Learn Morse Code Activity Sheet

Name: _____ Teacher Guide

Date: _____

Student answers will vary. Suggested responses and ideas to look for are provided.

Learn Morse Code

Note: You can print and laminate the alphabet guide to use again

1. Gather your materials to learn Morse code and create a telephone!

   a. Morse code alphabet guides (see attached page), flashlight, two types of string (for example: fishing line, embroidery string, twin, yarn, or hemp, etc.), two listening devices (for example: 2 tin cans, 2 paper cups, or 2 plastic jars), 2 paperclips, optional: hot glue or tape, dark piece of paper.

2. Before you begin, think about ways you communicate with friends who live far away:

   a. What are three different methods of communication that you use?

   Look for students to share non-electronic forms of communication, like letters, as well as digital forms like a computer for email, a **cell phone** to call, text, social media or video/FaceTime with friends, or older technology like a walkie-talkie to talk to a neighbor!

   b. How do these methods differ? Look for students to make meaningful comparisons. For example, some of these methods require people to move the message (like a letter) and may take longer to get to their destination than electronic messages like those sent by texting, phoning, and email. Some methods also last longer than others.

   i. Are you able to communicate the same ideas or feelings in each method? Sometimes it's hard to tell how someone is feeling in a text or email, but talking over the phone or video chatting makes it easier to read people's emotions. Letters can even show more than texting since handwriting can help show how someone was feeling while they wrote.

   c. How did your grandparents, or great-grandparents, communicate before cell phones? Look for students to share less technologically-based solutions. Also remember that, although our grandparents wrote a lot of letters, or even telegrams, some students will not know of a world without cell phones—help them understand by sharing your stories! (*Note: Telegraphy is the long-distance transmission of textual messages where the sender uses symbolic codes, known to the recipient, rather than a physical exchange of an object bearing the message*)

   i. What about before computers? before dial-up phones? before mail service? before written language? Students should start to explore ideas (and patterns) that help people communicate. For example, pictures and symbols drawn on rocks are evidence of communication. And, we know that Pacific people used shells and sticks to make maps. Invite students to also imagine— perhaps in some cultures, leaves and sticks were arranged in patterns to leave messages!

3. Read the background information on your sheet to familiarize yourself with the guidelines for Morse code.

1

Morse Code Background Information

Morse code is a system of communication that uses dots and dashes to relay messages. A dot looks like a period, and a dash is a long horizontal line. A dot is called a dit, and a dash is called a dah.

Different combinations of dits and days represent each letter in the english language. They can be strung together to create words and sentences.

Timing
The length of each symbol is related to the length of one dit:

- A dit is one unit of sound.
- When switching between dits and/or dahs in the same letter, you leave one unit of silence.
- A dah is the length of three units (three dits).
- To move to the next letter, you insert a pause of three units. To move to the next word, you insert a pause of seven units.

Remember:
1. Dit (.) = 1 unit
2. Dah (—) = 3 units
3. Between dits and dahs within a letter = 1 unit of silence
4. Between letters in a word = 3 units of silence
5. Between two words = 7 units of silence

4. Now that you're familiar with how Morse code works, practice by making the sounds for the short dit (.) of 1 unit, and the longer, drawn out"dah (—) of 3 units.
*Note: You can tap your finger while you say each letter to help keep pace, or use a metronome (can be found online). Also, a dit is often pronounced as "di."*
You can also find a Morse Code Translator online at:
https://morsecode.world/international/translator.html

5. Take a look at both of your alphabet guides. One shows you the dits and dahs for each letter. The other uses the shape of the letter to help you remember the sequence.

Memory devices, or word associations, can help you recall certain letters. For example, the word "mailman" starts with the letter "M." So, sounding out "mail - man" might help you remember that letter as "dah dah." If it's helpful, come up with your own creative ways to match the sounds from each letter.
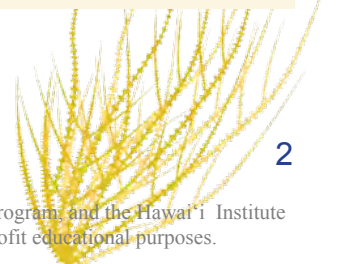
6. Let's start out with the letter "A." This letter is simple, with just a dit and a dah. A helpful word association might be the word "alpha" or "al - faa." Say it out loud, then move on to #7 to spell "aloha."
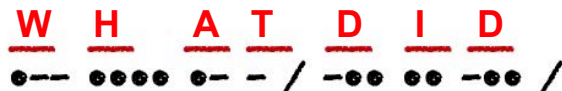
A · —
al faa
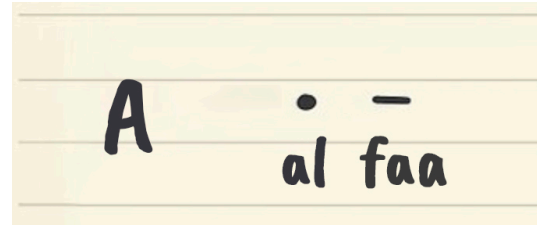
7. Continue in this way to spell out the word "ALOHA"

●–　●–●●　–––　●●●●　●–

8. Now that you've practiced writing and sounding out "ALOHA," conduct your trials:

Trial #1: Decipher the Code

a. Work with a partner to decipher the Morse code below to reveal a secret message.
Note: Each red line corresponds to a combination of dits and dahs that makes up a letter. Write your answer on the red lines.

W   H   A   T   D   I   D
●––　●●●●　●–　–　/　–●●　●●　–●●　/

T   H   E   W   A   V   E
–　●●●●　●　/　●––　●–　●●●–　●　/

S   A   Y   T   O   T   H   E
●●●　●–　–●––　/　–　–––　/　–　●●●●　●　/

b. Can you guess the answer to the riddle? Continue to trial #2 to find out

S   U   R   F   E   R
●●●　●●–　●–●　●●–●　●　●–●
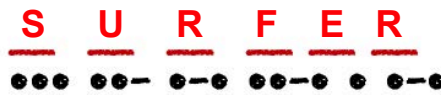
Trial #2: Speaking in Morse Code

a. Read the morse code script below to your partner:

b. **"di-di-di-dit di-dah di-di-di-dah di /
di-dah /
di-di-di di-dah-dah dit di-dah-di-di
di-dah-di-di /
dah di-dit dah-dah dit."**

c. As your partner listens, have them write the dots and dashes, then work together to translate the message.

Remember the timing:
- Dit (.) = 1 unit
- Dah (—) = 3 unit
- Space between dits and dahs within a letter: 1 unit of silence
- The space between letters: 3 unit of silence
- The space between words: 7 unit of silence

H   A   V   E   A
●●●●　●–　●●●–　●　/　●–　/

S   W   E   L   L   T   I   M   E
●●●　●––　●　●–●●　●–●●　/　–　●●　––　●
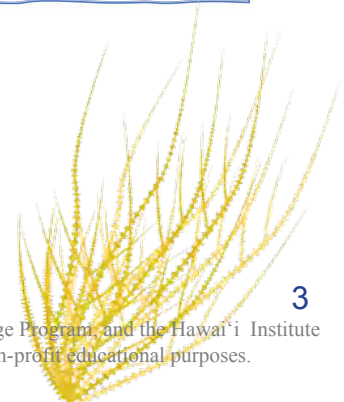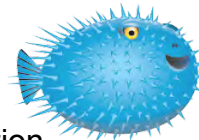
Trial #3: Morse Code in Lights

    a. Now that you're experienced with writing and listening, test your visual interpretation skills with lights!

    b. The pattern of turning lights on and off can work in the same way as dits and dahs.

    c. Practice by expressing the letter "a" in light by turning your flashlight on for 1 unit, off for 1 unit, on for 3 units, then off (dit-dah).
Note: Aim the light on the floor, on a peice of dark paper, or at the wall. Don't shine it in anyones eyes!

    d. Now, write out your name in dits and dahs.

      Your name in Morse: Example - Emily: ● ▬ ▬ ●● ●▬●● ▬●▬ ▬

    e. Use your flashlight to spell out your Morse code name with lights. Show your partner!

9. Answer the questions below:

    a. Which method of communication did you find easiest?

    Answers will vary; in our tests, it was easiest to read and write, because we had time to look at the guide and figure out which letter it was.

    b. Which method of communication did you find hardest?

    Answers will vary, but students may find it hard to translate the code in lights, because they don't have the letters memorized yet.

   c. What is an advantage of Morse Code?
    Answers will vary, but one of the attributes of Morse Code is that it is actually pretty simple. And, if you know it really well, it is useful to send messages to people far away. Also, because it is not often used in daily life, you can use it to send secrets :).

    d. What is a disadvantage of Morse Code?
    Because you have to spell out every letter, it can take a long time to send a message. Also, it seems like it could be easy to get confused or mess up letters. Note: Morse Code messages are usually pretty short and sent repeatedly to avoid confusion.

Part B: Make Your Own Telephone!

1. Adult supervision required!: Poke or drill small holes in the bottom center of both listening devices.
2. Cut a piece of string about 15-20 feet. *Note: make sure you have enough space to stand with the full length of the string pulled tight*.
3. Thread one end of the string through the bottom of the listening device, from the outside in.
4. Pull the string through the hole and tie the end of the string to a paperclip to hold it in place it so the string can't pass back through the hole. *Note: you can also tie a knot if you do not have a paper clip.*
5. Repeat steps 3-5 with the other end of the string and listening device.
6. Hold one listening device and have your partner hold the other. Walk away from each other until the string is fully stretched and tight between the listening devices.
7. Hold the listening device up to your ear and have your partner speak into their listening device.
8. Talk back and forth with your partner!
9. Change out your string with the other type of string in your materials. Retest your phone by talking with your partner, and record your observations.

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Activity Questions   Name: _____
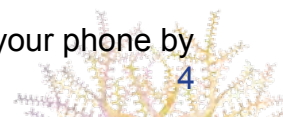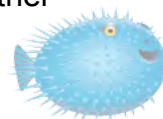
1. Look at your Morse Code Guide for numbers 0-9. What do you notice about the patterns? *Look for students to notice that the number of dots match the number up to number 5 (1 dot for 1, 2 for 2 etc.). Also, the dots are at the end after the dashes for numbers 6-9. The pattern of Morse Code for numbers kind of looks like shapes —like a pyramid of dashes or triangles of dots.*

2. Use the guide to write your birthday in Morse Code:

    April = Month 4 =
    ▬▬▬▬▬ ●●●●▬

    a. month number (with 1 for January through 12 for December)

    b. day 10th = ●▬▬▬▬ ▬▬▬▬▬

    c. year 1990 = ●▬▬▬▬ ▬▬▬▬● ▬▬▬▬● ▬▬▬▬▬

3. Describe three different methods you used to communicate in this activity.

    In this activity, students used Morse Code to communicate by reading and writing, by making sounds with their mouths, and by seeing it in lights. They also made a telephone!

4. Describe two different ways that animals use patterns to communicate (Hint: think about coloration, body motion, and sound.) *Look for students to give examples that use patterns. For example, butterflies use patterns of markings on their wings to confuse predators; snakes might have bright colors in certain patterns to warn predators that they are poisonous; birds use songs to attract mates; and geckos wiggle their tail in patterns for defense and mate attraction.*

5. Which string material worked the best for your telephone design? Why might one type of string might work better than another? *Look for evidence that supports their comparisons. For example, the regular kite string was easiest to tie, so it made the phone easier to build. The fishing line seemed to work just as well, and was really strong, so that might be good in a future phone design to last a long time.*

6. What material was your listening device made out of? Do you think that another type material might have worked better? Why? *Look for hypotheses based on logical reasoning. For example, I made my listening device out of two tin cans, a kite string, and fishing line. I noticed that the larger phones worked better, so it might help to use ta bigger listening device and thicker string, which I think will help send a louder signal.*

7. Describe a design change that you think would make your telephone better. *Look for students to show engineering design principles in their ideas. For example, I tried three ways to attach my string, and the tighter attachments sent a better signal. I would try to find a way to attach the string more securely to the listening devices so that it was more effective and transmitting the whole signal.*

8. How is your experience making the telephone similar and different to an engineer developing a new type of phone? *Look for students to show evidence of iterative development and trial and error. For example, I think an engineer would also need to test out their device a lot of times and make changes before they got it right. It's different because our telephone was made pretty quickly and is relatively simple. A professional engineer design would probably be more complicated and take longer to develop.*

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