

MAKEngineering Kit

Instructions:

Water Color Bot

Images and videos from previous participants.

ENGINEERING TASK

Design a motorized bot that “paints.”

Example: <https://youtu.be/mapCDTTKZI8>



DID YOU KNOW?

There are jobs in which people create robots—robotic engineers. In 2019, robotic engineers in the United States made an average salary of \$99,040 a year. They also like their jobs. They rated their career happiness 4.2 out of 5 stars. Watch the following videos to learn more.

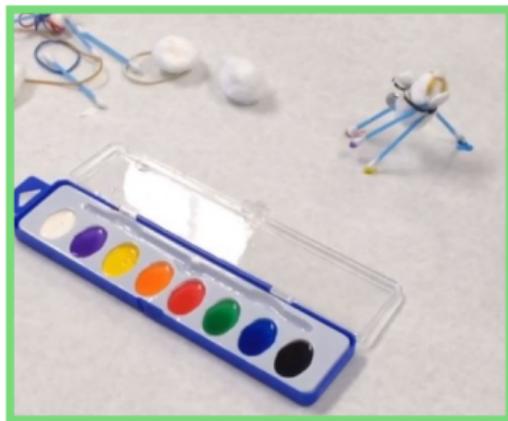
<https://youtu.be/sUOY3JZ-9C4>

<https://youtu.be/7trO3sQzmf8>

MATERIALS IN KIT

- ◆ ~25 Q-tips
- ◆ ~15 cotton balls
- ◆ ~15 rubber bands
- ◆ 2 cell batteries
- ◆ 2 vibrating motors
- ◆ Clear tape
- ◆ Water color kit
- ◆ Sheets of paper, cereal box, and aluminum foil

You will need a small amount of water.



STEP 1—RESEARCH

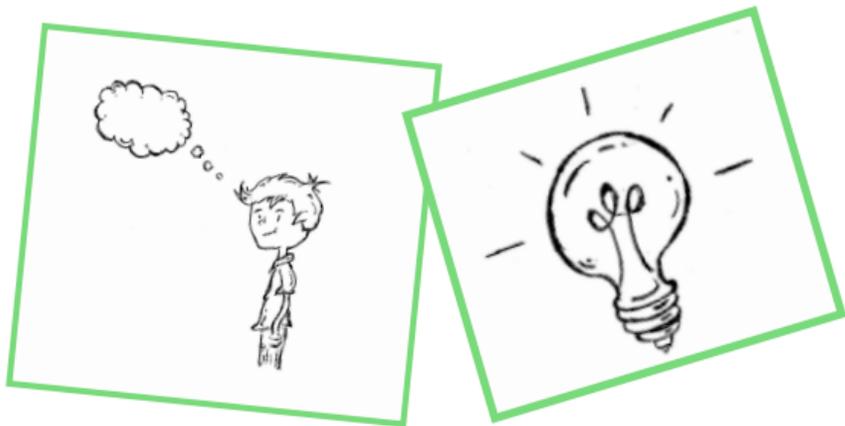
Watch the following video. This video shows examples of previous water color bot designs.

<https://youtu.be/NmOAUy1G3n8>

Stop the video as needed to take notes on what you notice that you might work into your own designs.

STEP 2—PLAN

Based on the video and your notes, design/sketch 3-4 bots and make a list of materials for each design. What makes each of your designs unique?



STEP 3—CREATE

Pick one of your designs from Step 2. Build the frame or body of your bot using Q-tips, cotton balls, rubber bands and/or tape.



How does the battery connect to the motor?
Where is a reasonable place to attach the battery and motor?

STEP 4—TEST

Try different material as your canvas—paper, empty food boxes (e.g., cereal), and aluminum foil. What other material in your home might you use?

Predict which material will work best. Why?

Lightly dip the end of each Q-tip into the water color of your choosing. Time to let you water color bot PAINT! Don't forget to try the different canvases.

STEP 5—IMPROVE

Are changes needed to the bot? Why or why not?

If so, what might you do differently? If not, what worked well?



STEP 6—PARALLEL PROTOTYPE

Try additional designs from Step 1. Do each step again—Build, Test, and Improve if needed.

We also have a few challenges for you to consider:

- no cotton balls.
- no tape.
- use other household objects.
- change the location of the battery and motor to see how it impacts the artwork.



DID YOU KNOW?

There are individuals who are programming (or teaching) robots to paint.



<https://youtu.be/nDp124yDr14>
<https://youtu.be/qzuEa1Xd12M>
<https://youtu.be/dkTjEi7O4lc>

WHAT TYPE OF ENGINEER ARE YOU?

Add a sticker to your Engineering Passport that identifies the type of engineer you were most like in the design of a water color bot. Don't forget to write why you chose the type of engineer.



This engineering kit would not have been possible without funding and support from the National Science Foundation.