

Creating a Simple Telegraph Machine

Grades: 5-8

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Goals/Standards:

- National Science Standard A: Science as Inquiry
- National Science Standard B: Physical Science
- National Science Standard E: Science and Technology
- National Science Standard G: History and Nature of Science
- North Carolina Science Standards Grade 5: Goal 4
- North Carolina Science Standards Grade 6: Goal 1
- North Carolina Science Standards Grade 6: Goal 2
- North Carolina Science Standards Grade 7: Goal 1
- North Carolina Science Standards Grade 7: Goal 2
- North Carolina Science Standards Grade 8: Goal 1
- North Carolina Science Standards Grade 8: Goal 2
- North Carolina Science Standards Grade 8: Goal 4

Objectives:

The students will create a working telegraph machine in order to understand the concepts of simple circuits, communication systems, force and motion, and technological advances?

Engagement:

What are some ways that people use to communicate with one another? Have you ever wondered how people communicated over long distances before the inventions of the telephone and email? Was it possible for people to communicate over great distances? Who came up with the inventions that first allowed people to communicate? Is it possible for you to make your own communication device or system of communication?

Materials:

- Two pieces of cardboard (9 inches by 4 inches)
- Two pieces of cardboard (1.5 inches by 3.5 inches)
- Three pieces of wire 8 inches long
- Three long pieces of wire (the length of the wire depends on the distance you want to be able to communicate over)
- Two buzzers
- One D cell battery
- Wire strippers
- Electric tape
- Four thumbtacks
- Masking Tape

Procedure:

1. The teacher will have the students brainstorm a list of ways people communicate with one another. The teacher will act as a facilitator trying to get students to come up with both modern and past ways of communication.
2. The teacher will read a brief passage about Samuel Morse and his invention of the telegraph machine.
3. Students will break into pairs and create a telegraph machine following the steps below.

Directions for Making a Simple Telegraph Machine.

1. Make a small fold in the small pieces of cardboard at approximately .5 an inch. Using the electrical tape, tape one small piece of cardboard on the far-right side of each larger piece of cardboard. (the smaller piece of cardboard should now look slightly elevated off of the larger piece of cardboard)
2. Tape the battery to the center of one of the larger pieces of cardboard, facing the positive end towards the taped part of the small piece of cardboard.
3. Place a thumbtack through the larger piece of cardboard so that when you push down the smaller piece of cardboard it touches the thumbtack.
4. Use the wire strippers to remove approximately .5 an inch from each end of all the wires.
5. Tape two of the short pieces of wire on the negative end of the battery so that the stripped part of the wire is in contact with the battery. Make sure that the exposed parts of the two wires are not touching one another.
6. Make a loop on the end of the wire that is closest to the small piece of cardboard. Attach the wire around the thumbtack placed under the small piece of cardboard. You may need to bend the tack on the bottom side of the cardboard to make sure that the wire is secured tight.
7. Tape one of the buzzers on the far-left side of the large piece of cardboard.
8. Connect the exposed end of the second wire around the negative wire of the buzzer (this is the black wire). You may need to secure the wires together using some of the electrical tape.
9. Place a second thumbtack through the small piece of cardboard so that the thumbtack is facing the other thumbtack, making sure that the thumbtack is aligned with the thumbtack in the larger piece of cardboard. When you push down on the smaller piece of cardboard the two thumbtacks should touch one another.
10. Tear off three small pieces of masking tape. Attach one piece of the tape to the middle of each long piece of wire making little flags coming off the wire. Label the three wires from one to three.
11. Make a loop in one end of long wire 1. Attach the wire around the thumbtack placed in the small piece of cardboard. You may need to bend the tack on the top side of the cardboard to make sure that the wire is secured tight.
12. Tape one end of long wire 2 around the positive end of the battery, making sure that the exposed part of the wire is in contact with the battery.
13. Connect one end of long wire 3 to the positive wire of the buzzer (this is the red wire). You may need to secure the wires together using some of the electrical tape.
14. Place a thumbtack through the second larger piece of cardboard so that when you push down the smaller piece of cardboard it touches the thumbtack.
15. Make a loop in the free end of wire 2. Attach the wire around the thumbtack placed under the small piece of cardboard. Then make a loop in one end of the remaining small wire. Attach this wire around the same thumbtack. You may need to bend the tack on the bottom side of the cardboard to make sure that the wires are secured tight.
16. Tape the second buzzer to the far side of the second piece of cardboard.
17. Connect the remaining end of the short wire to the positive wire of the second buzzer. You may need to secure the wires together using some of the electrical tape.
18. Connect the free end of wire 1 to the negative side of the second buzzer. You may need to secure the wires together using some of the electrical tape.
19. Place the remaining thumbtack through the small piece of cardboard so that the thumbtack is facing the other thumbtack, making sure that the thumbtack is aligned with the thumbtack in the larger piece of cardboard. When you push down on the smaller piece of cardboard the two thumbtacks should touch one another.

20. Make a loop in the free end of wire 3. Attach the wire around the thumbtack placed in the small piece of cardboard. You may need to bend the tack on the topside of the cardboard to make sure that the wire is secured tight.

You have now completed making your own telegraph machine.

4. The teacher will go over how to use a telegraph machine.
5. Students will practice using their machines.
6. The students will then be assigned the task of creating a new code that can be used on their machine.

Follow Up Questions:

1. Share what you did.
 - Was it easy to communicate with your partner after creating your own telegraph? Why or Why not?
 - What method did you use to create your own system of communication?
 - What was difficult in making your own communication system?
2. Process what is important.
 - Why was it important to make sure that you connected the wires from the battery to the appropriate wires on the buzzers?
 - What is the difference between a dash and dot when using the telegraph?
 - How did the message travel one piece of cardboard to the next?
 - How would the message be affected if the wires were connected in a random manor?
3. Generalize to your life.
 - How is the telegraph machine similar to the telephone? In what ways is it similar to text messaging?
 - How might a system of communication be useful in times when you do not want others intercepting messages?
 - What uses might the telegraph have in modern times?

Extension Activities:

1. Effects of different wire types on magnetic field strength.
2. Communication through different mediums such as air and water.

Resources:

- <http://www.scphillips.com/morse/> (website that lists morse code symbols)
- <http://inventors.about.com/library/inventors/bltelegraph.htm>
- <http://www.du.edu/~jcalvert/tel/morse/morse.htm>
- <http://www.chss.montclair.edu/~pererat/pertel.htm>
- <http://www.connectedearth.com/Journeys/Howitworks/Telegraph/Howthetelegraphworks/howthetelegraphworks.htm>

Glossary:

- simple circuit
- telegraph
- Morse code
- electromagnetism
- communication systems