



SPOTLIGHT on... STEM...

Science, Technology, Engineering and Math

STEM is used in everyday language to mean “science, technology, engineering, and math.” But what is the significance of STEM in Girl Scouting? In a report by the US Department of Education in 2007 it is stated that: “One way to encourage girls to choose careers in math and science is to foster the development of strong beliefs about their abilities in these subjects – beliefs that more accurately reflect their abilities and more accurate beliefs about the participation of women in math and science related careers.” According to an article by the American Association of State Colleges and Universities in 2005: “Many [girls] who are academically qualified for post secondary studies in science and math fields do not pursue those programs. They may be dissuaded by disappointing experiences, high tuition, demanding curricula or lack of role models with whom they can identify.” At GSSJC we know that girls today are natural scientists! The goals of the Girl Scout STEM program are:

- Teach girls the importance of technical literacy
- Connect girls with likeminded peers through innovative programs, events, trips and online discussions
- Encourage girls to explore career possibilities in fields such as engineering, aviation, astronomy, information technology and laboratory science

GSSJC has the benefit of working with a number of local entities to foster the goals stated above. Among these are: Rice University, the Society of Women Engineers, George Observatory, United Space Alliance, Dow Chemical, to name just a few. As volunteers working directly with girls, we can also help introduce girls of every age to science, technology, engineering and math. By providing girls with the opportunities to be involved with council STEM workshops, they are learning about careers in STEM fields, becoming math whizzes or just discovering more about their future.

Here are some simple, fun activities to do with the troop to help girls understand more about STEM. Don't forget to check the *Golden Link* and the CIN for the latest on STEM workshops from the GSSJC Program Department.

Edible Four-Layer Earth

You will need a large mixing bowl (the larger the better) for this activity.

To end up with a frozen model of half the earth, you will need these materials:

“green” ice cream	graham crackers
chocolate ice cream with nuts	“yellow” ice cream
Dragees (little metal-like edible silver spheres)	vanilla ice cream
red food coloring	green food coloring

Procedure

- Before constructing the edible earth, you may wish to make a scale model cross-section, or relate the size of the sections to known objects, such as the mantle to the size of a grapefruit and the outer core to the size of an egg.
- Make each layer and then freeze in the mixing bowl (one layer at a time).
- The four layers to make in order are:
 - Crust: use green ice cream and crushed graham crackers. Freeze this layer.
 - Mantle: chocolate ice cream with nuts (rocks). Freeze this layer on top of crust.

- Outer core: yellow ice cream with a few Dragees sprinkled throughout. Freeze this layer on top of the mantle.
- Inner core: gray ice cream (made by adding equal amounts (drop by drop) of red and green food coloring to vanilla ice cream), and a greater concentration of Dragees. Freeze this layer on top of the outer core.

When your model is finished you can observe the layers, compare them, and then best of all, **eat them at your next meeting!**

The Rice Krispies Experiment

You will need:

hand full of Rice Krispies (about ½ cup)	plate of plexiglass (or glass), square (1'x1')
wooden blocks, ceramic cups, or something similar to balance the plate 1-3 inches above the table (table should be non-metallic).	wool sweater

How to do the experiment:

1. Place the rice krispies on the table surface.
2. Put the wooden blocks or other non-conductive materials on the table, and balance the plate of plexiglass over the table + the pile of rice krispies.
3. Vigorously rub the top of the plexiglass with the wool sweater.
4. The rice krispies should slowly start to stand on end, then 'jump' from the table surface to the plexiglass and back again.

Explanation:

The effect is caused by the buildup of **static charge**. Rubbing the wool sweater on the plexiglass generates a net negative charge on the plexiglass surface. This net negative charge has the effect of **polarizing** the rice krispies on the table below, so positive charges accumulate on points closest to the overlying negatively charged plate. Unlike charges attract, and when the difference in charge has become great enough, the electrostatic attractions are sufficient to draw the rice krispies to the bottom of the plexiglass plate, against the force of gravity. The charges dissipate when the rice krispies contact the plate. Having no further means of attraction, the now neutral krispies falls back to the surface of the table allowing the process to start over again.

Play an Icy Trick

What you need:

A glass of water	An ice cube
A piece of string	Salt

What to do:

- Put the ice cube into the glass of water. Put one end of the string on the ice cube. Hang the other end over the edge of the glass.
- Sprinkle salt on the ice cube and let the glass stand for about 5 minutes.
- Remove the ice cube from the water just by lifting the string.

How do you do that?

- The salt lowered the freezing point of the water below the usual 32 degrees F so the ice melted a little. Then the ice refroze and trapped the string.
- You seem to have the ice colder, but really you super-cooled the water. It's the water, not the ice that is colder.

What does it mean if it doesn't work?

Experiments don't always go the way we think they should. In this case, we know that salt should lower the temperature of the water below freezing. What might have kept this experiment from working? Maybe the glass wasn't clean enough or there was something on the string, like wax, that you couldn't see. Maybe 5 minutes was too long or too short for the experiment to work.

(This might be a good activity to do if making ice cream from scratch using a manual ice cream maker.)

***Paper Magic: The Mobius Strip (pg. 36)**

You need:

A sheet of paper
Scissors

a pencil
tape or glue

What to do:

- Cut a strip of paper 1"x10". Give one end a half twist and tape or glue the ends together to form a loop.
- Draw a lengthwise line down the center of the strip until you reach your starting point.
- Cut along the line you have drawn.

What happens:

There is no side without a line! And you wind up with only one loop – twice as long as your original look.

Why:

No one has been able to explain this strange "trick." But it has actually been put to practical use. Ordinarily, auto fan belts and factory conveyor belts wear out faster on the inside than the outside. But belts made with a half twist like this wear out more evenly and more slowly.

***How Do You Make an Egg Float? (pg. 71)**

You need:

An egg
12 tablespoons or more of salt

a glass of water

What to do:

- Put an egg in a glass half full of water. Notice what happens. Add several tablespoons of salt, stir gently, and observe what happens.
- To half a glass of salty water (10 tablespoons or more of salt), slowly add half a glass of fresh water. Don't stir. Gently lower in the egg.

What happens:

In the fresh water the egg sinks. As you add salt, it floats higher and higher. When you add fresh water to the very salty water; the egg is suspended in the middle!

Why:

- The denser the liquid the greater its upward lift (or buoyancy). Salt makes the water denser.
- When you add fresh water to the salty water, it remains on top. The egg sinks through it and floats on the lower, denser, salty water.

Possible Older Girl Activities

****Design Gone Wild**

You will need:

Paper and pens or pencils (enough for each girl)
Colored pencils or markers (optional)

Introduction:

Say something like: "Since we know that design and technology are always changing, today we will think about what things might look like in the future. And we will use our imaginations in the process."

Activity:

- Separate the girls into pairs or small groups.
- Distribute paper and pens or pencils.

- Ask each pair or group to think of three objects that people use, such as cell phones, automobiles, kitchen appliances, or computers, and to imagine what those objects would be or look like in 10 years and in 50 years. Encourage girls to draw pictures of the objects, with lots of details. Tell girls they will have about 20 minutes for this activity.
- Each pair or small group presents one idea (if time allows, all three ideas) to the rest of the group.

Reflection/Discussion:

Ask girls:

- Does life always get better when technology advances?
- What are the positive effects of the advancement of technology?
- What are the negative effects?

****Get Perspective!**

You will need:

Paper and pens or pencils (enough for each girl)

Empty paper towel or toilet paper tubes (as many as possible)

Introduction:

Say something like: Today's activity is about learning to look at things in a new way. Scientists are not only masters of observation, but they also must practice being open-minded in order to constantly see things with fresh eyes. You cannot invent something new if you are always looking at your environment in the same old way. It all depends on your perspective."

Activity Part 1:

- Distribute paper and pens or pencils.
- Tell girls that you are going to do a few quick "experiments."
- Instruct girls to pick up their pen or pencil and hand it to their neighbor. Ask girls: "Which hand did you use to pick up your pen or pencil?"
- Instruct girls to interlock their fingers. Ask girls: "Which thumb is on top?"
- Instruct girls to cross their arms across their chest. Ask girls: "Which hand is on top?"
- Ask girls to look through the paper towel or toilet paper tube at a distant object. Ask girls: "With which eye do you look through the tube?"
- Ask girls: "So, which side of the brain are you? Are you a lefty or a righty?"
- Explain to the girls:
 - The cerebrum (thinking brain) is made up of two halves, or hemispheres, connected by a thin cord. The hemispheres work together as a team to perform "thinking" jobs.
 - Both halves of the brain look exactly the same and work the same way, but they are in charge of different sides of the body. The left hemisphere controls the right side of the body.
 - For most people, the left side of the brain also controls language activities, such as reading, and writing, and skills like those used in mathematics and logical reasoning. The right side of the brain contains the areas that relate to things like color, shape, imagination, creativity, and emotions. Although basically "equal," one side of the brain is usually "stronger" (or more dominant) than the other.

Activity Part 2:

- Say something like this: "Since the side of the brain we use most gets a daily workout, let's try the following activity using our non-dominant hands so we can begin to strengthen the other parts of our brains, or the other parts of ourselves.
- Separate the group into pairs.
- Once girl in each pair asks two questions of her partner, and should record a short answer (one or two sentences) with her non-dominant hand:
 - If you could travel to any country or place in the world, where would it be, and why?
 - Who is your favorite music group, and why?
- Repeat the process, reversing the roles of interviewer/recorder

Reflection/Discussion:

- Ask girls: In what other areas of your life could a new perspective be helpful? Why?
- Encourage girls to set a period of time to use their non-dominant hand instead of their dominant one (being aware of safety), and observe whether they feel any different or experience things in a different way.

*Activities adapted from: Simple Science Experiments with Everyday Materials by Muriel Mandell, Sterling Publishing Co., Inc., 387 Park Avenue South, New York, N.Y. 10016 © 1989

** Activities adapted from Girl Scouts USA website at: <http://www.girlscouts.org/mixitup/home.html>

Be an asset builder! How can you show girls that you care?

- Be curious with them.
- Introduce them to your friends and family.
- Tell them how much you like being with them.
- Let them solve most of their own problems.
- Meet their friends.

Connecting to the Girl Scout Leadership Experience and Forty Developmental Assets

Girls will be able to acquire the following outcomes by participating in these activities:

- Discover: Girls develop critical thinking skills.
- Connect: Girls promote cooperation and team building
- Take Action: Girls are resourceful problem solvers.

The assets, as presented by the Search Institute that are supported this month are both external and internal.

- External Assets: These activities will help girls find activities that make constructive use of their time. All girls need access to quality programs and activities that enrich their lives, develop their talents and interests, and help them develop healthy relationships. These can include: music; drama and other arts; sports and hobbies; and involvement in a church, synagogue, temple, or other religious community. It's also important that they spend time at home. Adults should ask themselves: What opportunities do girls in this community have to be involved in positive activities or groups? Do they think it is important to regularly spend time at home with others in their family? Why or why not?
- Internal Assets: These activities will help girls to nurture within themselves a commitment to learning. Girls need to develop a lifelong commitment to learning. Adults help young people develop this commitment when we: encourage them in their education; challenge them to explore and learn new things; and read and learn with them. Adult should ask themselves: What was the best thing about my school? What was the worst thing? Do I enjoy reading? Is there a way to share my interests with girls?



What are Developmental Assets? Want to know more? Want to dig deeper? Check out this website on building assets: <http://www.search-institute.org/>

