SWENext Newsletter - K-8

In this edition:

What is Electrical Engineering?

You are probably reading this newsletter on a computer right now. Have you ever wondered what makes a computer work? What about the electricity in your house? Electrical engineers design and make things that use electricity in ways that help everyone!

Some electrical engineers will work in power generation, which is how your house is able to get power for lights and electrical stoves. Other electrical engineers work on microchips that make your phone or computer work. Even things like internet or cable are made possible by electrical engineers!

Electrical Engineering Spotlight

Meet Sabrina, a graduate student studying Electrical Engineering in Florida.

Sabrina earned her Bachelor's degree in Physics from the University of Puerto Rico in Humacao. She is a PhD student at the University of South Florida in Tampa, Florida. She is also a researcher at the Brookhaven National Laboratory.

What made you decide to study Electrical Engineering?

I always liked challenges. I like knowing why things happen and where they come from. That is why I always liked science. When I started my bachelor's degree in physics, I knew that I wanted to go to graduate school. Although, I was afraid to go because I wasn't good at math. **I learned that I do not have to be good at everything to do what I want to do. I just have to work hard.** When I thought about science and engineering that way, I became really good at what I was studying.

I decided to study electrical engineering in graduate school. I knew that I wanted to make things better for everyone else, and I knew that studying electrical engineering would help me do that. I knew that it would not be easy, but I was ready for the challenge because my goal was worth it.

What are some really cool things that people in your profession work on?

Electrical engineers can work to create medical devices for people who need help with their heart or other parts of the body. Some electrical engineers create the computers and electrical systems that are needed in the shuttles that send astronauts to space. These are just a few examples. There are tons of other awesome things that electrical engineers do.

What kinds of challenges have you had as a woman studying Electrical Engineering? How have you overcome them?

I find that I am often the only woman in class. This does not happen all the time, but it does happen a lot. Women have been taught that they are not smart enough to study STEM subjects (*Science, Technology, Engineering, Math*), but this is not true at all.

Now that there are more women studying STEM than ever, more girls are interested. This is great because now there is more diversity. Women can bring great ideas to the STEM community. Some of the challenges of being a woman in engineering can seem scary, but none of them stopped me. As long as we want it bad enough, we can do anything.

What do you love most about your school and its Electrical Engineering program?

I love that I can take all sorts of classes. I can take courses related to electronics. I can also take other courses like biomedics and nanomedicine. This is great for me and other students because we get to learn a lot. This helps us be prepared for all sorts of problems I might face as an electrical engineer.

My university cares a lot about its students. Our teachers understand that we are humans with needs and problems that are beyond our control. My university has allowed me to take time off because of health problems or if I needed to take a break. That's because the health of students is more important than school.

Do you have one piece of advice for young girls who might want to become Electrical Engineers?

Always believe in yourself! There will be times where not everything will be perfect. You might even fail sometimes. **Keep trying until you reach your goal.** Many times, there are obstacles and problems that discourage us. These obstacles are lessons in life. They make us stronger and should teach us to take risks. The world belongs to those who take risks.

February is Black History Month

The United States and Canada have been celebrating Black History Month for almost 100 years! Black History Month is important because during this time, we celebrate the successes and history of African-Americans. Throughout history, African-Americans have accomplished many great things from civil rights to scientific breakthroughs. We would like to introduce you to some incredible young women who are making history today!

Christin Salley - Graduate Student at Johns Hopkins University

Christin is working on earning her Ph.D. in Civil and Systems Engineering. She earned a Bachelor's degree in Fire Protection Engineering from the University of Maryland.

Christin has been a part of the National Society of Black Engineers (NSBE), Society of Women Engineers (SWE), Society of Fire Protection Engineers and College Park Scholars. She was a Ronald E. McNair Post-Baccalaureate Achievement Program Scholar and was in the National Science Foundation Louis Stokes Alliance for Minority Participation Program. She interned at AECOM, the United States Pentagon, and the National Institute of Standards and Technology as a Fire Protection Engineering Intern.

Now, Christin works hard to help minorities become a part of STEM. She believes that

anyone can make good changes through their work and their studies. **She wants you to know that if you are thinking about doing STEM, you can absolutely do it!**

Zsamia Barnes - Student at Prairie View A&M University

Zsamia is studying Chemical Engineering at Prairie View A&M University. She earned a Bachelor's degree in Biology from Texas Woman's University.

Zsamia decided to study STEM because she loves solving the world's problems. After meeting women of color who were also chemical engineers, Zsamia was inspired to pursue a degree in chemical engineering.

During her undergraduate studies, Zsamia volunteered and helped teach kids how to read and write. In the future, she hopes to help kids learn more about STEM. Today, she is making a difference by entering in the AMIE Design Challenge at the 2020 BEYA Conference in Washington, D.C., where she will represent her school.

When she graduates, Zsamia wants to improve how food is produced and hopes to make farming easier and safer. She hopes to make food cheaper in poverty-stricken areas. Zsamia wants you to know that **while STEM can be hard, it is worth it.** Stepping out of your comfort zone is scary, but if we never face our fears, we'll never get anything done!

8th Grader Wins STEM in Action Award at DesignLab San Diego

Vanesha, an 8th grader from Remond, Washington, won a STEM in Action Award at the SWENext DesignLab event in San Diego on February 1, 2020.

Vanesha is interested in Computer Science, Robotics Engineering and Software Engineering. Last year, she was captain of a FIRST Lego League team. Her team qualified to go to semi-finals and won the Teamwork Award. She also created, initiated and helped lead the FIRST SheCodesArt workshop around website creation for 30 girls at the Microsoft headquarters. Well done, Vanesha, and congratulations!

2020 SWENext Awards Season – Apply Now

Do you live within a couple of hours of **Buffalo or Des Moines**? Are you willing to travel to one of these cities with your friends? If so, read on!

We are excited to announce the 2020 SWENext STEM in Action Award.

The **SWENext STEM in Action Award** recognizes girls in **grades 6-12** who are actively interested in STEM and doing something in their community about it (ex:, raising awareness, mentoring students, participating in SWENext, etc.). STEM in Action Award recipients will attend the DesignLab event where they will meet women engineers, learn about careers in engineering, learn how to be a role model and view the DesignLab presentations. They will also receive a certificate during the awards ceremony.

You must attend the DesignLab event in order to receive the award. See the dates of the event below.

We are using a rolling application process, which means we will review your application and notify the award recipients. Apply early so you can save your seat at the DesignLab event! Learn more and apply today!

The DesignLab Event in Buffalo will be held on March 28, 2020.
STEM in Action Award Application Deadline: March 1, 2020 - **STEM in Action Application**

The DesignLab Event in Des Moines will be held on April 18, 2020.
STEM in Action Award Application Deadline: March 22, 2020 - **STEM in Action Application**

Electrical Engineering Challenge

Can you imagine what it would be like today if there were no electricity? We would have no electric lights, no computers, and no cellphones. Our kitchens would not have refrigerators or microwaves. Our daily lives and routines would be much different than what we are familiar with today.

Electrical engineering is an engineering discipline concerned with the study, design and application of equipment, devices and systems which use electricity, electronics and electromagnetism. Although most of us take electricity for granted, Electrical engineers think about it and work with it every day. We're going to learn the basics of electrical circuits by making our very own squishy circuits!

Think of a circuit like a path for electricity. Open circuits are when the electricity is

interrupted by something, such as a switch. A closed circuit is when the electricity isn't interrupted at all (meaning no switches).

What You Will Need:

For the conductive dough (instead of making from scratch you can also use Play-Doh):

- 1 cup water
- 1.5 cups flour
- 1/4 cup salt
- 9 Tbsp. of lemon juice
- 1 Tbsp. Vegetable Oil
- Food Coloring (optional)

For the insulating dough (instead of making from scratch you can also use Modeling Clay):

- 1 cup flour
- 1/2 cup sugar
- 3 Tbsp. vegetable oil
- 1/2 cup deionized (or distilled) water (Regular tap water can be used, but the resistance of the dough will be lower.)

Hardware (Can be found at most craft/hobby stores or by searching on Amazon):

- Battery Holder 4xAA with Cover and Switch
- 4 AA batteries
- 10 mm diffused lens light-emitting diodes (LED lights)

Making Conductive Dough: Mix 1 cup water, 1 cup of flour, 1/4 cup of salt, 9 tablespoons of lemon juice, 1 tablespoon of vegetable oil and a few drops of food coloring in a medium sized non-stick saucepan. Place saucepan over medium heat and stir continuously until the mixture thickens. **(Get help from an adult to do this!)** Continue stirring over heat until the mixture forms a ball. Place the ball on a lightly floured cookie sheet or countertop. Slowly knead 1/2 cup of flour into the ball or until it is no longer sticky to the touch.

Making Insulating Dough: Mix 1 cup of flour, 1/2 cup of sugar and 3 Tbsp of vegetable oil in a mixing bowl. Stir until all oil is absorbed. Pour small amounts of the deionized water into the mixture and stir until water is absorbed. Repeat this until ball forms. Place the ball on a lightly floured cookie sheet or countertop. Knead small amounts of flour into the ball until it is no longer sticky.

(You can keep both the conductive and insulating dough in a sealed container or bag for up to a week. If the oil separates while in storage, add flour to remove the stickiness.)

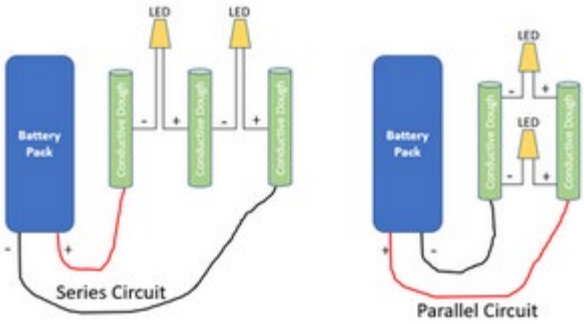
Now it's time to put your conductive and insulating dough together to form a squishy

circuit!

Take some conductive dough and form it into 2 separate rolls. Connect the red (+) wire from the battery holder to one roll and the black (-) wire to the other (Make sure the batteries are in the battery holder.).

Take one LED light and insert the long leg (+) into the roll that is connected to the red wire. Insert the other LED leg into the opposite roll and then turn on your battery pack. At this point, you have created a circuit, and the LED should light.

Electrical current flows in a circle and takes the path of least resistance. It's easier for the electricity to flow through the dough versus the LED. When the two rolls are pushed together, the current bypasses the LED creating a short circuit. Try it – your LED should go out.



In order to prevent short circuits, we need an insulator between the conductive dough. Take some of your insulating dough and place it between the two pieces of conductive dough. What happens to the LED now?

See what happens if you try some other configurations to make circuits in series and parallel. A series circuit is one that has one path for the electricity to flow. A parallel circuit is one that has two or more paths for the electricity to flow.

In addition to lighting an LED, you could power a DC motor or a buzzer in the same way. You can find more projects at **squishycircuits.com** that show what can be created with conductive and insulating dough.

CAUTION: Never connect LEDs directly to the battery pack; too much current can damage the components or cause them to overheat and pop.

Enjoy learning about electricity with your squishy circuits!

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