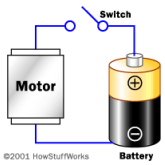
Cloverbud Investigators: STEM for Every Season

Be My Valentine Scribble Bot

February

Background: Have you ever wondered how Valentine's Day got its name and why we celebrate it the way that we do? One of a few legends is that Saint Valentine was a priest who served during third century Rome. During that time, the Emperor of Rome, Claudius II decided that single men made better soldiers than those that were married. Emperor Claudius II outlawed marriage for all young men serving in his army. Saint Valentine thought this wasn't fair and started to marry young couples secretly. When Emperor Claudius II found out that Valentine was secretly marrying couples, he had him imprisoned. Some stories say that Saint Valentine was given gifts, such as flowers and letters, from the couples he married, when they visited him in the prison. In another slightly different version, Valentine fell in love with his jailor's daughter. Before he was put to death he sent the first "valentine" to his love, when he wrote her a letter and signed it "Your Valentine". These words are still used on cards today.

We may never know the true identity and story behind the man named Saint Valentine, but this much is for sure...February has been the month to celebrate love since the middle ages. In fact, Valentine's Day ranks second only to Christmas, in the number of greeting cards sent. That's a lot of cards! There has to be an easier way to get all those cards colored or signed and sent off! This leads us to today's challenge, designing a scribble bot. Our scribble bots are going to have a little moving motor, a battery, markers, and a cup to put it all together. The scribble bot is going to use the little motor and battery to vibrate, causing it to move across your page, helping you color. We are going to use the **Engineering Design Process** to help build a robot.



First we need a little knowledge about how batteries work. Here is a short video to help you understand how a battery works. Overview from the video: a battery has a negative (-) and a positive (+) end. Inside the battery are three things that make it work, the anode (negative charge), the cathode (positive charge), and the electrolyte. Also in the battery are elements like zinc, graphite, and ammonium chloride. These elements work together by causing a chemical reaction inside the battery. The anode (-) starts to have extra electrons, which makes an imbalance in the battery. The electrons want to move or rearrange to place the extra electrons in the cathode (+) but they can't just travel through the battery itself, they need help! To travel the electrons will need a conductor to flow through. To achieve this, we will need to make a circuit. A circuit is a closed path where electric current can flow. You can have an open circuit or a closed circuit depending on if you want to turn something on or off. The battery, wires, and something to turn on (our motor) is what is needed to complete the circuit and also to make the electrons in the battery happy/balanced again. Now when the wires from our motor are connected to both ends of our battery we made a closed

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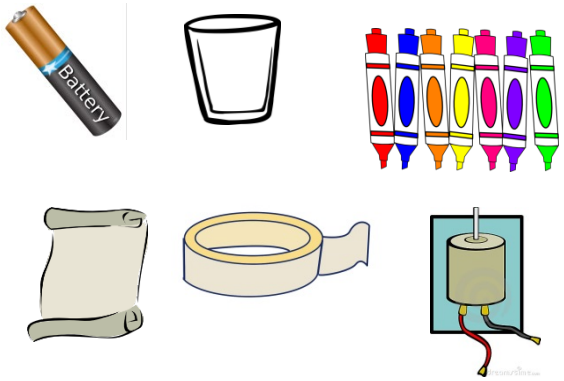
circuit. As the electrons travel from the anode through the wires/conductor, they will pass energy to the motor making it move. The electrons continue to travel to the cathode, restoring balance to the battery.

Now that you know how a battery works, you need to build a closed circuit to make your scribble bot color.

February's Mystery: Wouldn't it be nice if you could design a robot to sign or color your Valentine's Day cards for you?

***Supplies*:**

- 8.5 oz. Styrofoam or plastic cup
- Markers (3 or 4 per cup)
- 10 mm pager vibrating motor
- A 1.5-3.0 volt button cell battery
- Duct tape (try a variety of colors)
- Valentine's coloring sheet or large sheet of paper
- Table clothes or table protectors



Science Behind the Scribble Bot:

Take the material provided and build a robot to help you color your Valentine, using the

Engineering Design Process:

1. Find the problem.
2. Create ideas. Brainstorm possible solutions.
3. Evaluate and compare possible solutions. Decide which solution to try.
4. Build a prototype. A prototype is a first attempt at a design.
5. Test the prototype. Experiment or try out your Robot to see if your prototype works.
6. Tell your story. Share what you learn with others, what worked, what didn't, how to change it.
7. Redesign & Retest. How you can use what you've learned to improve or change your design.

What to Do:

Step 1: Turn your cup upside down and duct tape 3 or 4 markers on to the outside of the cup. Try to tape all the markers on the cup at same length so your bot is not lopsided.

Step 2: Duct tape the 10 mm pager vibrating motor on top of the cup. Be sure the moving part of the motor can still move freely. If the motor is new, be sure to strip the insulation off the red and black wires.

Step 3: Using a small piece of duct tape, fold it over to make it double-sided. Place the duct tape on top of the cup. Place the red wire end on the tape and push the watch battery, positive side up, on the tape.

Step 4: Turn on your scribble bot by pressing the black wire on to the battery using a small piece of duct tape.
Step 5: Take off the tops on your markers and put your scribble bot down on the Valentine's Day Coloring Sheet or large sheets of paper.

Go Over Findings:

How did the battery and the pager motor work together? Can you have one without the other?

How did your scribble bot work? How can you make it better?

What else could we use this for?

Can you think of a career which might use robotics?

Investigate, Create, & Take: Investigators can take with them:

- ✓ Decorated Card from the Scribble Bot
- ✓ Decorated Robot Cup

Sources:

Marshall Brain, William Harris & Robert Lamb "How Electricity Works" 28 May 2004. HowStuffWorks.com. <http://science.howstuffworks.com/electricity.htm> 20 January 2016

Kiddy House, "All About Valentine's Day for Kids and Teachers", Valentine's Day Facts and Resources, ,<http://kiddyhouse.com/Valentines/> January 20,2016

The Engineering Design Process, http://www.sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml#keyinfo January 20,2016

Mocomi & Anibrain Digital Technologies Pvt. Ltd. "How Do Batteries Work?" https://www.youtube.com/watch?v=KkRwuM4S8BQ

Additional Links: Kiddy House, "Animated history of Valentine's Day" Video, http://kiddyhouse.com/Valentines/

Developed By: Tiffany Sanders Riehm, Gallia County 4-H Program Assistant, Ohio State University Extension 4-H Youth Development, riehm.11@osu.edu. Reviewed and Edited by Tracy Winters, Gallia County 4-H Extension Educator, Ohio State University Extension 4-H Youth Development, winters.5@osu.edu and Michelle Stumbo, Meigs County 4-H Extension Educator, Ohio State University 4-H Youth Development. Adapted from Jeanie Rowbotham, 4-H Science, Johnson County 4-H Agent, Arkansas Extension