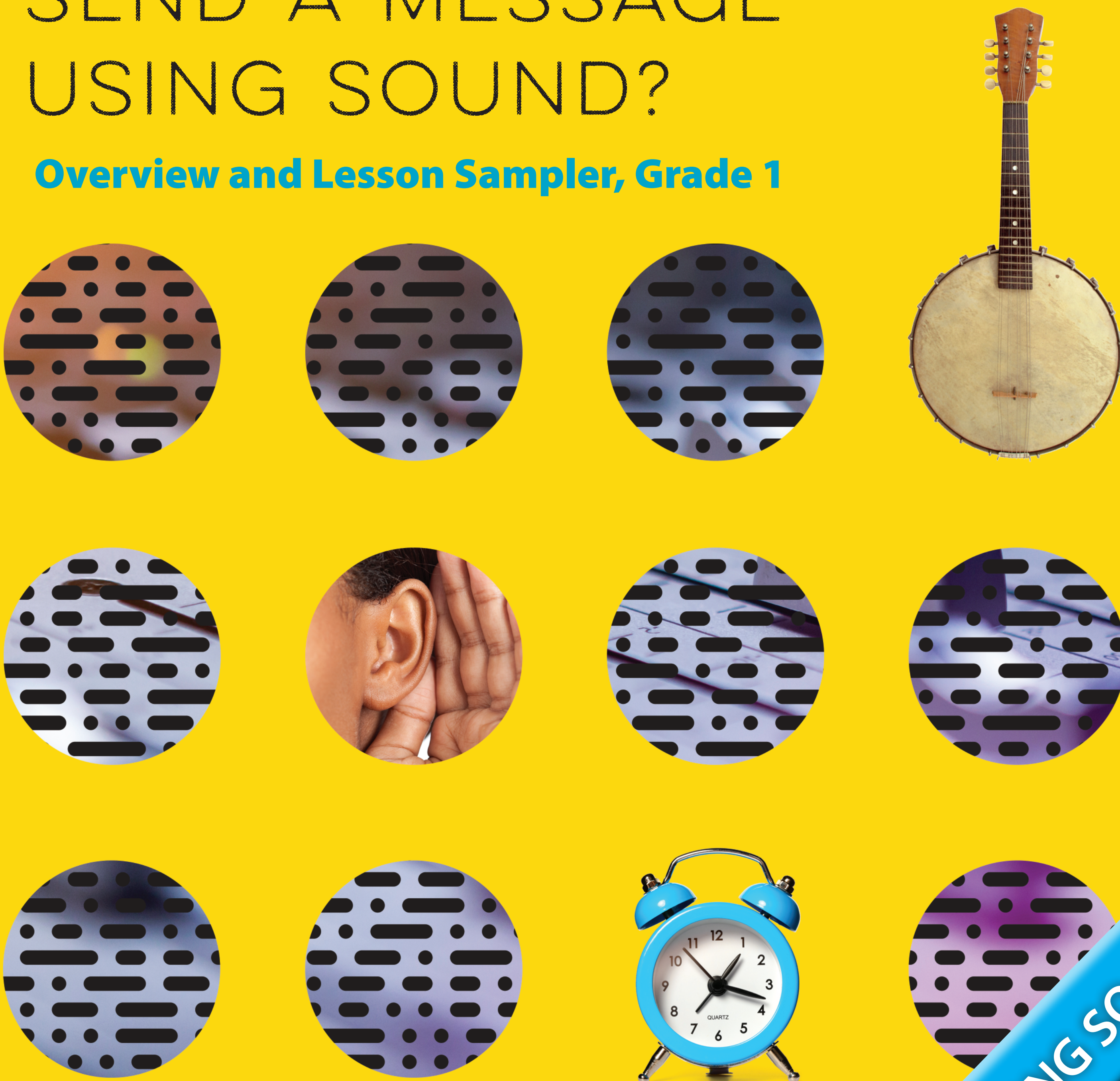
Smithsonian

SCIENCE *for the classroom*

HOW CAN WE SEND A MESSAGE USING SOUND?

Overview and Lesson Sampler, Grade 1



COMING SOON

ENGINEERING

INSIDE

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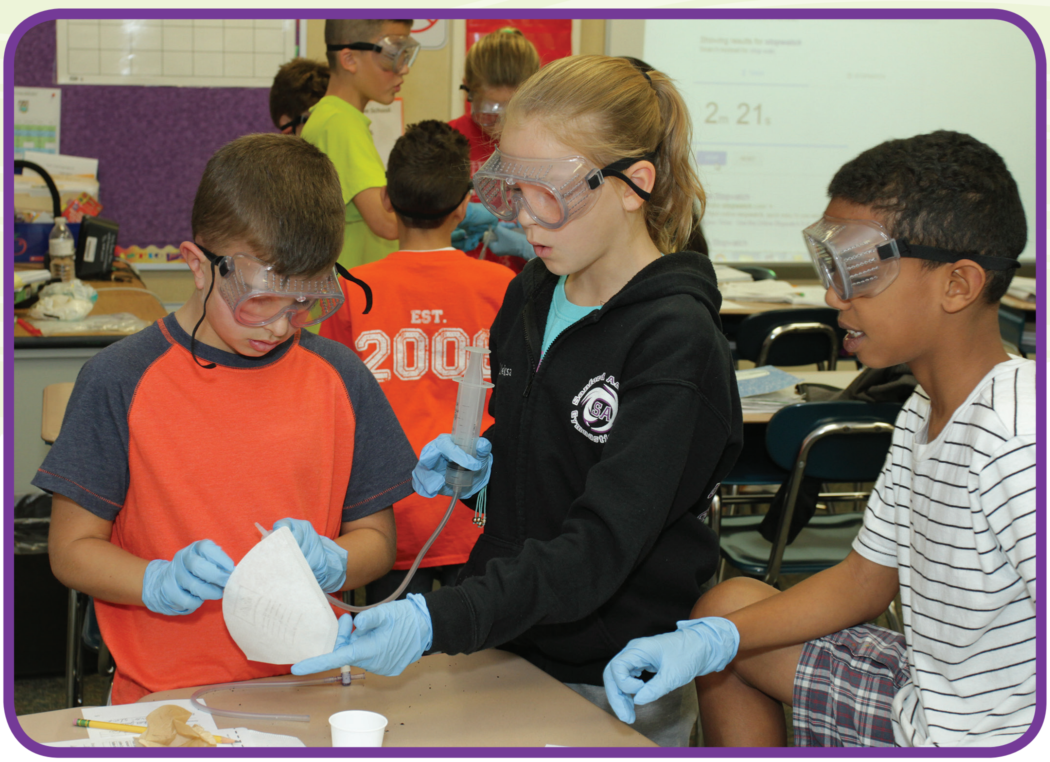
All New for NGSS—*Smithsonian Science for the Classroom*™ for Grades 1–5

For decades, the Smithsonian Science Education Center has been a leader in providing curriculum, professional development, and leadership development in support of inquiry-based science education. The release of the Next Generation Science Standards (NGSS) triggered key shifts in curriculum, instruction, and assessment.

The vision laid out by the NGSS explicitly requires performances that blend content, practices, and crosscutting concepts. The Smithsonian Science Education Center responded with a new generation of high-quality curriculum materials for Grades 1–5—*Smithsonian Science for the Classroom.*

***Smithsonian Science for the Classroom* was developed to:**

- Meet the Next Generation Science Standards through intentional curriculum design
- Support for teachers as they learn to implement new standards
- Incorporate findings from education research on how students learn
- Center on coherent storylines that flow logically from lesson to lesson as students work toward explaining phenomena or designing solutions to problems
- Broaden access to world-class Smithsonian collections, experts, and resources
- Include instructional supports to ensure all students can meet the standards
- Seamlessly incorporate a comprehensive assessment system to monitor student progress



Smithsonian Science for the Classroom Curriculum Framework—Designed for the Next Generation Science Standards

Module titles introduce phenomena or define problems

Life Science	Earth and Space Systems Science	Physical Science	Engineering Design
Grade 1			
How Do Animal Parents Keep Their Babies Safe? *1-LS1-1 • 1-LS1-2 • 1-LS3-1 • K-2-ETS1-1* **Supporting:** Engineering Design	**Is a Day Always the Same Length?** *1-ESS1-1 • 1-ESS1-2 • 1-PS4-2* **Supporting:** Physical Science	**How Can We See Things in the Dark?** *1-PS4-2 • 1-PS4-3 • 1-LS1-1 • K-2-ETS1-1* **Supporting:** Life Science and Engineering Design	**How Can We Send a Message Using Sound?** *K-2-ETS1-1 • K-2-ETS1-2 • K-2-ETS1-3 • 1-PS4-1 • 1-PS4-4* **Supporting:** Physical Science
Grade 2			
How Do Plants and Animals Need Each Other? *2-LS2-1 • 2-LS4-1 • 2-LS2-2 • K-2-ETS1-1* **Supporting:** Engineering Design	**What Can Maps Tell Us About Water on Earth?** *2-ESS2-2 • 2-ESS2-3 • 2-PS1-1* **Supporting:** Physical Science	**How Do Heating and Cooling Change Things?** *2-PS1-1 • 2-PS1-2 • 2-PS1-3 • 2-PS1-4 • K-2-ETS1-1* **Supporting:** Engineering Design	**How Can We Stop Soil From Washing Away?** *K-2-ETS1-1 • K-2-ETS1-2 • K-2-ETS1-3 • 2-ESS2-1 • 2-ESS1-1* **Supporting:** Earth and Space Science
Grade 3			
What Explains Similarities and Differences Between Organisms? *3-LS1-1 • 3-LS3-1 • 3-LS3-2 • 3-LS4-2 • 3-ESS2-2* **Supporting:** Earth and Space Science	**How Do Weather and Climate Affect Our Lives?** *3-ESS2-1 • 3-ESS2-2 • 3-ESS3-1 • 3-5-ETS1-1* **Supporting:** Engineering Design	**How Can We Predict Patterns of Motion?** *3-PS2-1 • 3-PS2-2 • 3-PS2-3 • 3-PS2-4 • 3-5-ETS1-1* **Supporting:** Engineering Design	**How Can We Protect Animals When Their Habitat Changes?** *3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3 • 3-LS4-1 • 3-LS2-1 • 3-LS4-3 • 3-LS4-4* **Supporting:** Life Science
Grade 4			
How Can Animals Communicate with Light and Sound? *4-LS1-1 • 4-LS1-2 • 4-PS4-1 • 4-PS4-2 • 4-PS4-3 • 3-5-ETS1-1* **Supporting:** Physical Science and Engineering Design	**How Is the Ring of Fire Evidence of a Changing Earth?** *4-ESS1-1 • 4-ESS2-1 • 4-ESS2-2 • 4-ESS3-2 • 3-5-ETS1-1* **Supporting:** Engineering Design	**How Does Motion Energy Change in a Collision?** *4-PS3-1 • 4-PS3-3 • 4-LS1-1 • 3-5-ETS1-1* **Supporting:** Life Science and Engineering Design	**How Can We Provide Energy to People's Homes?** *3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3 • 4-PS3-4 • 4-PS3-2 • 4-ESS3-1* **Supporting:** Physical Science and Earth and Space Science
Grade 5			
How Can We Predict Change in Ecosystems? *5-LS1-1 • 5-LS2-1 • 5-PS3-1* **Supporting:** Physical Science	**How Can We Use the Sky to Navigate?** *5-ESS1-1 • 5-ESS1-2 • 5-PS2-1 • 3-5-ETS1-1* **Supporting:** Physical Science and Engineering Design	**How Can We Identify Materials Based on Their Properties?** *5-PS1-1 • 5-PS1-2 • 5-PS1-3 • 5-PS1-4 • 5-LS2-1* **Supporting:** Life Science	**How Can We Provide Freshwater to Those in Need?** *3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3 • 5-ESS2-1 • 5-ESS2-2 • 5-ESS3-1* **Supporting:** Earth and Space Science

Smithsonian Science for the Classroom Curriculum Overview

20 Hands-On Inquiry Modules that:

Bring Phenomena-Based and Problem-Based Learning to Your Classroom

- Life, Earth, and Physical Science module titles present questions about natural phenomena—students construct explanations
- Engineering Design modules present problems—students design solutions

Incorporate Three-Dimensional Learning into Every Investigation

- Investigations blend Disciplinary Core Ideas with Science and Engineering Practice and Crosscutting Concepts
- Investigations invite students to construct scientific explanations or design solutions for real-life problems

Provide Four Modules at Each Grade Level to Meet all NGSS Grade-Level Performance Expectations

- One interdisciplinary module per grade level in Life, Earth, and Physical Science strands
- Engineering Design modules integrate engineering and science together, never treating engineering design in isolation from the scientific knowledge it is based on

Provide Everything You Need to Meet the NGSS Standards

- Teacher support, step-by-step investigations, guiding questions, literacy, assessment, and hands-on materials

Bring the expertise of the Smithsonian's world-class collections, experts, and resources into your classroom.

Lesson design supports the NGSS teacher

Keep an Eye Out!

What to Look for in a *Smithsonian Science for the Classroom* Module:

Coherent Learning Progression

- Concepts and Practices Storyline shows how concepts build from one lesson to the next within the module using the 5-E model

NGSS Support at Point of Use

- Explanations at point of use explicitly define how students are engaging in the Science and Engineering Practices and Crosscutting Concepts

Literacy and Math

- ELA and Mathematics connections to Science overlap with student engagement in the science and Engineering Practices
- *Smithsonian Science Stories* On-Grade and Below-Grade Literacy Series
- STEM Notebooks

Misconception Identification

- Reveals common misconceptions students may have and offers ways to address them in the lessons

Technology Integration

- A balance between hands-on investigation and technology
- Foundations for coding


Grade 1
Smithsonian
SCIENCE
for the classroom
HOW CAN WE
SEND A MESSAGE
USING SOUND?
ENGINEERING
TEACHER GUIDE

Summary

In this module, students explore different ways of sending a message and organize them by how the message is sent (light or sound) and by distance. They use a drum to send a simple message using a pattern of sounds. Students collect evidence through hands-on activities and text to build a claim that sound is caused by something vibrating. They build a model of a kazoo and use this to demonstrate that sound also causes vibration. They use a model of an eardrum to collect more evidence that sound causes vibration. They use a text to construct an explanation for how we hear. In the end-of-module design challenge, students apply what they have learned about sound and engineering to make a simple musical instrument that can send a message a short distance.

Concepts and Practices Storyline

1

Lesson 1: Pass It On

Objects have been invented that help us send a message a long distance.

Students define the problem of how to send a message a long distance. They organize objects that send messages into objects that can send a message a short distance and objects that can send a message a long distance.

2

Lesson 2: Zoo Game

A pattern of sounds can be used to send a message without speaking.

Students design a solution to the problem of sending a message a short distance without speaking. They use a pattern of drum beats to help a zookeeper feed the animals in a simple board game.

Featured sample lesson

20 How Can We Send a Message Using Sound?

Lesson 3: Science of Sound
Sound is caused by vibration.

Students ask questions about what causes sound. They plan and carry out an investigation to answer this question.

Lesson 4: Good Vibrations
Sound is caused by vibration.

Students complete their investigation into what causes sound. They use patterns of movement in objects that make sound to argue from evidence that sound is caused by vibration.

Lesson 5: Sound of Music
Music is caused by vibration.

Students read texts on drums and banjos. They collect evidence from the texts to build a claim that music is caused by part of an instrument vibrating.

Lesson 6: Kazoo Kraziness
Different solutions need to be tested to see which one best solves the problem.

Students carry out research into parts of a kazoo. They plan and carry out an investigation to test different kazoo parts and argue from evidence which materials make the best kazoo sound.

Lesson 7: Make It Jump
Sound causes vibration.

Students use their kazoo to observe that sound causes vibration. They plan and carry out an investigation to answer the question: Does sound cause vibration?

Lesson 8: Hear, Hear
We hear by sound causing our eardrum to vibrate.

Students discuss how they can hear a struck tuning fork with their hand covering their ear. They obtain evidence from a text to construct an explanation for what causes us to hear sound.

Every module ends with a performance task

Design Challenge

Lesson 9: Help Hopper Cross the River Part 1
Different solutions need to be tested to see which one best solves the problem.

Students carry out research into parts of a banjo. They build a banjo by testing different banjo parts and argue from evidence which materials make the best banjo sound.

Lesson 10: Help Hopper Cross the River Part 2
A pattern of sounds can be used to send a message without speaking.

Students design a code that can be used to solve a problem. They use their banjo to send a message a short distance using a pattern of sounds.

Teacher notes:

Define problems for engineering

LESSON 2: **ZOO GAME**

Lesson Question:
How can I send a message using a drum?

2

Class periods: 1

Objectives

- **Develop a pattern of beats that solves the problem of sending a message a short distance.**
- **Test a pattern of beats to see how well it solves the problem.**

E Explore Explain

Introduction to coding

Lesson Background Information

In this lesson, students play a board game in pairs. In the game one student plays the role of the zookeeper who needs to feed five animals (zebra, elephant, panda, wolf, and lion) that live off a path through the zoo (see Figure 2.1). This student has a single counter that he/she moves. The other student plays the role of the messenger who tells the zookeeper which animal to feed. This student has a drum, a stick, and a set of five animal cards. Students first need to agree on a code to use. There are a number of different ways students could come up with a code. Students could use a number of beats to represent the position of each animal on the path, e.g., one beat for zebra, two beats for elephant, etc. Students could use a number of beats to instruct the zookeeper to move forward, backward, and stop. Students could use combinations of loud and soft and long and short beats. Students could also use sounds that represent each animal, e.g., one loud, long beat for a lion's roar. There is no right answer! The important thing is that students learn that patterns of sounds can be used to send a message and evaluate how well their code worked.

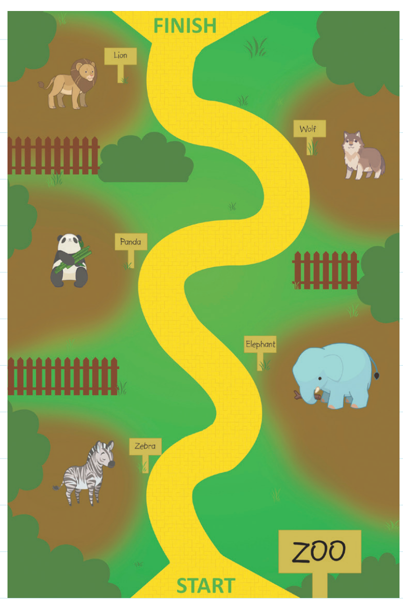


Figure 2.1 Game board

Vocabulary

code
inventor
pattern

Materials

For the teacher

- 1 Computer or tablet with Internet access*

For each student

- STEM notebook*
- 1 Lesson 2 Notebook Sheet

For each group of two students

- 1 Game board
- 1 Game piece
- 1 Set of Zoo Animals cards
- 1 Plastic container to use as a drum, 16 oz
- 1 Dowel to use as a stick (optional)

*needed but not supplied

Teacher tip

If you prefer, you can have students use their hands instead of a stick.

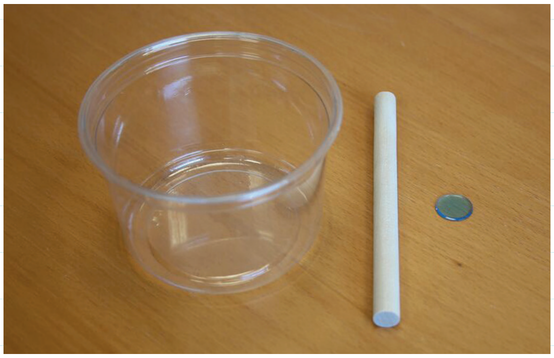


Figure 2.2 (left to right) Drum, stick, game piece

Preparation

1. Write the lesson question and lesson title on the board.
2. Put a stick and a set of Zoo Animal cards in each drum as shown in Figure 2.3. These are the materials for the messenger.
3. Make a copy of Lesson 2 Notebook Sheet for each student.

Figure 2.3 Materials for messenger

Procedure

Getting Started

1. Navigate to **ScienceEducation.si.edu/sound**. Play the Ada Asks Introduction animation. Below is a transcript of what Ada says in the animation:

   "Hi, I'm Ada! Welcome to my treehouse! I've heard that you have been discussing the problem of how to send a message. You did a great job sorting objects that can send a message. Wow, what a lot of objects use sound to send a message! The people who invented these really made our lives easier. You may not know this, but I'm an inventor too. I changed my phone so it makes one sound when my dad calls and another when my grandmother calls. Neat, hey? In fact, that gives me an idea for a game to play. I'm going to pretend I'm a zookeeper and I need to feed all the animals. The problem is the animals are all fed at different times. To help me, you have to tell me which animal to feed first. To make it tricky though, you can't speak to me. You can only use a drum to tell me where to go. This means you have to come up with a code! Perhaps you can use the drum to make a pattern of sounds that tells me what to do. Let's see how good you are at this game!"

2. Ask students for suggestions for new words to add to the word wall.

Teacher tip

If you do not have access to a computer for this lesson, go straight to the Activity.

Technology integration

Literacy integration

Tech tip
Navigate to ScienceEducation.si.edu/sound. Project the game board on a smartboard.

Activity

1. Show students the game board. Tell students that they will play this game in pairs. Explain that one student will be the zookeeper and one student will be the messenger. The goal is for the zookeeper to get to the Finish and to feed all the animals along the way.

2. Navigate to **ScienceEducation.si.edu/sound**. Open the Game Rules file. Read out the game rules or have students read them aloud.

Teacher tip
If you do not have access to a computer for this lesson, print out the game rules or write them on chart paper or the board.

3. Ask students if they have any questions about the rules.

4. Use the following guiding questions to facilitate a discussion on what code students could use:

   - **What problem are we trying to solve?**
     (The zookeeper needs to feed all the animals in a certain order.)
   - **What messages does the messenger need to send to the zookeeper?**
     (The messenger needs to tell the zookeeper to go forward, go backward, and stop. The messenger needs to tell the zookeeper to go to stop 1, 2, 3, 4, and 5.)
   - **What pattern of beats could you use for each message?**
     (I could use a number of beats. I could use a mixture of short and long beats. I could use a mixture of loud and soft beats.)
   - **How are you going to make sure the messenger and zookeeper both understand the code?**
     (Write it down in our STEM notebooks. We will use a dot for one short beat and a dash for one long beat.)

Comprehension and collaboration

Defining problems

Students define the problem of animals needing to be fed in a particular order. They ask questions in order to clearly understand the problem.

Point-of-use teacher support

Good Thinking!

Misconception

Students often think that a model has to be a physical object (5). Having students represent a solution (a code) as a series of dashes and dots helps them gain understanding of how models are used in science.

78 How Can We Send a Message Using Sound?

5. Organize students into pairs.

6. Hand out a game board to each pair of students.

7. Hand out a copy of the Lesson 2 Notebook Sheet to each student. Model for students how they should record their code on the notebook sheet. Students should write their message in the left-hand column and the pattern of beats in the right-hand column. Let students know that they don't need to use all the lines.

8. Give students 5 minutes to discuss the code with their partner and to answer question 1 on their notebook sheet. (Students write their code.) An example of a completed code on a notebook sheet is shown in Figure 2.4.

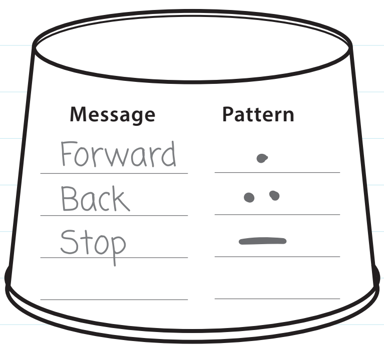


Figure 2.4 Example of a student code

Diverse learner support

ELL strategy
It may be helpful to ask English Language Learners to discuss the goals of the activity with a peer and rewrite it in their own words (6).

9. Once all students have written the code, ask students to decide who will be the zookeeper and who will be the messenger. Tell students that they will get a chance to play both roles.

Patterns

Students develop a code using patterns of drum beats and think of a way to represent their patterns.

Designing solutions

Students design a code that will help them play a game without speaking.

Developing models

Students represent the code as a series of dots and dashes.

Math integration

Number and operations in base ten

Carrying out investigations

Students carry out an investigation that tests how well their code works in solving the problem of feeding the animals in the correct order.

Using mathematics and computational thinking

Students use counting and numbers to develop and use a simple pattern of long and short sounds to send a message.

10. Hand out the drum containing the stick (if using) and the Zoo Animal card set to each messenger.

11. Hand out a single game piece to each zookeeper.

12. Give students 10 minutes to play the game (see Figure 2.5).

13. Halfway through this time, ask students to switch roles. Use the following guiding questions to check that students are thinking about what they are doing:

    - **What problems are you having playing the game?**
      (One person keeps forgetting the code or doesn't understand it.)

    - **What could you do differently?**
      (We could go over the code together to make sure we both understand it.)

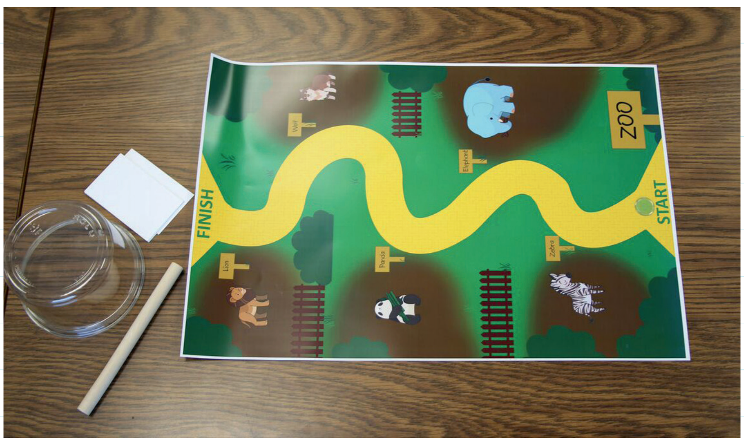


Figure 2.5 Game set up for play

14. When both students have played the role of zookeeper, ask students to complete question 2 on their notebook sheets. (Students reflect on how well their code worked.)

Bringing It All Together

1. Bring the class back together.

2. Use the following guiding questions to facilitate a discussion on how well the code worked:

   - **How well did your code work in solving the problem?**
     (Answers will vary. The code sort of worked.)

   - **Were there any problems sending a message this way?**
     (The messenger made a mistake; the zookeeper did not understand the message; the zookeeper did not hear the message; the zookeeper moved too fast.)

   - **How easy did you find it to understand the way you drew the code on your notebook sheet?**
     (It was sometimes hard to go from the code to the drum.)

   - **Can you think of a different pattern that might work better for a code?**
     (We could use a different type of sound for each message, such as long, short, soft, loud, rather than a different number of beats.)

   - **How could you improve this way of sending a message?**
     (We could play slower, use a different code, use a louder drum, go somewhere quieter.)

Good Thinking!

Misconception

Many students tend to think that problems only have one (or one best) solution (7). This discussion is intended to get students to start thinking about ways to improve an initial solution and to consider the possibility of changing it entirely.

Misconception support

Patterns

Students consider how the patterns they used in their code worked and didn't work and consider other possible patterns that could work.

Designing solutions

Students consider how well their code solved the problem, any drawbacks this solution had, and brainstorm ways to improve their solution.

Assessment tools aligned to the three dimensions of NGSS

Assessment

Formative Assessment

Use this table to provide timely, actionable feedback for individual students on their successes and areas for improvement as well as to plan any necessary whole-class remediation. Revisit the Common Misconceptions table in the module overview to familiarize yourself with other possible difficulties.

Assessed Task Bringing It All Together: Step 2 (Discussion)		
Concepts and Practices	***Indicators of Success***	***Indicators of Difficulty***
Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	☐ Students say that they used and understood the written representations (e.g., dot-dot-dash) to represent their code.	☐ Students say that they weren't sure what the symbols meant or why they would be helpful.
Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	☐ Students can think of ways to improve their solution. ☐ Students say they could change their code entirely to use a different pattern.	☐ Students can't think of any ways to improve their solution. ☐ Students do not think it would be possible to use a different code or pattern.
Designing solutions	☐ Students say that their code was at least somewhat helpful in solving the problem.	☐ Students do not think their code helped solve the problem.
Patterns	☐ Students are able to suggest ideas for new patterns to be used as a code.	☐ Students do not seem to connect codes to patterns. ☐ Students cannot think of ideas for new/different patterns that could be used as a code.

Differentiated learning

Remediation

Ask students to play the game with just three animals. Ask students to think how many stops there are between the Start and each animal. Ask students to choose a number of beats to represent the number of stops. For example, the wolf would be four beats.

Enrichment

When students swap roles, ask them to come up with a new code. Ask them to compare codes and discuss which code worked best and why.

Extensions

Literacy: "Messages on a Wire"

Comprehension and collaboration

Materials

For each group of students

- Smithsonian Science Stories Literacy Series: *Beats and Banjos*

Procedure

Read "Messages on a Wire," the story of Alexander Graham Bell, aloud to the class or have students read the story in pairs. Use the questions and suggestions below to guide the discussion.

- **What was Alexander Graham Bell's important invention?**
  (It was sending the sound of voices over a wire. It was the telephone.)
- **What is the difference between a telegraph message and telephone call?**
  (A telegraph message used signals (dots and dashes) over a wire that spelled out letters using Morse code. A telephone call sends voices over a wire.)

Students could practice using Morse code to write words to aid in their understanding of patterns.

Engineering, technology, and applications of science

Students learn that life would be very different today without the development of the telephone.

Operations and algebraic thinking

Math: Animal Number Lines

Materials

For each group of two students

- Game board
- Sticky notes*

*needed but not supplied

Procedure

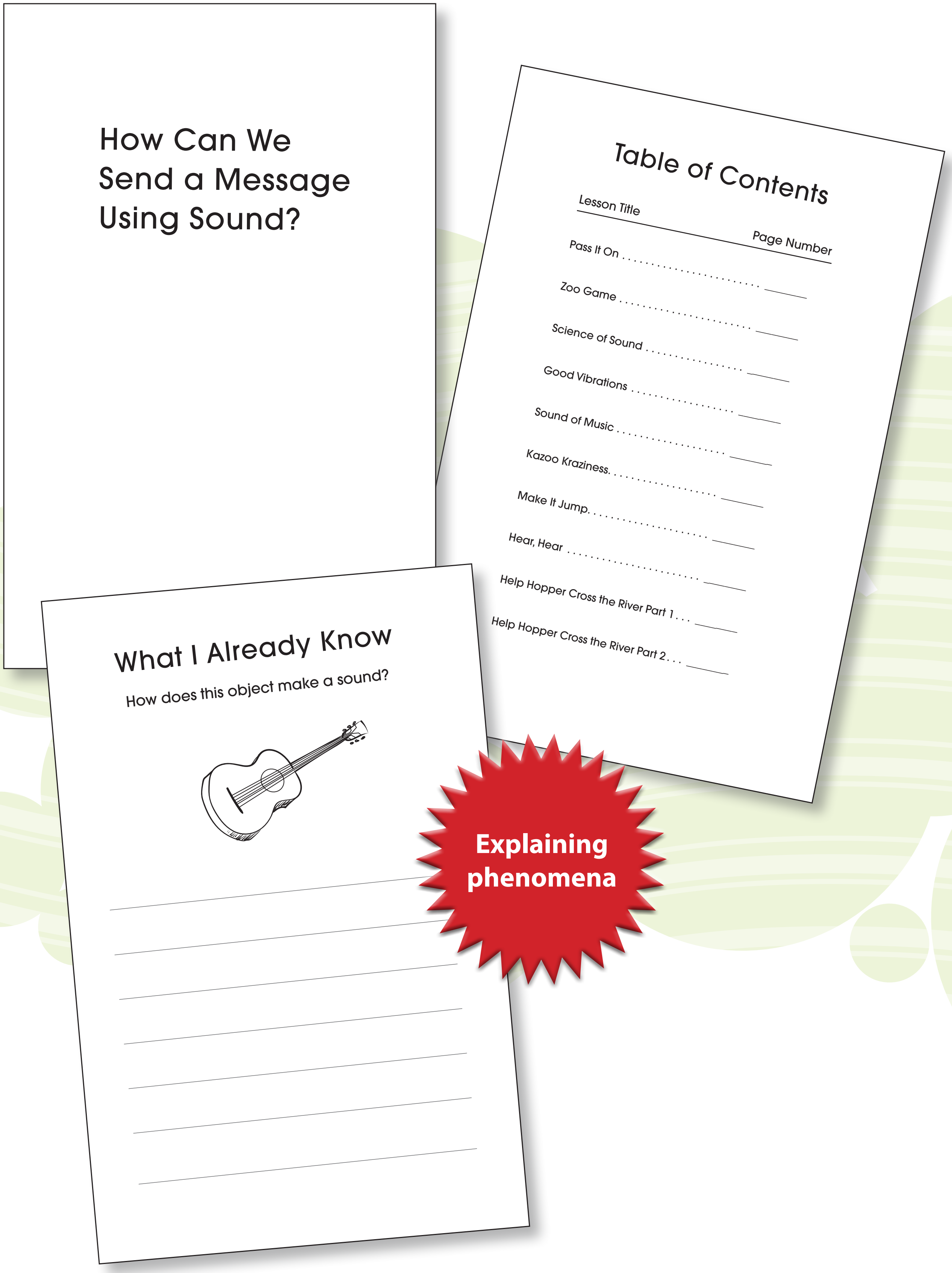
Have students write the numbers 1 to 5 or numbers of your choosing on separate sticky notes. Have students place each sticky note just below each animal with the lowest number below the zebra and the highest number below the lion. Give students various number line addition and subtraction problems to solve. For example, have them move from the elephant to the lion and say what the number would be (4 if using numbers 1–5).

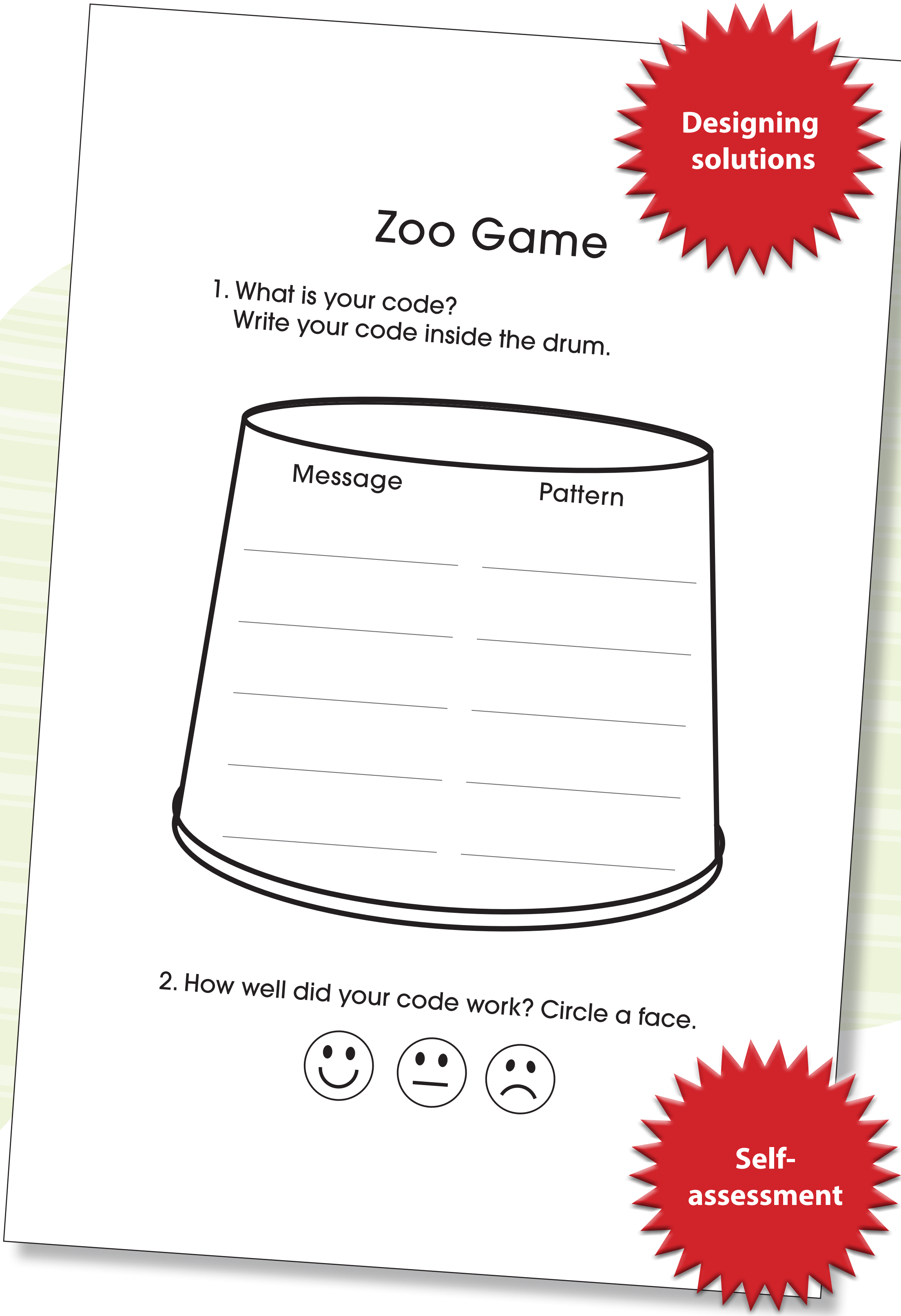
Smithsonian Science for the Classroom Creates Student Scientists and Engineers

Anyone with a question can be a scientist! *Smithsonian Science for the Classroom* gets students thinking, acting, reflecting, and communicating like scientists and engineers.

Scientists and engineers explore and investigate, read to gather information, record their data, and reflect on their ideas. *Smithsonian Science for the Classroom* provides students with:

- Hands-on investigations that integrate literacy through the *Smithsonian Science Stories* Literacy Series
- Literacy lessons dedicated to reading, writing, speaking, and listening to gather information to support claims
- STEM Notebooks built by students to keep records of their questions, predictions, claims linked to evidence, and conclusions. Lesson notebook sheets scaffold student thinking and provide opportunities for students to explain phenomena, communicate their design for solutions, and self-assess.


How Can We Send a Message Using Sound?
Table of Contents
Lesson Title
Page Number
Pass It On
Zoo Game
Science of Sound
Good Vibrations
Sound of Music
Kazoo Kraziness
Make It Jump
Hear, Hear
Help Hopper Cross the River Part 1
Help Hopper Cross the River Part 2
What I Already Know
How does this object make a sound?
Explaining phenomena



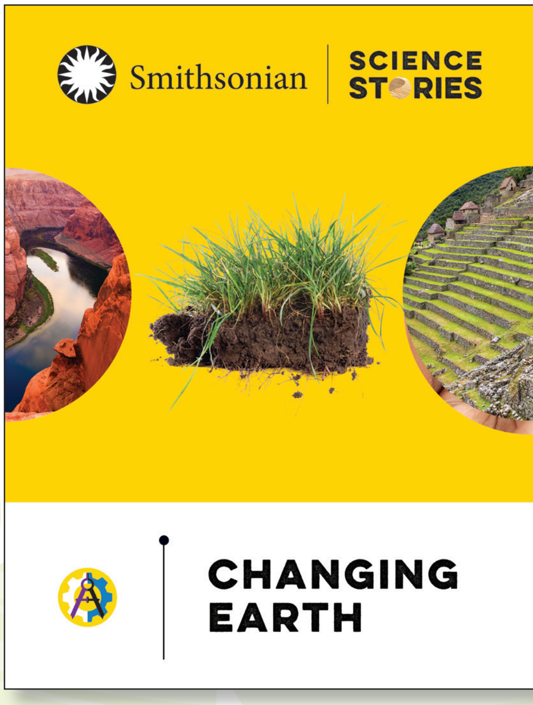
Zoo Game

1. What is your code?
   Write your code inside the drum.

Message   Pattern

2. How well did your code work? Circle a face.

Module-Specific, On-Grade and Below-Grade Nonfiction Literacy Supports Every Module of the *Smithsonian Science for the Classroom* Program.



Grade 2 *How Can We Stop Soil From Washing Away?*

Grade 3 *How Can We Protect Animals When Their Habitat Changes?*

Grade 4 *How Can We Provide Energy to People's Homes?*

Grade 5 *How Can We Provide Freshwater to Those in Need?*

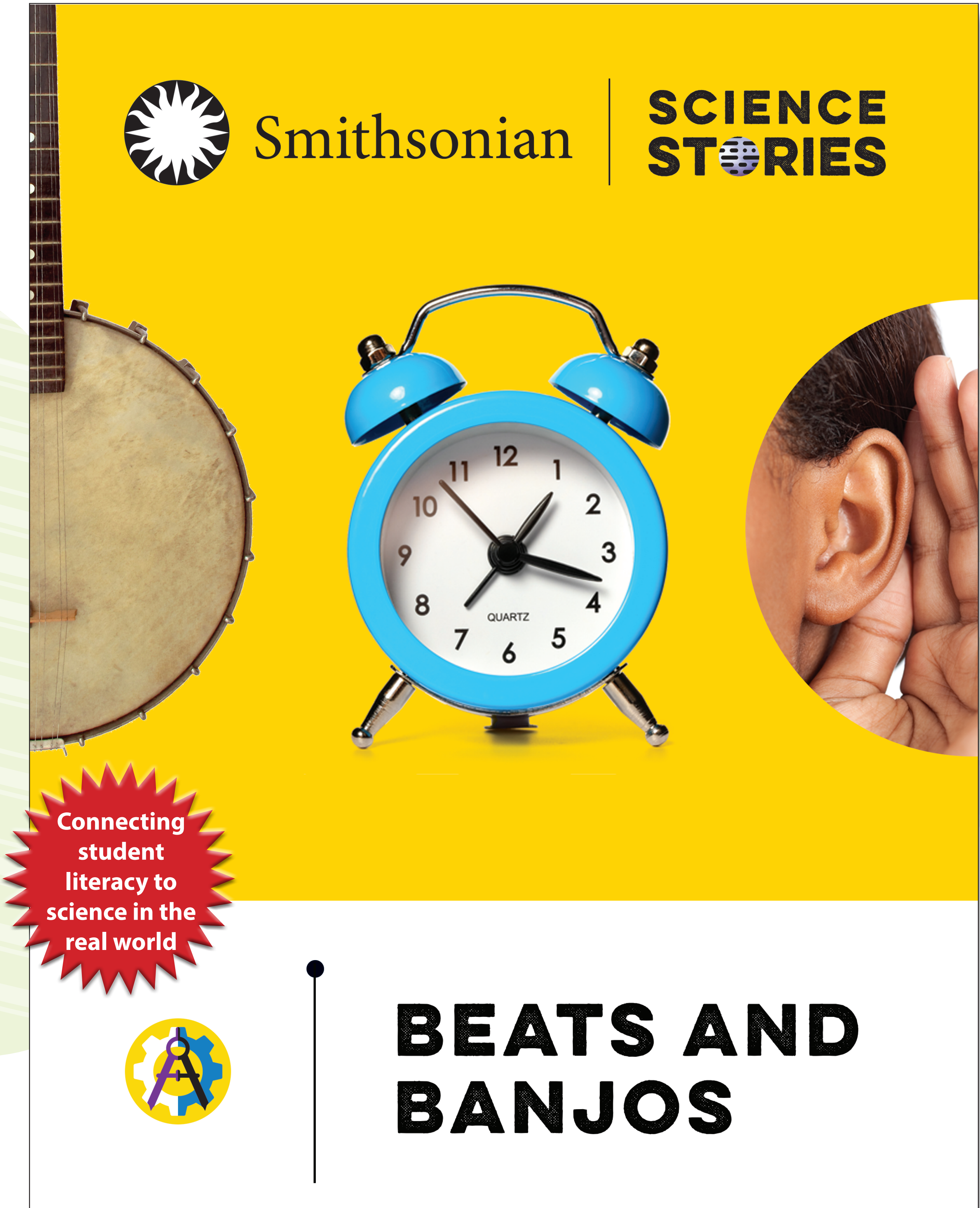
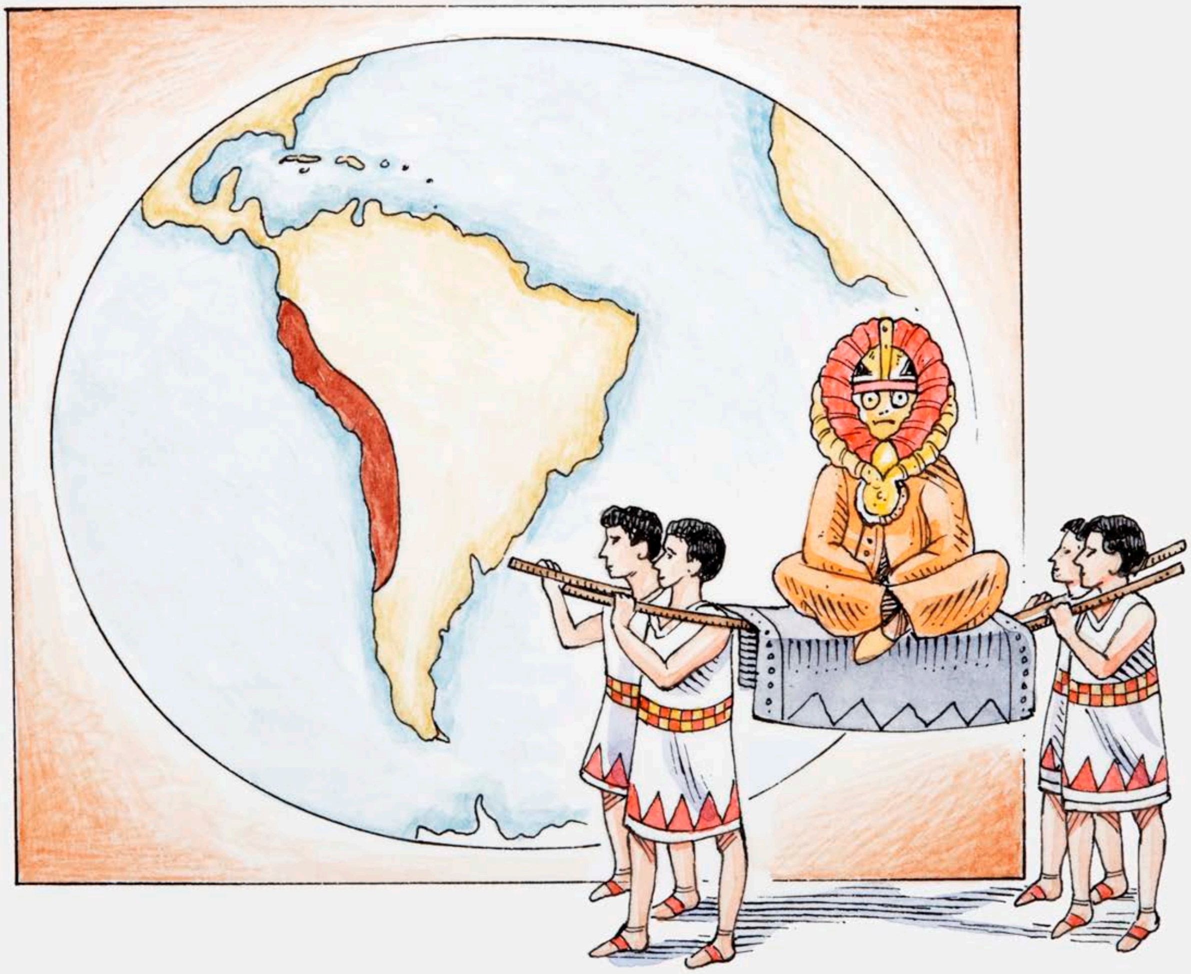

Smithsonian
SCIENCE STORIES
QUARTZ
Connecting student literacy to science in the real world
BEATS AND BANJOS

TABLE OF CONTENTS

Bring the expertise of the Smithsonian into your classroom


FIRE ALARM
PUSH



An Inka king and a map of his kingdom

The kings used chaskis to carry messages.

The kings used khipus for bigger messages.

The kings kept in touch with their kingdom.

The kings ruled for many years.

7

READING

2

MESSAGES ON A WIRE

There was a time when there were no TVs.

There were no computers.

There were no cellphones.

Watching TV

Working on a computer

8

Texting a friend

How could people get the news?

How could people send a message?

How could you talk to a friend far away?

These were problems to solve.

9

Telephone wires

Using Patterns

How could you send a message fast and a long way?

People tried using electricity and wires.

They sent **signals** over the wires.

But how could you read the signals?

10

MESSAGES ON A WIRE

You could use Morse code.

Morse code is a **pattern** of signals.

Long and short signals stand for different letters.

Each letter is made of dots and dashes.

That is how a telegraph works.

FUN FACT

MORSE CODE

H	E	L	L	O
is dot-dot-dot-dot	is dot	is dot-dash-dot-dot	is dot-dash-dot-dot	is dash-dash-dash
(• • • •)	(•)	(• — • •)	(• — • •)	(— — —)

Put it all together and

• • • •   •   • — • •   • — • •   — — —

means

HELLO

MESSAGES ON A WIRE

The Work of Alexander Graham Bell

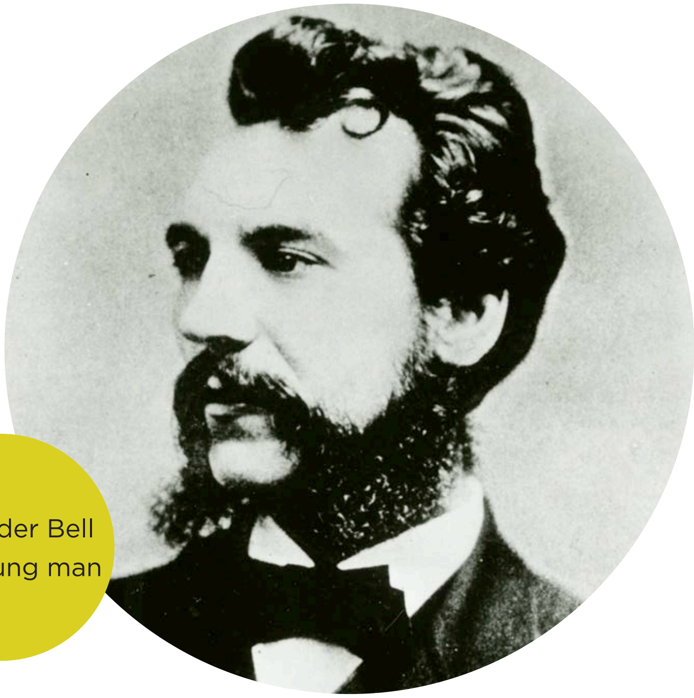
What other ways could you send a message?

One man had an idea.

His name was Alexander Graham Bell.

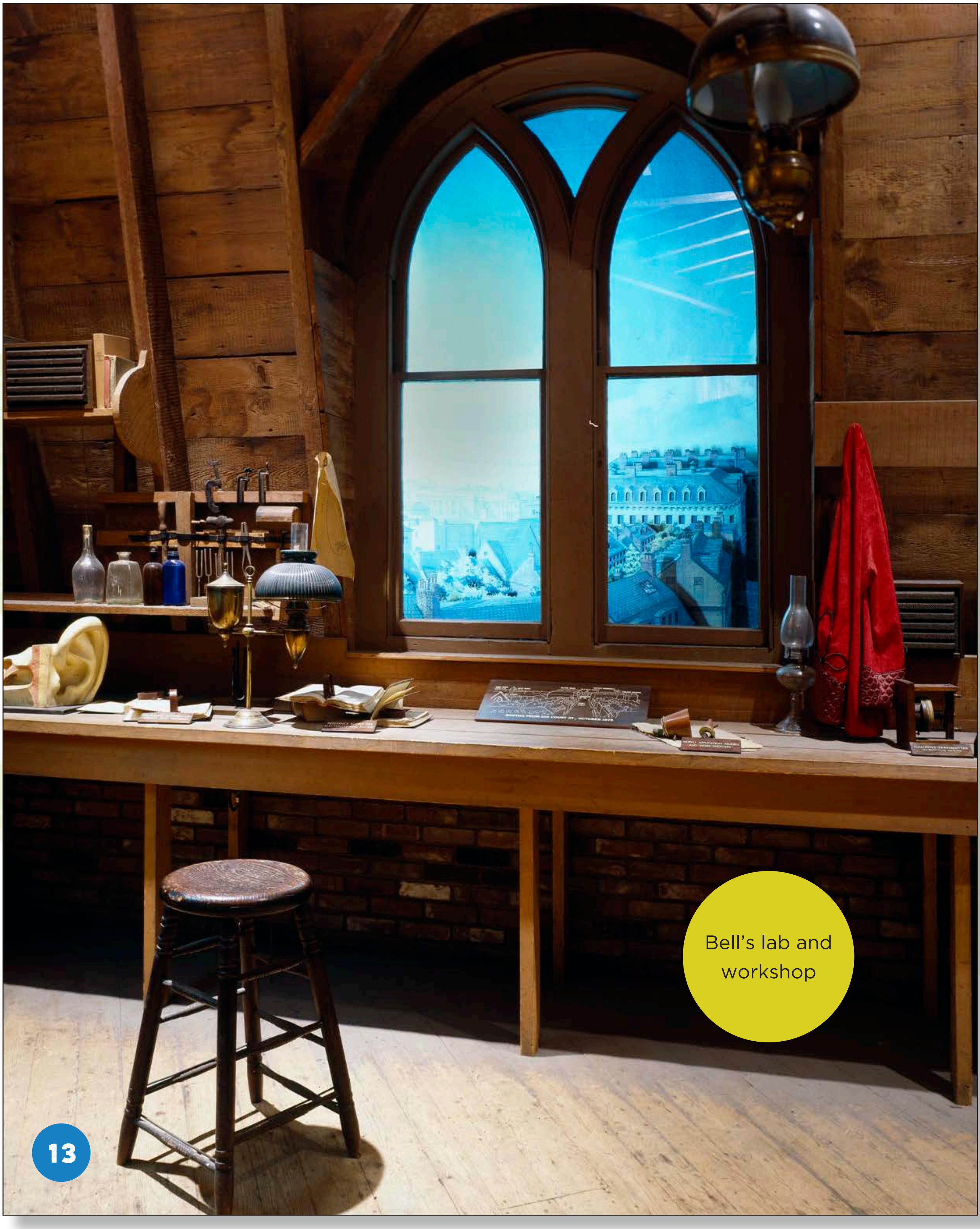
He wanted to send his voice over a wire.

How did he start?



Alexander Bell as a young man

12



Bell's lab and workshop

13

Changes in lighting for homes

Scientists working in a lab

How to Solve a Problem

Bell looked at how the world worked.

He was a **scientist**.

He used science and math to solve problems.

He was an **engineer**.

He had ideas for new machines.

He was an **inventor**.

14

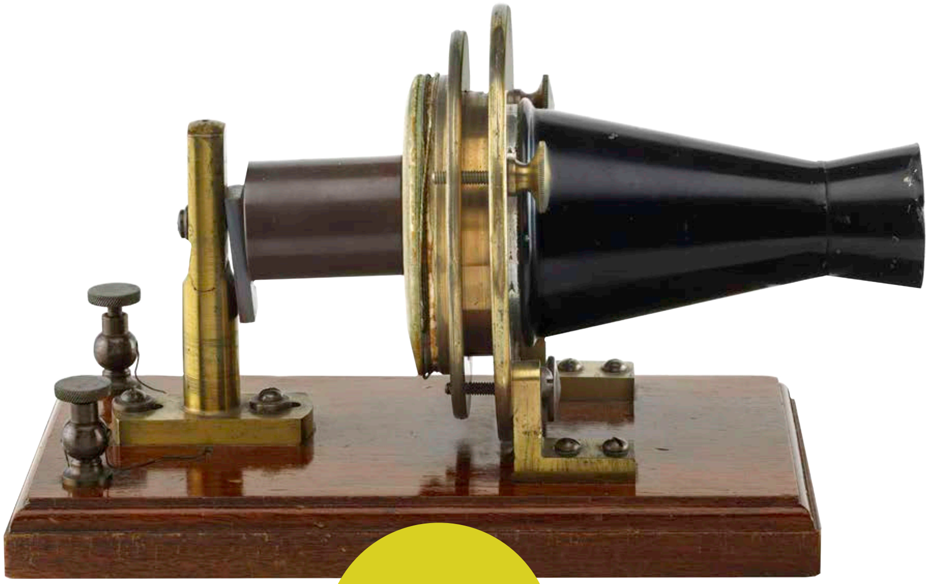
What Did Bell Do?

Bell worked on how to send sound over a wire.

He worked with a helper, Thomas Watson.

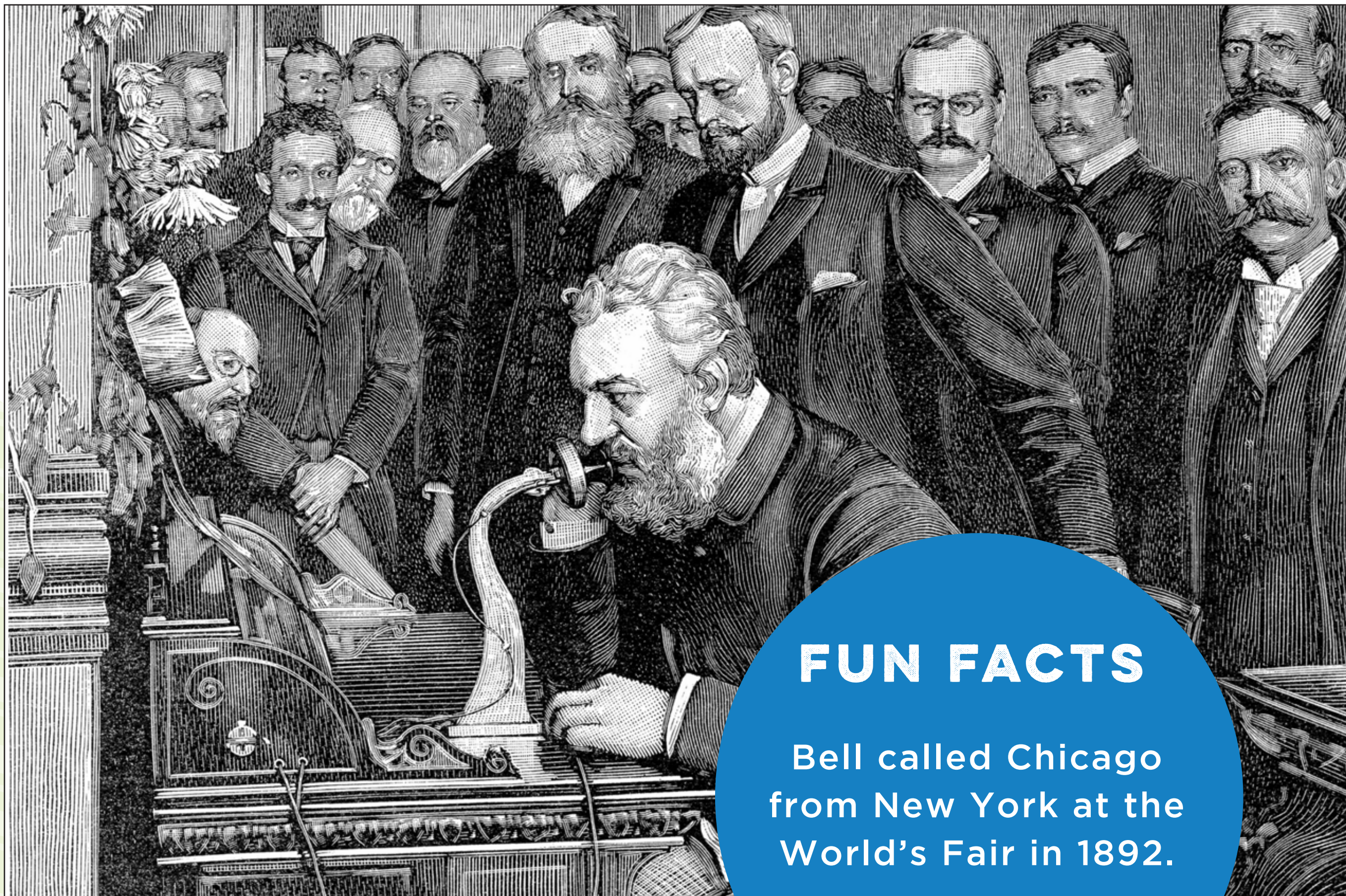
He tried many things.

He tried many times.



Early Bell telephone

15



Bell using a telephone

FUN FACTS

Bell called Chicago from New York at the World's Fair in 1892.

People were amazed.

One day it worked!

He sent the first message.

"Mr. Watson—come here—I want to see you."

That was the start of the telephone.

16

ENGLISH GLOSSARY

Engineer
someone who uses science to solve a problem

Inventor
someone who makes something for the first time

Message
news that is sent from one place to another

Music
sounds that are pleasing to hear

Noise
sounds that are loud and harsh

55

GLOSARIO

ingeniero
alguien que utiliza la ciencia para resolver un problema

inventor
alguien que hace algo por primera vez

mensaje
información que se envía de un lugar a otro

música
sonidos que son agradables de escuchar

ruido
sonidos que son fuertes y desagradables

57

Smithsonian SCIENCE for the classroom

Life Science	Earth and Space Systems Science	Physical Science	Engineering Design
Grade 1			
How Do Animal Parents Keep Their Babies Safe? *1-LS1-1 • 1-LS1-2 • 1-LS3-1 • K-2-ETS1-1* **Supporting:** Engineering Design	**Is a Day Always the Same Length?** *1-ESS1-1 • 1-ESS1-2 • 1-PS4-2* **Supporting:** Physical Science	**How Can We See Things in the Dark?** *1-PS4-2 • 1-PS4-3 • 1-LS1-1 • K-2-ETS1-1* **Supporting:** Life Science and Engineering Design	**How Can We Send a Message Using Sound?** *K-2-ETS1-1 • K-2-ETS1-2 • K-2-ETS1-3 • 1-PS4-1 • 1-PS4-4* **Supporting:** Physical Science
Grade 2			
How Do Plants and Animals Need Each Other? *2-LS2-1 • 2-LS4-1 • 2-LS2-2 • K-2-ETS1-1* **Supporting:** Engineering Design	**What Can Maps Tell Us About Water on Earth?** *2-ESS2-2 • 2-ESS2-3 • 2-PS1-1* **Supporting:** Physical Science	**How Do Heating and Cooling Change Things?** *2-PS1-1 • 2-PS1-2 • 2-PS1-3 • 2-PS1-4 • K-2-ETS1-1* **Supporting:** Engineering Design	**How Can We Stop Soil From Washing Away?** *K-2-ETS1-1 • K-2-ETS1-2 • K-2-ETS1-3 • 2-ESS2-1 • 2-ESS1-1* **Supporting:** Earth and Space Science
Grade 3			
What Explains Similarities and Differences Between Organisms? *3-LS1-1 • 3-LS3-1 • 3-LS3-2 • 3-LS4-2 • 3-ESS2-2* **Supporting:** Earth and Space Science	**How Do Weather and Climate Affect Our Lives?** *3-ESS2-1 • 3-ESS2-2 • 3-ESS3-1 • 3-5-ETS1-1* **Supporting:** Engineering Design	**How Can We Predict Patterns of Motion?** *3-PS2-1 • 3-PS2-2 • 3-PS2-3 • 3-PS2-4 • 3-5-ETS1-1* **Supporting:** Engineering Design	**How Can We Protect Animals When Their Habitat Changes?** *3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3 • 3-LS4-1 • 3-LS2-1 • 3-LS4-3 • 3-LS4-4* **Supporting:** Life Science
Grade 4			
How Can Animals Communicate with Light and Sound? *4-LS1-1 • 4-LS1-2 • 4-PS4-1 • 4-PS4-2 • 4-PS4-3 • 3-5-ETS1-1* **Supporting:** Physical Science and Engineering Design	**How Is the Ring of Fire Evidence of a Changing Earth?** *4-ESS1-1 • 4-ESS2-1 • 4-ESS2-2 • 4-ESS3-2 • 3-5-ETS1-1* **Supporting:** Engineering Design	**How Does Motion Energy Change in a Collision?** *4-PS3-1 • 4-PS3-3 • 4-LS1-1 • 3-5-ETS1-1* **Supporting:** Life Science and Engineering Design	**How Can We Provide Energy to People's Homes?** *3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3 • 4-PS3-4 • 4-PS3-2 • 4-ESS3-1* **Supporting:** Physical Science and Earth and Space Science
Grade 5			
How Can We Predict Change in Ecosystems? *5-LS1-1 • 5-LS2-1 • 5-PS3-1* **Supporting:** Physical Science	**How Can We Use the Sky to Navigate?** *5-ESS1-1 • 5-ESS1-2 • 5-PS2-1 • 3-5-ETS1-1* **Supporting:** Physical Science and Engineering Design	**How Can We Identify Materials Based on Their Properties?** *5-PS1-1 • 5-PS1-2 • 5-PS1-3 • 5-PS1-4 • 5-LS2-1* **Supporting:** Life Science	**How Can We Provide Freshwater to Those in Need?** *3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3 • 5-ESS2-1 • 5-ESS2-2 • 5-ESS3-1* **Supporting:** Earth and Space Science

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