



Group STEM activities for youth groups and robotics teams



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Introduction

This instruction set was made as part a Girl Scout Gold Award with the intention of making STEM related activities easier to use for group and provide idea for high school STEM organizations to reach out younger students.

A Note to High School STEM Organizations

These instruction and activities were tested when local Girl Scout troops and other youth organizations visited FIRST Robotics team 2410 the Metal Mustangs to learn more about robotics and STEM. We hope that we can share some of things we learned while hosting these group that will make it easier for other high school STEM organizations to host youth groups.

If your group is looking to host students you can reach out to your local scouting organization and other and ask that your team becomes a contact for troops interest in learning more about STEM. Once a troop or youth group is interested it is important to check how long the group is planning on visiting for and how many participant they will have. This information can help guide what activities you do with groups. Here is a sample schedule from when we've hosted groups:

Introduction and Snack time-15 min.

Show this years challenge video-5 min.

Demonstration of what your group does. For our events we demonstrated our robot but other groups demonstrate chemistry experiments -15 min.

Stylin' Safety Glasses Activity-15 min.

Shop Tour and power tool demonstarion-20 min.

Binary Bracelets-40 min.

Clean up-15 min.

It's nice to have some extra supplies for sibling who may want to participate and it is important to have extra safety glasses for parents. Groups usually bring their own snacks and we have provided supplies for activities but that can be arranged with each group.

Binary Bracelets

Intro: This activity is a fun introduction to binary and gives kids an opportunity to make some personal jewelry with it. In addition to these instructions, there is also a binary presentation available on the www.mmr2410.com website under community page.

Age Range: 3rd to 6th grade

Time for Activity: 30-45 minutes

Prep time: 30 min

Supplies:

- Beads (vary based on participants)
- Elastic string
- Pens/Pencils
- Organization bins

Prep Instructions

1. Determine how many letters each kid will do. Words shorter than 6 letters are recommended.



2. When purchasing beads, remember each letter will take 8 beads plus a spacer in-between each letter
3. Once you have beads, sort into color. You can even label what color bead will be representing the 1, 0, and spacers.
4. Pre-tie knots in the elastic cord to avoid fault knots tied by kids
5. Print off Word Templates and Binary Charts for participants

Activity Instructions

1. Have each student write out their what they are going to spell in between the parentheses of the Word Template. Then write out zero and ones on the dashes
2. Take the elastic and start with a spacer, then using the colors previously determined as zero and one to create each letter, putting a spacer after each letter is completed.
3. Once finished, tie a knot to form the bracelet

Pasta “Rock”

Intro: This is a neat way for kids to make their own sedimentary rocks and investigate its composition and strength. It does take a while to dry so this project is perfect for a camp or after school group that meets daily.

Age: 1st And Up

Prep: None

Time For Activity: 20 Min

Dry Time: 6+ Hours

Supplies

- Multiple types of pasta (1 cup per)
- Plastic baggies (2x per)
- White glue (3 Tbs per)
- Water (1 cup per)
- Wax paper
- Scissors
- Marker

1. Combine different types of pasta and rice together in a large bowl and place about 1/2 cup of mixture in bowl or cup. Each participant will need 2 bowls.
2. For the 1st bowl remove about $\frac{1}{4}$ of the pasta and place in a plastic bag and label
3. For the 2nd bowl, remove $\frac{1}{2}$ of the pasta and place in a plastic bag and label
4. Next crush all of the pasta in both bags with a rolling pin or other heavy instrument. The smaller the piece the better the “rocks” will turn out
5. Pour the uncrushed pasta into the plastic bag and shake until mixed well
6. To each bag, add 1 cup of water to the plastic bag and 3 tablespoons of Elmer’s glue. Food coloring can also be added here. Mix together ingredient in bag by shaking until the pasta begins to clump together
7. Over a sink or outside, snip the corner of each plastic baggie just enough for excess water drain out
8. Over wax paper, open the plastic baggie and remove clumped pasta. You may need to push the mixture together to get a solid “rock.” Label each side of the wax paper with what fraction of pasta in each rock was crushed
9. Allow a minimum of 6 hours to dry
10. After drying, observe each rock and discuss which one is stronger and why. The “rock” where $\frac{1}{2}$ of the pasta was



crushed should be stronger because there were more small piece to dry tighter and cement the larger pieces

Go Further

Pass out magnifying glasses and notebook and have kids draw a picture of each rock and write down a few observations. You can even create more pasta “rocks” with a higher percentage of the pasta crushed in it and have students observe those.

Stylin' Safety Glasses

Intro: This is a simple craft to decorate standard safety glass and is great when paired with a machine shop tour, power tool demonstration or manufacturing project

Supplies:

1 pair of Safety Glasses per participant (12 glasses can be purchased on Amazon for about 12\$)
- Markers for labeling
- Stick on jewels, Shapes, and other decorations (can be picked up at Wal-Mart for about 3.00 \$ a bag)

Age: Kindergarten and up

Prep: None

Time for Activity: 10 min

Activity Instructions

1. Pass out safety glasses and have each participant put their name on the glasses with a market
2. Let kids decorate with stick on jewels, shapes, sticker, or whatever else is on hand (decorations can be hot glued on but the stick on ones are MUCH faster)

Electrifying Potatoes

Intro: This is a great project that allows students to work with electricity beyond snap together circuits. The potatoes have sugar, water, and acid inside of them. The zinc and cooper used in project turn into electrodes and allow electrons to move back in forth to create a light.

Supplies

2 potatoes per person
2 pennies per person
2 zinc nails per person
Knife
Cooper Wire
1 LED per person

Age: 2nd grade and up

Time for Activity: 20 min

Prep: 15 min

Prep Instruction

1. Cut 4 lengths of cooper wire at about 6 inches for each person participating in the activity
2. For younger kids you may want to pre-cut the slits in the potatoes

Activity Instructions

1. Cut a penny sized slit to put the penny on one side of the potato. Wrap cooper wire around the penny with a little extra sticking off and place into slit
2. Push 1 nail into the potatoes on the side opposite of the penny and wrap cooper wire around the nail with a little extra sticking off. Make sure the penny and the nail don't touch.



3. Repeat steps 1 and 2 on a second potato.
4. Set the two potatoes side by side and connect the extra wire from one of the pennies to one of the nails. You can twist the two copper wires together or wrap the wire from the penny around the nail.
5. Take the extra wire from the penny not attached to the nail and wrap it around one of wire on the LED.
6. Take the extra wire from the nail that is not connect to the penny and wrap it around the other wire on the LED
7. Your LED should now be lighting up!!!

Go Further

Hooking up more potatoes will make the light brighter by increasing the voltage. You can also experiment with different varieties of potatoes, depending on water and sugar content in different potatoes varying amount of voltage will be produced. You can also use a voltmeter to show students how voltage is changing by adding more potatoes.

Activity Resources

Word Template

- 1.** () _____
- 2.** () _____
- 3.** () _____
- 4.** () _____
- 5.** () _____
- 6.** () _____
- 7.** () _____
- 8.** () _____

- 1.** () _____
- 2.** () _____
- 3.** () _____
- 4.** () _____
- 5.** () _____
- 6.** () _____
- 7.** () _____
- 8.** () _____

Binary Chart

A						N														
B						O														
C						P														
D						Q														
E						R														
F						S														
G						T														
H						U														
I						V														
J						W														
K						X														
L						Y														
M						Z														

Black=0
White=1

A						N															
B						O															
C						P															
D						Q															
E						R															
F						S															
G						T															
H						U															
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