Marker Robot – Making Art with Technology!
Grade 8 Physical Science

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References:

- Science Buddies Staff. "Art Bot: Build a Wobbly Robot Friend That Creates Art" Science Buddies. Science Buddies, 16 Apr. 2015. Web. 25 Sep. 2015 <http://www.sciencebuddies.org/science-fair-projects/project_ideas/Robotics_p014.shtml>

Benchmarks:

- T/E.2 - Differentiate among elements of the engineering design cycle:
- T/E.3 - Explain the relationship between the properties of a material and the use of the material in the application of a technology
- Learning Goal 2.6 - Investigate the Law of Conservation of Energy

Objective:

Students will us the engineering design process to build—given a few constraints—a simple robot that draws with markers on paper. After testing it, they will evaluate their results to determine modifications to be made, make those modifications, and retest.

Materials: (per group)

- Plastic cup(s) (1)
- Cork (1)
- Popsicle stick (1) or plastic spoon (1)
- Washable markers (3-4)
- Large googly eyes (optional)
- White posterboards or large paper
- Double-sided foam tape
- Tape

Target Concept:

- Simple robots can transfer chemical energy (batteries) to electrical energy (to run the motor) to mechanical energy (spinning the fan, moving the robot). Energy is not created or destroyed here!
- The engineering design process

Procedure:

1. Begin this lesson by discussing the goal of the students' robots, and the different parts available:
    a. Motor – must be connected to battery. Can use battery holders if desired. Must be attached to an *uneven* fan blade to cause the cup to vibrate.
    b. Fan blade – can use spoon, popsicle stick, etc.
    c. Show them a demo of how it can work.
2. Constraints
    a. May use a maximum of 4 markers
    b. The Marker Bot must move unassisted once it starts
    c. Must use one, and only one, plastic cup
3. Have them sketch designs for their bot, including any changes they would make to my demo.
4. Have them build and then test their models.

5. Students must then evaluate what went well and what didn't go well in their designs.
6. After evaluating, students can modify and re-test their Marker Bots.

Target Observations:

- They should see that they can make small changes (batteries in a different spot, different number of markers, wires connected differently, changes to the fan blade, etc.) to improve the Marker Bot. Through this they will be implementing the engineering design process.