

Problem 1.5 Communicating with Light and Sound Design Problem Teacher Notes

Introduction

In this design problem, students will create a device to communicate over a distance using light or sound with available materials. At the beginning of the module, students were introduced to the problem through fictional characters Angelina, Suzie, and Mylo. The three friends are on a hike with their classmates and become separated from the group. As evening falls the students must communicate with the rest of the class using only available items. This includes a flashlight, mirror, water bottle, bandana, masking tape, and plastic cups.

Students will follow the design process and document each step in their Launch Log as they solve the design problem of communicating over a distance using light or sound.

Equipment

- Each group of 4 students will be supplied with the following:
 - 1 Flashlight
 - 1 Mirror
 - 1 Metal water bottle
 - 1 Bandana
 - 1 Roll of masking tape
 - 2 Plastic cups

Procedure

1. Remind students that their design problem is to work in a team to design, create, and evaluate a device to communicate across a distance using light or sound. To be successful the students must be able to signal for help across a distance. The length may be determined by the teacher and may be across a classroom or a larger outdoor area.
2. The students document their work as they follow the steps of the design process in their Light and Sound Launch Logs.
3. 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 available materials or why the students would want to communicate with the rest of the group.
 - c. Students write or draw the problem faced by the group of fictional characters under the **Ask** section of the engineering notebook.
4. The second step in the design process is **Explore**.

- a. Allow students to **Explore** ideas by talking in small groups about possible ideas for a communication device. Remind students that during this part of the process, no ideas are too silly.
 - b. Using the Launch Log as a guide, have students sketch ideas for their communication device using pencils, crayons, or colored pencils.
 - c. Allow students to examine the available materials that they can use to create their devices. Items may be displayed on a table for students to observe or held up in front of the group one at a time. The teacher may also wish to place a set of each of the items in a backpack or other bag for each team.
 - d. Note: The list of items included in the fictional story include: a backpack, comfortable walking shoes, water bottle, bandana, rain jacket, snack, and a flashlight. The fictional characters chose to add items to their backpacks before they went on the hike including a mirror, tape, and plastic cups. The teacher may choose to allow students additional materials for the creation of their communication device or may limit students to communicating with either light or sound.
5. 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 communicating over a distance using light or sound the best.
 - b. The teacher facilitates the creation of the communication devices.
 - c. Students document their models in their engineering notebooks by drawing the final version of the device under the heading **Model**.
 - d. The students will use the iPad® tablet to photograph the device.
 6. The fourth step in the design process is **Evaluate**.
 - a. Students test their communication devices to see if they can communicate over the distance set by the teacher. The students can also compare their device with another group and discuss how each group solved the problem.
 - b. Students record their findings in their engineering notebooks. Additionally, students explain one strength and one weakness of their model. If these terms are too advanced for the students, the teacher may ask them to write or draw one good thing about their design and one thing they would like to change about their design.
 7. The fifth step in the design process is **Explain**.
 - a. Students use the iPad app entitled Stage: Interactive Whiteboard and Document Camera to take a photo of their device in action and either write or draw over the top of the image to explain how the device works.
 - b. The students use this image and explanation to present their device to the class.
 8. The teacher then leads a discussion on the features, strengths, and weaknesses of the different communication devices.

Conclusion Questions

Note: The conclusion questions may be for discussion only and documented as a class. Alternatively, the teacher may choose to record student responses with the video camera on the iPad® tablet and assist the students in submitting the video through the Canvas application.

1. Now that you have seen other communication devices 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 work well to communicate over a distance using light or sound?