Problem 1.5 Paintbrush Design Teacher Notes

Introduction

Everything around us that is not from nature was designed and built by humans. Every object was created to serve a specific purpose.

In this design challenge, students will follow the design process to sketch, build, test, and reflect on a new paintbrush design. With teacher support, students will compare physical models of paintbrush tool designs and describe the differences in material choice, shape, and size. The students will use technology to document their final design solutions and suggest improvements.

Equipment

- Variety of household and classroom items that may include:
  - Dowel rods, pencils, sticks, and other items to make the handle
  - Feathers, pipe cleaners, sponges, foam – precut or Styrofoam packing peanuts, string, yarn, floss, and other items to create the brush
- Variety of items to assemble brushes that may include:
  - Tape, glue, string, hot glue and glue gun if operated by an adult
- Paint and white paper to test final paint brush designs
- Pencils
- Crayons or colored pencils
- Launch Log for each student

Procedure

1. Show students a paint brush or an image of a paintbrush and discuss the parts of the paintbrush (handle and brush) and how it is used.
2. Introduce the idea that everything around them except for things found in nature was designed by a person. This includes their chairs, crayons, and shoes.
3. Explain to students that they will be designing and building a paintbrush of their own design.
4. Explain to students that the people who design new products or things are engineers and designers. These people follow a step-by-step process to help them solve problems and design new things.
5. The students complete the page titled Problem 1.5 Paintbrush Design in their Launch Logs by circling all the items designed by a person.
6. Remind students that their challenge is to design and create a paintbrush. They will use the same step-by-step process engineers and designers use to solve problems.
7. The teacher will document all steps of the design process as the students create their paintbrushes with an interactive engineering notebook. This can be a piece of chart paper, a note taking app on the tablet, or other method that can be used to document student responses during the problem.

8. The first step in the process is **Ask**.
    a. Guide a discussion where students **ask** questions to gather information that will help them define the problem.
    b. Students may ask questions about what materials are available or why we use paintbrushes.
    c. Document the discussion under the heading of “Ask” in the class interactive engineering notebook.
9. The second step engineers and designers follow is **Explore.**
    a. Allow students to **explore** ideas by talking in small groups or as a class about possible ideas for a new paintbrush. Remind students that during this part of the process there are no ideas too silly.
    b. Document some of the ideas under the “Explore” heading in the class engineering notebook.
    c. Direct students to sketch ideas for their paintbrush design using pencils, crayons, or colored pencils in their Launch Logs on the corresponding page.
    d. Allow students to see the available materials that they will use to create their brushes. Items may be displayed on a table for students to observe or held up in front of the group one at a time.
10. The third step in the design process is **Model**.
    a. Ask the students to circle their best design; this is the one that solves the problem of applying paint to a paper the best of all of their possible designs.
    b. The teacher facilitates the creation of the brushes. Note: allow students to design paint brushes without handles if desired.
    c. Document some of the models under the heading “Model” by either printing photographs of the paintbrushes in progress or finished paintbrushes. You may also choose to include sketches of the students’ paintbrush designs.
11. (Optional) The teacher takes photos of the finished paintbrushes with the students if desired.
12. The fourth step in the design process is **Evaluate**.
    a. Students test their paintbrushes by painting a variety of lines and shapes on construction paper.
    b. After the students have tested their design, they will sit with a partner to look at their paintbrush and painting and a partner’s paintbrush and painting.
    c. The teacher then leads a discussion on the features, strengths, and weaknesses of the different paintbrush designs and documents key insights under the “Evaluate” heading in the interactive engineering notebook.
13. (Optional) Student work, including paintbrush and painting, may be photographed and/or displayed.

Conclusion Questions for Discussion

Note: the conclusion questions may be for discussion only and documented as a whole class under the “Explain” heading of the interactive engineering notebook, or

the individual comments may be recorded by the teacher on a notecard for display with the paintbrush and painting. Alternatively, the teacher may choose to record student responses with the video camera on the iPad and assist the students in submitting the video through the Canvas application.

1. Now that you have seen other paintbrush designs and how other students used the materials, what would you do differently if you were allowed to start all over again?

2. What other materials do you think would make a good paintbrush?