



FACILITATOR GUIDE

Deconstruct a Communication System

Learning Objectives

1. Learn words and ideas used to describe a communication system.
2. Recognize that sound and radio waves are not the same.

Activity Goals

- This activity is intended to build a cardboard model of a communication system that captures learners' ideas about how messages can travel through individual components of that system.
- The resulting model will be used to highlight areas of uncertainty that will motivate exploring how information is encoded, decoded, and transmitted.
- This model also serves as an artifact that you can use to come back to track progress as you revise it based on the ideas learners develop through the follow up activities.

Materials

- Large (12" x 12" or larger) pieces of cardboard (6-10 pieces per group)
- Black marker
- Scissors
- Tape

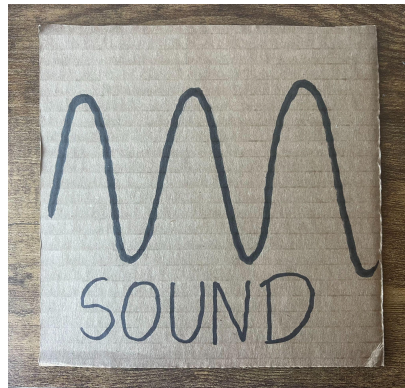
Safety

- Consider using Canary corrugated scissors to cut cardboard

Advance Preparation

- Have available pieces of scrap cardboard (12" x 12" or larger) to cut out components.
- The mouth and ear cardboard pieces can be prepared in advance, leaving the middle components to be determined by the learners during the activity. Note that pieces can represent any ideas of learners including processes and components of

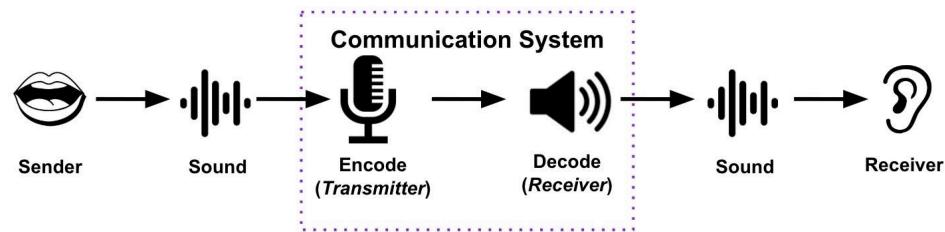
communication systems. Below is a cardboard piece that represents a component of a communication system.



Activity Procedure

1. Begin by asking learners “How does a message travel from our mouth to the ears of someone who is listening? What steps take place starting from the sound coming out of the mouth to the ears of the other person?” Encourage learners to consider the process where words are created in our mouths, travel through the air, and reach the ears of the listener. Use follow up questions to capture as many ideas as possible while highlighting areas of consensus and disagreement: “Who has a similar idea?” “Who has a different idea?” “Do we all agree with ___?”
2. As learners generate ideas and mention keywords, label cardboard pieces with the name of the components mentioned. Some of these components might include 'sender,' 'message,' and 'receiver.' Tape the components on the board or a wall in order of message transmission, so that every learner can see the components.
3. Ask learners “How does this process differ when we send a voice message from our phone to a friend's phone with whom we are conversing?” Are there any different or new components we should have?” Encourage learners to think about the different types of components that are required for this type of message transmission.
4. Label and tape new cardboard pieces for additional components that emerge from this discussion, such as signal, transmitter, receiver. Use question marks to highlight areas of disagreement. During this part, elicit as many ideas as possible to reflect how the group thinks the cardboard pieces should be taped to represent the message of transmission.
5. A basic communication system should include a sender and receiver, a message, and a set of various components comprising the communication system. Below are a few examples of communication systems. Consider sharing these and asking learners to notice which parts are the primary or similar components of all communication

systems. This is the first step of building towards an understanding of wireless RF communication.



6. Use the following prompts to motivate exploring follow up activities that can help learners grasp how a radio communication system works:
 - a. Other than voice, what other types of information can our devices send?
 - b. What questions does this diagram raise for you?
 - c. What are the limitations of using our voices only to communicate with people far away?

Notes to the Presenter

- Consider revisiting this model as other activities are introduced. Alternatively, share a complete model on the board the person-to-person communication and radio-to-radio communication models below.
- The **Sending Digital Images** and **Make a Lighthouse** activities are designed to help learners explore these ideas.

Conversational Prompts

- What are the advantages and disadvantages of communicating through voice only?
- What are the advantages and disadvantages of using radio communication, like our cell phones, to communicate with others?

Content Background

A communication system can involve several radio components that operate together to form a system that communicates messages.

The transmitter is the component crucial for sending messages. It converts information into signals suitable for transmission through encoding.

Before transmission, information undergoes encoding, where it gets transformed into a format compatible with the communication channel. On the other end, the receiver captures and decodes incoming signals. Explaining the functions of receivers in decoding messages enhances comprehension.

At the receiving end, the encoded message needs decoding to retrieve the original information. The **Make a Lighthouse** and the **Sending Digital Image** activities are both designed to explore how transmitters encode information. These activities will help learners grasp how decoding occurs, the role of receivers in this process, and potential challenges of communication mechanisms.

Signal strength: Signals travel through space or a medium, and they are affected by distance. The **Signal Strength Detectives** activity will help you explore the role of distance on signal strength using micro:bits.

Radio communication systems have evolved from their inception. The **Titanic Problems & Solutions** activity touches upon the historical development of radio communication technology. It helps learners understand how radio-based technology has evolved to meet changing communication needs.

List of Terms Related to this Activity

Radio transmitter: A device that transmits radio waves by creating an alternating current at a desired frequency that is used to send a communication message.

Radio receiver: A technology device that is able to receive radio waves and then convert them into a communication message that can be understood by another device or human.



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