spangler website – http://www.stevespanglerscience.com/lab/experiments/acid-base-rocket

MICHIGAN STATE UNIVERSITY | Extension

MI STRONGER FAMILY

Inquiring Minds Want to Know

Science Activities for Young Minds

Launching Cotton Ball Catapults

WHAT YOU'LL NEED

- ❑ Plastic spoons
- ❑ Cotton balls
- ❑ Rubber bands
- ❑ Masking tape
- ❑ Craft sticks (such as popsicle sticks)
- ❑ Tape measure

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Have a variety of launching photos to share during the wrap-up at the end. A few examples: rocket launch, catapult, baseball pitch, football toss, diving board.

LET'S GO

1. Explain to the children that their job is to **experiment** with a rubber band to find a way to use it to launch a cotton ball.

   Were you able to launch your cotton ball using the rubber band? Did your first idea work? Did you try different ways? Do you think the first time always works for scientists?

2. Explain to the children that their next job is to experiment with a variety of items to design something that will launch a cotton ball. Distribute the rubber bands, plastic spoons, masking tape, craft sticks and cotton balls. Measure how far each cotton ball flies.

   Were you able to launch your cotton ball? What did you use to launch your cotton ball? Did you make changes to the first design that launched your cotton ball?

TALK IT OVER

Observe and discuss the launching photos and/or videos.

What are some other examples of ways that things can be launched?

Have you ever used something to launch something else or yourself? For instance, a ball thrower, sling shot or a diving board?

Do you think the first time always works for scientists or engineers?

How many times do you think scientists or engineers test their designs?

What worked? What did not work and why?

What was different about the catapult designs that launched the cotton balls farther?

What other items could you use to launch your cotton ball?

If you launched something heavier than a cotton ball, would the extra weight make a difference in how far the object travelled?

GOOD TO KNOW

9- 12-year-olds:

This activity is a great way to introduce older children to the engineering design process. The process asks children to identify the problem or challenge, brainstorm possible design ideas, select a design and build it, test the design, improve the design and finally communicate their process. Children may document the design ideas tried throughout the process and the results through a journal.

Challenge older children to discover more real-life launchers and why they are important.

You may wish to create challenges for accuracy, height and distance with older children.

THE SCIENCE BEHIND IT

Catapults are simple or compound machines that propel an object.

A catapult stores potential energy and releases it. The physics concept that a catapult is based on is that stored potential energy can be converted into moving (kinetic) energy.

When the object is released from the catapult, it faces air resistance before getting to its target.

The science behind the fun is called transferring energy. When you pull the rubber band back, you are applying force over distance and doing work on the rubber band. How much work you do depends on how hard you pull on the rubber band (force) and how far back (distance) you pull the rubber band. Work=force times distance.

The work you do is stored as elastic energy in the rubber band. When you release the rubber band, the rubber band then does work on the object being launched, and the elastic energy is transformed into what is called kinetic energy (the energy of motion) in the flying object.

When the object hits something and stops, the kinetic energy is then transformed into another form of energy and/or transferred to that object. In other words, the energy you produce by pulling back on the rubber bands can be transformed from one kind of energy to another or transferred from one object to another.

Scientists and engineers use their understanding of simple machines, their knowledge of how science works and observations of the world around them to design many items that we use every day.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county or the MSU Extension Science and Technology website – http://4h.msue.msu.edu/programs/science_technology.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.

(Launcher was modified from the Engineering Challenges section of *Family Engineering: An activity and event planning guide* available at http://www.familyengineering.org/store/.)

Inquiring Minds Want to Know

Science Activities for Young Minds

Lava Lamps

WHAT YOU'LL NEED

- ❑ Clear bottles with caps (preferably plastic)
- ❑ Food coloring
- ❑ Vegetable oil
- ❑ Water
- ❑ Salt
- ❑ Fizzy antacid tablets, such as Alka-Seltzer (optional – for bubbling lava lamps)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

You may want to do a sink/float activity before doing this activity. Consider prefilling the bottles prior to the experiment for young children. If available, have a traditional lava lamp for demonstration.

LET'S GO

*What do you **predict** will happen when you mix water and oil?*

1. Fill the bottle about 3/4 full with oil.
2. Fill the rest of the bottle with water almost to the top.
3. When everything settles, have the children **observe** the oil. *Why do you think the oil floats on top of the water and doesn't sink? (optional) Put equal amounts of water and oil in cups on each end of a balance and see which is heavier.*
4. *What do you **predict** will happen when you add food coloring?* Add one drop of food coloring at a time. Dark colors work best to see that the food coloring colors only the water, not the oil. Have the children **observe**. *Why do you think the food coloring mixes only with the water and not with the oil?*
5. *What do you **predict** will happen when you add salt?* Shake salt on top of the oil slowly. Have the children **observe** what happens. Add more salt to keep the action going if desired. *What happened when the salt was poured on the oil?*

TALK IT OVER

Why do some things sink and others float?

*How can you **predict** if something will sink or float?*

Do all liquids weigh the same?

GOOD TO KNOW

- For a bubbling lava lamp, do not use salt. Divide fizzy tablet into eight pieces instead.

  *What do you **predict** will happen when you add the fizzy tablet?*
- Drop one of the tiny fizzy tablet pieces into the oil and water mixture. **Observe.** When the bubbling stops, add another chunk of tablet.

  What happened when the fizzy tablets were dropped in?

  What happens when you shake the bottle?

THE SCIENCE BEHIND IT

Oil floats on the surface of the water because water is denser than oil. Water molecules are polar molecules. Polar molecules have a partial charge on each end, like a magnet. Food coloring, soda pop and tea are all water-based and made of polar molecules. Polar molecules can mix. Oil molecules are nonpolar molecules, which do not have a partial charge. When you shake the bottle, the oil breaks up into small drops but does not mix with the water. Salt is denser than water, so when you pour salt on the oil, it sinks to the bottom of the mixture, carrying a blob of oil with it. In the water, the salt starts to dissolve. As it dissolves, the salt releases the oil, which floats back up to the top of the water.

The fizzy tablet reacts with the water to make tiny bubbles of carbon dioxide gas. These bubbles attach themselves to the blobs of colored water and cause them to float to the surface. When the bubbles pop, the color blobs sink back to the bottom of the bottle.

Things that are denser than water will sink. Even though oil and water are both liquids, Chemists call them "immiscible liquids." "Immiscible" simply means that they don't mix.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- Exploratorium – http://www.exploratorium.edu/science_explorer/volcano.html.
- Steve Spangler website – http://www.stevespanglerscience.com/.
- MSU Extension – http://msue.anr.msu.edu/news/explore_science_principles_with_a_homemade_lava_lamp.

Inquiring Minds Want to Know
Science Activities for Young Minds

Make It Rain

WHAT YOU'LL NEED

- ❑ Clear jar (a jar that is suitable for handling heat, such as a canning jar)
- ❑ Plate (ceramic, plastic, foam, or coated paper plate)
- ❑ Hot water
- ❑ Ice cubes
- ❑ Ruler
- ❑ Paper towel to clean up spills

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

1. Collect the supplies needed. Remember that adults should handle the very hot water.
2. Divide children into groups of two to four members with an adult to help. Groups should be small enough that each child can help with the experiment and easily observe what is happening.

LET'S GO

What kinds of weather have we had lately? Any snow? Rain? Warm and sunny?

Can you predict when it is going to rain?

Have you ever been outside when it was raining? What makes it rain? Do you think we could make it rain here in the room?

1. Let's see if we can make it rain. Have one child in each group get a clear jar for his/her group.
2. Have the adult pour about 2 inches of very hot water into the clear jar. Have another child cover the jar with the plate and wait a few minutes. *What do you* ***observe*** *happening inside the jar? Do you hear anything?*
3. Have another child put ice cubes on the plate while it is on top of the jar. *What do you* ***predict*** *will happen to the ice cubes on the plate? Why? Do you think the water in the jar will change? How?*

TALK IT OVER

What did you ***observe*** *happen to the air in the jar?* The steam in the jar is called water vapor.

What happens to the water vapor in the air in the jar when it hits the cold plate?

Where do the raindrops come from?

What happens to the rain when it falls to the bottom of the jar?

Can you think of anything in your world that is similar to the activity we just watched in the jar?

GOOD TO KNOW

0-to 5-year-olds:

Be especially careful with the hot water and talk with children about safety. This experiment is best done as a small group demonstration when working with small children. In small groups, children can see what's happening and help with the experiment. Children learn best when they are actively involved in the experience and able to use as many of their senses as possible. However, since this one uses very hot water, you need to address safety concerns.

9- to 12–year-olds:

After the initial activity, challenge youth to find out how big a raindrop is. Have them fill a shoebox lid with flour and level it off with a ruler. When it rains, take the lid out in the rain until 15 to 25 raindrops have fallen in the flour. Bring it inside and observe. Carefully pour the flour from the lid into a sieve over a bowl. Shake the sieve gently – the little lumps left behind are preserved raindrops. Carefully dump them out onto a table and use the ruler to measure them. *Why are the raindrops different sizes?*

THE SCIENCE BEHIND IT

All air holds moisture in the form of water vapor. Warm air has a higher saturation point than cold air – that means that it holds more water vapor than cold air. When hot water is put in the jar, the air is warmed and rises. When the plate is put on top of the jar, the warm air begins to condense and forms vapor that makes the jar look kind of steamy. When the ice is placed on the plate, the plate cools quickly. The cool plate cools the air inside the jar, causing the water vapor to condense and form water droplets. This is the same thing that happens in the atmosphere. Warm, moist air rises and meets colder air high in the atmosphere. The water vapor condenses and forms precipitation that falls to the ground as rain.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/.
- Rain Cloud in A Jar, SciTech Discovery – http://www.youtube.com/watch?v=pglbX1xtofE.
- Experiments for Kids Learning about Weather – http://www.weatherwizkids.com/weather-forecasting.htm.

MICHIGAN STATE UNIVERSITY | Extension

Inquiring Minds Want to Know
Science Activities for Young Minds

Oobleck

WHAT YOU'LL NEED

- ❏ Cornstarch
- ❏ Water
- ❏ 2 big bowls or containers
- ❏ A place you can get messy
- ❏ Food coloring (optional)
- ❏ Rimmed baking sheet (optional)
- ❏ Sound system with a subwoofer speaker (optional)
- ❏ "Bartholomew and the Oobleck" by Dr. Seuss (optional)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

(Optional) Oobleck gets its name from the Dr. Seuss book, "Bartholomew and the Oobleck." You could read the book to introduce the name of the substance you will be working with.

Add food coloring to the water to make colored oobleck (optional).

WARNING! This is messy! Washing oobleck down the drain might clog your pipes. This is safe to do outside on a nice day and then hose off afterward. Corn starch is biodegradable and can be left on the ground. Food coloring has the potential to stain clothes.

LET'S GO

1. Have the children **observe** the texture of the cornstarch before you add the water. Have the children measure and mix about 3 cups cornstarch with 1 1/2 cups water. The amount of water may vary. (You may try mixing with a spoon, but hands work best.) The recipe can easily be doubled or tripled. More oobleck allows for more experimentation.
2. Children will naturally experiment with the oobleck without any prompting. Let the children play! Here are some things to try with the oobleck:
   - *What do you **predict** will happen if you punch the oobleck?* Punch it! *What do you **observe?** Does your fist go in? Why or why not?* Make sure you have a thick bowl of oobleck, so they don't accidentally punch through to the bowl.
   - *What do you **predict** will happen if you pour it slowly from one bowl to another?* Pour it slowly from one bowl to another. *How can it pour when it seems solid? Does the speed at which you pour make a difference?*
   - *What do you **predict** will happen if you poke it with your finger fast? Slow?* Try poking it with your finger. Try pushing your finger in quickly or slowly slicing it. *Does it make a difference?*
   - *What do you **predict** will happen if you squeeze a fistful of oobleck?* Take a fistful of the oobleck and hold it as tight as you

can in your hand. *What do you **observe** when you are squeezing it tightly? What do you **observe** when you aren't squeezing it tightly?*

- *What do you **predict** will happen if you place the oobleck above a speaker?* Put some in a rimmed cookie sheet on a subwoofer speaker on its side. Turn on the speaker and watch the oobleck "dance". You can add food coloring while doing this for an artistic effect. *What makes the oobleck dance?*
- Take action figures or dolls with hard feet and have the kids "jump" the figures across the bowl quickly and forcefully. Then set the action figures on top. This can be fun to act out. "Oh no! I am sinking in quicksand!"

TALK IT OVER

Is oobleck a solid or a liquid? Why do you think that?

If you change the amounts of cornstarch and water, what might happen?

Are there any examples of this happening in nature?

What do you think would happen if you tried to freeze it? Or boil it?

Do you think you could swim in it?

What would happen if you just let it sit out in the air

Are there other experiments that you could conduct?

THE SCIENCE BEHIND IT

One of the earliest science principles that young children learn is the states of matter. Learning to identify something as a solid, a liquid or a gas can start children on the process of observing physical properties. You can start this exercise by asking the students about the differences between a solid, a liquid and a gas.

Oobleck is a mixture of a solid (corn starch) suspended in a liquid (water). Oobleck behaves like a solid when force is acted on it quickly. This is because the pressure forces all the particles of corn starch together and they behave like a solid. When you move through it slowly, the particles of corn starch have time to move away and slip around the object. It can be helpful to explain it to children like sand at the beach. If you punch the sand, it doesn't move, but you can wiggle a finger into the sand fairly easily.

If you are really ambitious and have a lot of cornstarch, you can mix the material in a kiddy pool and try "walking on water". (A video of this experiment being done at Michigan Technological University is at http://www.youtube.com/watch?v=j_ECCLQ7BPo.)

RESOURCES

If you are interested in other resources or ideas, contact your local university Extension office – http://msue.anr.msu.edu/county.

MICHIGAN STATE UNIVERSITY | Extension

MI STRONGER FAMILY

Inquiring Minds Want to Know

Science Activities for Young Minds

Ramp-N-Roll

WHAT YOU'LL NEED

- ❏ A ramp (try stiff cardboard, a game board or a picture book)
- ❏ Blocks or a box (to prop up your ramp)
- ❏ Objects that may or may not roll:
  - ❏ balls
  - ❏ plastic cups
  - ❏ plastic bottles
  - ❏ crayons
  - ❏ spools
  - ❏ rolls of tape
  - ❏ toy car
  - ❏ socks (a single and a rolled pair)
  - ❏ a book
  - ❏ crumpled paper
  - ❏ small blocks
  - ❏ a spoon
  - ❏ other stuff around that the kids want to try

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

Gather materials that you will use for your ramp and objects for rolling.

LET'S GO

1. Make a ramp by propping up one end of a game board, picture book or piece of stiff cardboard onto a box or a stack of blocks.
2. Gather objects that may or may not roll, such as those suggested.
3. Explain the "Slide or Roll?" **experiment** by asking the children to **predict** what might happen when you try to send one of these objects down the ramp. *What do you **predict** will happen when you put this at the top of the ramp? Will it slide? Will it roll? Will it stay put?*
4. Have the children try each object. As they play, have them sort the objects into things that roll and things that don't.
5. Help the children discuss what they ***observed***. *Why do you think some objects rolled and others did not?*
6. Have the children place one of the rolling objects at the top of the ramp but face it in a different direction. For example, place a car sideways instead of forward, or stand a bottle up instead of placing it on its side. As they play, have them sort the objects into things that roll from more than one side and things that only roll one way.

   *What do you **predict** will happen when you turn an object that rolled sideways? What did you **observe**? Did it still roll? Why or why not?*

   Can you find a way to park a toy car on the ramp without it rolling down?

   Can you make a rolling object stop halfway down the ramp?

TALK IT OVER

What are some things at home that might roll or not?

What things do we know that slide?

Why do we use sleds to go down a hill in the winter instead of something with wheels?

Why do cars not roll when they are parked on a hill?

How do you slide down a slide? Why don't you roll?

*What do you **predict** will happen if you pull the wheels off a toy car? Will it still go down the ramp?*

Are heavier things or lighter things more likely to slide?

Why do some things roll faster than others?

Why do some buildings have ramps up to the door? Why do sidewalks have ramps at the corner? Find some examples, and ask the children to think about why those ramps are there.

When might someone need to use a ramp instead of the steps? This discussion should bring up another one of those super simple machines – the wheel. People in wheelchairs, kids pulling wagons and delivery people with dollies are all happy that those ramps are there!

GOOD TO KNOW

Help children design **experiments** to answer these questions. Make **predictions** and talk about what you **observe**. Then make up more new **experiments** together.

- *How far do objects go when they roll down your ramp? Can you make them go farther? How?*
- *What happens when you raise or lower the ramp?*
- *How can you make an object roll faster? How can you slow it down?*
- *Put a phone book at the bottom of your ramp. Race two objects down the ramp and watch to see which will hit the phone book first.*
- *What if the texture of the ramp is different? What if it is wet? What if it has cloth on it? What if it has oil on it?*

THE SCIENCE BEHIND IT

Playing with ramps and things that roll helps children learn simple principles of physical science and engineering. A ramp is an example of a simple machine called an inclined plane.

"**Work**" has a specific meaning in physics involving the transfer of energy to an object and making it move. We don't expect young children to know this. When we say that "simple machines make work easier," we are using an accurate but young-child-friendly description of what simple machines do and how they help people.

RESOURCES

- The 2015 National Youth Science Day Experiment "Motion Commotion" – http://www.4-h.org/4-h-national-youth-science-day/science-experiments-projects/motion-commotion/.
- For more information about simple machines – http://www.cosi.org/downloads/activities/simplemachines/sm1.html.
- Your local university Extension office – http://msue.anr.msu.edu/county.
- Science Blast website – http://4h.msue.msu.edu/programs/science_technology/science_blast.
- PBS – http://www.pbs.org/parents/education/science/activities/preschooler-kindergarten/.

MICHIGAN STATE UNIVERSITY | Extension

MI STRONGER FAMILY

Inquiring Minds Want to Know

Science Activities for Young Minds

Soil Tube Races

WHAT YOU'LL NEED

- ❑ Three empty 2-liter soda pop bottles (with caps)
- ❑ Pea gravel or small stones
- ❑ Sand
- ❑ Clean plain clay kitty litter
- ❑ Glasses of water
- ❑ Measuring cups (optional)
- ❑ Hot cocoa mix, food coloring, drink mix (optional)

WHAT TO DO

Remember: The purpose is NOT to teach a specific topic but to help children experience the excitement of **science exploration!**

GETTING READY

1. Cut off the bottoms of the 2-liter pop bottles.
2. Put holes in the caps of the bottles with a small nail or drill, and put the caps back on the bottles.
3. Fill the bottles – one with gravel, a second with sand, and the last with kitty litter. Note: kitty litter can be dusty.

LET'S GO

1. Have the children **observe** each substance (gravel, sand and kitty litter) and describe it using their own words. Describing how something feels is using **observation** made through touch to identify physical properties of each substance.

   *What do you **observe**? How are the substances similar? Different?*

2. Have the children **predict** which soil tube water will run through faster.
3. Give three children each a cup with the same amount of water and have them pour it into the open ends of the pop bottles.

   *Were the children's **predictions** correct? Why did the water run faster or slower through the bottles?*

TALK IT OVER

If you poured water on the soil in your yard, what would happen?

What would happen if you poured water onto the sand at the beach?

What would happen if you poured water in a parking lot?

If the ground is already full of water from a lot of rain, will that change things?

How would this knowledge affect where you might put a house? A playground? A landfill?

GOOD TO KNOW

- Pour muddy water, food coloring, drink mix or hot cocoa through the tubes and see what happens. *Do you **predict** that the soil will make the water clear? What do you **observe**?*

  If pollution is spilled on the ground, how would the soil affect how the pollution moved?

- Use two measuring cups – one to pour water in the top and the other to catch it at the bottom.

  *Do you **predict** that the same amount of water will come out as went in? Does all the water poured in the top come out the bottom? If not, where does some of the water go?*

- Learn about where the water comes from in your community. A list of community water supplies in Michigan is available at http://www.michigan.gov/deq/0,4561,7-135-3313_3675_3691-9775--,00.html.

  Does your water come from water that moves through the soil? A reservoir? A lake? A river?

THE SCIENCE BEHIND IT

Most of us learned the water cycle a long time ago:

- The heat of the sun causes water to evaporate.
- The water condenses to form clouds.
- Precipitation in the form of rain or snow causes water to fall back to the earth.
- Repeat the process.

This leaves out a big portion of the water cycle. What happens when the water hits the surface of the earth? The simplified version that we were taught in school often does not take into account soils. Different types of soil allow water to move through at different speeds. That groundwater eventually comes to the surface in lakes, streams and wetlands, or is pumped from wells.

RESOURCES

- Your local university Extension office – http://msue.anr.msu.edu/county.
- Michigan Groundwater Mapping Project – http://gwmap.rsgis.msu.edu/.
- U.S. Web Soil Survey – http://websoilsurvey.sc.egov.usda.gov.

MICHIGAN STATE UNIVERSITY | Extension