**Operation Game**

Will need a lot of extra time from the teacher to complete.

**OBJECTIVE:**

Create your own operation game using the concept of circuits.

**TERMS TO GO OVER:**

Circuit – open and closed

**PRE-LAB DEMONSTRATION MATERIALS:**

* D battery
* Small light bulb
* Wire

**PRE-LAB DEMONSTRATION PROCEDURE:**

1. Show how a circuit works

**LAB MATERIALS:**

* White cardstock paper
* Various colors of cardstock paper
* Colored pencils
* Markers
* Foam stickers
* Scissors
* ¾ inch or ½ inch Styrofoam
* Razor blade
* Aluminum foil
* Glue
* 30-gauge wire
* Wire cutters
* Optional: wire strippers
* 2 AA batteries each
* Metal tweezers
* LED light
* Soldering iron
* Solder
* Electrical tape

**GROUP LEADER/VOLUNTEER/TLC ROLE**

Wield the razor blade.

**SETUP PROCEDURE**

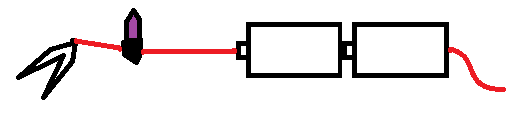
1. Cut the Styrofoam and aluminum the same size as the cardstock paper
2. Tape the batteries together so they’re positive touching negative
3. Cut the aluminum into .5in wide by 3in long strips
4. Cut the wire into 2in long pieces, stripping both ends
5. Set up the grabber:
   1. Cut the wire into 2in and 12in pieces and strip both ends
   2. Solder both wires to the LED light
   3. On the other end of the 2in wire, using electrical tape, tape the exposed wire to the metal tweezers
   4. Suggested: add a resistor to this circuit because during our experiment, many of the LED lights got burned out in a short amount of time

**LAB PROCEDURE**

1. Choose between 5 and 7 foam pieces to put on the board.
2. Trace the foam pieces, and then outline a slightly larger general shape for it – this will be the well design. Be sure not to have the shapes too close to the sides or to each other.
3. Design and color the rest of your board.
4. Cut out holes for the foam pieces, and then test to see if they will fit in nicely enough
5. Next, the teachers will cut the same shapes out of the Styrofoam with a razor. Also cut out a place for the batteries where it is most convenient along the side.
6. While the teachers are doing step 5, on a cardstock paper color of your choice, glue the aluminum paper-sized sheet onto one side, smoothing out any lumps as well as you can – take care not to not cause rips – and set aside to dry
7. Once the holes are cut out of the Styrofoam, the students need to line the sides of the well with aluminum strips by taking gluing one end to the top side of the Styrofoam, go through the well, and glue the other end to the bottom side of the Styrofoam so it would like ] – rather than lining the sides of the well by making a loop with a single strip.
8. Next, glue the decorated cardstock onto the Styrofoam, making sure that the holes match up.
9. Then, teachers hand out the batteries, tweezers (already wired and connected with LED light), stripped 2in wire, and tape.
10. Test the tweezers to make sure it lights up
11. Tape the long wire on the end of the tweezers to the battery – test again
12. Tape the stripped 2in wire to the negative end of the battery – test again by touching the tweezers to the wire. (If it doesn’t work, double check to see if the tape is holding the wires in place, then test the tweezers on a different battery.)
13. Next, note where the battery well is on the Styrofoam and place the battery accordingly on the aluminum sheet and tape down.
14. Next, tape the wire on the negative end onto the aluminum sheet so contact is being made – test the connection by placing the tweezers onto the aluminum, and the LED should light up.
15. Place the Styrofoam on top of the aluminum sheet and battery and tape securely together along the sides.
16. Test the tweezers on the bottom and sides of each well to ensure that the circuit will close upon contact
17. Congratulations! You’ve just made your very own operation board game!

**WHAT IS HAPPENING?**

This is the circuit while it is open:



This is circuit while it is closed:

