4-H Club GO TO Resources

November 2020

Science - Leakproof Bag

Lesson Objectives:

Club members will learn: about the chemistry of polymers and the experiential learning model

Time: 10 - 20 minutes

Equipment and supplies:

- Zip lock sandwich bag
- Water
- Sharpened pencils
- Sink, bucket or bowl to catch water (if needed)
- Towel

Preparations:

- Review lesson and watch video at: https://www.stevespanglerscience.com/lab/experiments/leak-proof-bag/
- Gather equipment and supplies

Who would have ever thought that a plastic bag, some water, and a few pencils would have adults screaming with fear? Learn how to poke holes in a plastic bag filled with water without spilling a drop. Well, that's the theory you're going to test . . . and it's wise to practice your liquid trick over the sink or bowl. It's a cool way to learn about the chemistry of polymers.

1. **Experience:** Start by sharpening the pencils. Make sure the tips are sharpened to a point. Fill the bag half way full with water and then seal the bag closed. What would happen if you tried to push one of the pencils through the bag of water? Would the water leak out and make a giant mess? How can you poke the pencils through the bag without spilling a drop of water? Test your theory. Did it work? What did you do? What surprised you?
2. **Share:** One way to do it is to hold the pencil in one hand and the top of the bag in the other hand. Push the pencil right through one side of the bag and halfway out the other side without spilling a drop. The long chains of molecules that make up the bag "magically" seal back around the pencil and prevent water from leaking out. Be careful not to push the pencils all the way through the holes.
3. **Process:** Why doesn't the bag start leaking? How many pencils can you add to the bag before it starts leaking? If your bag starts leaking … why? What would you do differently to make sure your bag doesn't leak?
5. **Generalize:** What if you try different sizes and thicknesses of bags? What if you tried different sizes and shapes of pencils? What types of bags and pencils work the best? What key points have you learned?
6. **Apply:** Have you had a similar experience related to this activity? In what ways do people help each other learn new things? What personal qualities do you think are important to have to learn new things about science?

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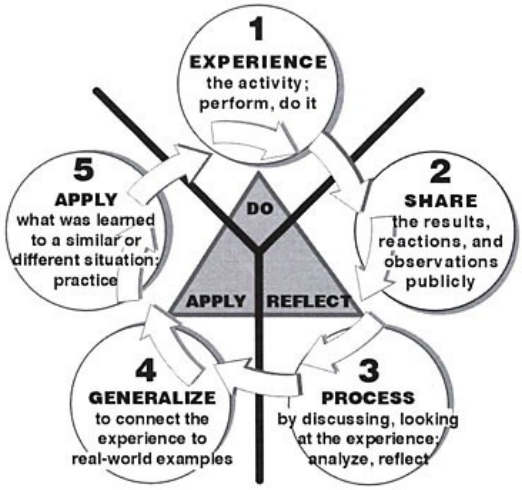
How Does it Work: The zip lock plastic bag you used was most likely made out of a polymer called low-density polyethylene (LDPE). It's one of the most widely used packaging materials in the world. It is low in cost, lightweight, durable, a barrier to moisture, and very flexible. Think of the polyethylene molecules as long strands of freshly cooked spaghetti. The tip of the sharpened pencil can easily slip between and push apart the flexible strands of spaghetti, but the strands' flexible property helps to form a temporary seal against the edge of the pencil. When the pencil is removed, the hole in the plastic bag remains because the polyethylene molecules were pushed aside permanently and the water leaks out. As you might have discovered, it's much easier for the stretched plastic to seal around the smooth sides of a round pencil than the straight edges found on other pencils.

Experiential Learning Model:



The Experiential Learning Model is used to help members become successful learners. "Learn By Doing" is an integral part of 4-H, but there is more to Experiential Learning than just "doing". Supportive, caring leaders help youth move beyond the "doing" to reflect on and apply the learning experience to similar or different situations. By practicing and utilizing the experiential learning model, leaders are able to help youth look back at their experience critically, determine what was useful or important to remember, and apply the new information to real life situations.

Why is Experiential learning important? Experiential learning helps young people learn and master new skills. Think about some of the skills you've learned during your lifetime. Were you able to master the skills the first time you did it or did you require some practice? Most skills can't be learned in a single experience. Mastery only comes after trying, learning, and trying again...the "learn-by-doing" concept. The reflection and application process helps us learn from our attempts. Reflection and application helps us learn from our findings by shifting our knowledge from preexisting conceptions to a more accurate understanding of a concept. We then need to try again using the new knowledge gained. The sequential steps of the Experiential Learning Model help youth identify what they have learned and apply it to other situations.

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Sources & Additional Lesson info:

4-H Club GO TO Resources is being offered to 4-H clubs in Boone, DeKalb and Ogle Counties as a way to enrich and enhance 4-H experiences and programming at the club level. It is the goal of the Extension staff to assist 4-H leaders and officers in providing simple hands-on activities on a monthly basis that can broaden the 4-H club experience and as a result heighten positive youth development.

Resources:

Steve Spangler Science: Leak Proof Bag: https://www.stevespanglerscience.com/lab/experiments/leak-proof-bag/

Experiential Learning: https://www.extension.iastate.edu/4h/files/page/files/experiential_learning_model.pdf

Additional lessons about polymers:

https://www.4hpolymers.org/

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