ELA
Common Core
State Standards
Resource Packet
2 of 2
Science Investigations

1st Grade – Unit 7
Thinking, Acting and Writing Like a Scientist:
Investigation Notebooks
About the Causes and Effects of Sound
12/31/14

1st Grade – Unit 7
Thinking, Acting and Writing Like a Scientist: Investigation Notebooks About the Causes and Effects of Sound – Resource Packet 2 of 2 Table of Contents

Science Investigation Resources

This unit is designed to include two resources that MUST be used in tandem: Lesson Plan Packet and Teacher Guides for <u>each</u> Investigation (found in the Resource Packet #2).

A. ***Lesson Plans - The primary purpose of the lesson plans are to explain in "first grade language" what it means to think, act and write like a scientist. These lessons give specific explanations (e.g. what, how, when, why) of each step of the process (e.g. Question, Knowledge Probe, etc.).***

B. ***Teacher Guides - The Investigation Teacher Guides walk teachers step-by-step through each investigation, so students gain procedural knowledge of the Scientific Process by actively doing science. Furthermore, the Teacher Guides assists teachers in teaching the Sound Standards from Next Generation Science Standards. Please see Resource Packet #2 Science Investigations.***

1.Waves: Light and Sound

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Students who demonstrate understanding can:

1-PS4-1. **Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.** [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

1-PS4-2. **Make observations to contruct an evidence-based account that objects in darkness can be seen only when illuminated.** [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

1-PS4-3. **Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.** [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [*Assessment Boundary: Assessment does not include the speed of light.*]

1-PS4-4. **Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*** [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.] [*Assessment Boundary: Assessment does not include technological details for how communication devices work.*]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
- Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-PS4-2)
- Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods
- Science investigations begin with a question. (1-PS4-1)
- Scientists use different ways to study the world. (1-PS4-1)

Disciplinary Core Ideas

PS4.A: Wave Properties
- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

PS4.B: Electromagnetic Radiation
- Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2)
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3)

PS4.C: Information Technologies and Instrumentation
- People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)

Crosscutting Concepts

Cause and Effect
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1),(1-PS4-2),(1-PS4-3)

Connections to Engineering,Technology, and Applications of Science

Influence of Engineering, Technology, and Science, on Society and the Natural World
- People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)

Connections to other DCIs in first grade: N/A

Articulation of DCIs across grade-levels:
K.ETS1.A (1-PS4-4); **2.PS1.A** (1-PS4-3); **2.ETS1.B** (1-PS4-4); **4.PS4.B** (1-PS4-4); **4.PS4.C** (1-PS4-4); **4.ETS1.A** (1-PS4-1)

Common Core State Standards Connections:

ELA/Literacy —

W.1.2	Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. *(1-PS4-2)*
W.1.7	Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-PS4-1),(1-PS4-2),(1-PS4-3),(1-PS4-4)
W.1.8	With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1),(1-PS4-2),(1-PS4-3)
SL.1.1	Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. *(1-PS4-1),(1-PS4-2),(1-PS4-3)*

Mathematics —

MP.5	Use appropriate tools strategically. *(1-PS4-4)*
1.MD.A.1	Order three objects by length; compare the lengths of two objects indirectly by using a third object. *(1-PS4-4)*
1.MD.A.2	Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. *(1-PS4-4)*

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

Sound Unit Supply List for Science Equipment and Science Investigation Notebooks

Non-Consumables and Consumables Science Equipment

- The Sound Investigations were designed so that equipment and supplies needed could be gathered from recyclable materials and/or purchased at a dollar store.
- Gathering materials for the first implementation of this unit will take time. It is suggested materials be gathered at least a week prior to beginning the unit. Store all materials and supplies developed for Investigations. (e.g., Use two – gallon-sized baggies, clearly labeled for each investigation, and place in large plastic tubs.)
- Consider sending home a Unit Supply List of everyday household items that parents may wish to contribute (aluminum soup cans, wire hangers, etc.).

Investigation	Non-Consumables	Consumables
#1 Sound Hunt (Part 1)	Optional: clipboards	#1 Sound Hunt Data Collection Sheet
#2 Sound Makers	plastic containers with lids filled with water, sand, cotton balls, ice cubes, strings, paper cups, cardboard boxes, sticks, Styrofoam cups, rubber bands, pencils, popsicle sticks, plastic spoons, metal spoons, wooden spoons, balloons, wire, puffed rice, tape, combs, paper, foil, aluminum soup cans/variety of recyclable cans, bottles, safety glasses	#2 Sound Makers Data Collection Sheet
#3 Wire Hanger with Strings (Part 1)	sets of wire hangers with two pieces of yarn, one unsharpened pencil for every pair of students, safety glasses	#3 Wire Hanger with Strings (Part 1) Data Collection Sheet
#4 Wire Hanger with Strings (Part 2)	wire hanger with two pieces of yarn, safety glasses, variety of tapping tools: metal spoons, plastic spoons, wooden spoons, pipe cleaners, cotton swabs, etc.	#4 Wire Hanger with Strings (Part 2) Data Collection Sheet
#5 Drums (Part 1)	2 or 4 oz. plastic cups or soup/vegetable cans, aluminum foil, plastic wrap, parchment paper, a cut rubber balloon, rubber band, duct tape, unsharpened pencils, safety glasses	#5 Drums (Part 1)) Data Collection Sheet

Investigation	Non-Consumables	Consumables
#6 Drums (Part 2)	balloon-head drums from Drums Part 1, safety glasses, tapping tools of plastic, metal, and wooden spoons	#6 Drums (Part 2) Data Collection Sheet
#7 Meter Stick	wooden meter sticks (or yard sticks), safety glasses	#7 Meter Stick Data Collection Sheet
#8 Ruler	plastic (or wooden) ruler, safety glasses	#8 Ruler Data Collection Sheet
#9 Rubber Band Instrument	two or three rubber bands of various widths, plastic container, duct tape, safety glasses, sturdy bowls and/or a variety of sizes of facial tissue boxes, safety glasses	#9 Rubber Band Instrument Data Collection Sheet
#10 Salt Crystals (Part 1)	30 mL plastic cups, plastic wrap, rubber band, masking or duct tape, salt crystals, permanent marker, safety glasses	#10 Salt Crystals (Part 1) Data Collection Sheet
#11 Salt Crystals (Part 2)	30 mL plastic cups, plastic wrap, rubber band, masking or duct tape, permanent marker, paprika, pepper, cinnamon, safety glasses	#11 Salt Crystals (Part 2) Data Collection Sheet
#12 Balloon	5 inch, 7 inch, or 12 inch helium quality balloons, inflated Mylar balloon on a ribbon, safety glasses, sound source (such as a CD player or an iPod with speaker), variety of songs with heavy bass (e.g., Adele Rolling in The Deep, John Williams Olympic Fan Fare)	#12 Balloon Data Collection Sheet
#13 Sound Hunt (Part 2)	Optional: clipboards	#13 Sound Hunt (Part 2) Data Collection Sheet
#14 Application	variety of non-consumables from previous sessions, depending upon student-designed investigations that are approved by the teacher, safety glasses	Student Data Collection Sheet or teacher-designed Data Collection Sheet

Science Investigation Notebooks

Class thinking and discussions about Investigations 1-5 are recorded on Anchor Charts #1- Class Science Investigation Notebook. (See photo example in the 1st Grade Thinking, Acting, and Writing Like a Scientist: Investigation Notebooks, Unit 7 Common Core State Standards Lesson Plan Packet.) Each student records Observations on individual Data Collection Sheets. The teacher records class science thinking on a chart-sized version of each Investigation Notebook page/chart. A**ll 13 Investigations** can be planned, conducted, and recorded as a whole class on class charts. (This is the teacher's choice and may depend on student needs from year to year).

Small Group/Partner Investigations

Student Scientists' thinking and discussions about Investigations 6-14 are recorded on 11" x 17" paper on Small Group /Partner Science Investigation Notebooks. (See photo example in the 1st Grade Thinking, Acting, and Writing Small Group Investigations. Use 11" x 17" paper or similarly sized pages.) The Small Group/Partner Group Science Investigation Notebooks can be bound and placed in the classroom library. These class books reveal the collective thinking of student groups, when the Science Investigation Books are shared by students.

Individual Investigations

At any time teachers may provide students the option to complete Science Investigation Notebook pages individually. Use standard paper size and collate individual student Science Investigation Notebook pages into booklets. Templates may be found in the **Resource Packet**.

Formatting Options for Science Investigation Notebooks:

- Template that has each step listed per page
- Regular lined or graphing paper where label with Investigation step is affixed
- Computer templates

1st Grade Hybrid Unit Combining Science and Writing Standards Overview
for 1. Waves: Sound
Common Core Writing Unit of Study:

Thinking, Acting, and Writing Like a Scientist: Investigation Notebooks

About the Causes and Effects of Sound

Unit 7

Standards
Performance Expectations (What can be assessed at the end of the grade or grade band) **1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials make sound and that sound can make materials vibrate.** [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating fork.] **1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.** [Clarification Statement: Examples of devices could include a paper cup and string "telephones," and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]
Learning Performances/Outcomes (Knowledge-in-Use) Students will need to learn how to: 1. **Plan and carry out investigations** to determine what is happening when sounds are made (i.e., vibrating matter can make sound) and how sounds affect objects (i.e., sound can make matter vibrate). 2. Gather observations about sound and vibration; **record data** in Class, Group, and/or Student Science Notebooks. 3. **Compare** the vibrations of different objects by **collecting data and analyzing the data.** 4. **Communicate findings** from observations of different vibrating objects making sounds and sounds making materials vibrate. 5. **Raise questions** from observation of different objects vibrating and **design investigations** to **answer those questions**. 6. **Communicate findings** from personal reflection about how they have acted, thought, and communicated as scientists.
Narrative/Teacher Background Information
In order to help students meet performance expectations about sound and vibrations, the unit builds on students' prior knowledge and experiences. Thirteen carefully structured investigations build students' understandings of sounds and vibrations through the science and engineering practices of *asking questions, planning and carrying out investigations, and analyzing data and making explanations*. Students do science by making, recording, and discussing their observations. Students look for patterns in their data and make sense of what those patterns mean. Students craft explanations; they make claims and use evidence to support their claims to answer the investigation question. These practices develop students' abilities to think, act, and write like scientists. As a result, students are highly engaged in sound unit lessons.

First Graders will need to understand:

- Vibrating objects/matter can make sounds.
- Sound can make objects/matter vibrate.
- People can use sounds and vibrating matter to send messages/communicate over distances.
- How to write information/explanatory text to examine and convey complex ideas about sound and vibration.
- How to write information/explanatory text to examine and convey complex ideas about how scientists act, think, and communicate.

First Graders will need to be able to:

- Identify and describe sounds and vibrations.
- Plan and carry out investigations about sounds and vibrations.
- Design and build a device that carries sound over a distance.
- Collaborate and communicate the investigations they have planned and conducted in a Science Investigation Notebook either as a class, small group, and/or individually.
- Conduct short as well as more substantial research projects.
- Communicate in an information article that describes how they have learned how to think, act, and communicate as a scientist.

Prior Knowledge

In their lives outside of school, students have made sounds by hitting objects (spoons and pots, etc.), singing songs, reciting nursery rhymes, mimicking patterns in bird calls, and imitating other animal sounds. They have observed a variety of animals (dogs, cats, etc.) making sounds to communicate. They have experienced a variety of pattern stories and poems in the school setting.

Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Asking Questions Planning and Carrying Out Investigations Analyzing and Interpreting Data Constructing Explanations (Science) and Designing Solutions (Engineering) Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	**PS4.A Wave Properties** Sound can make matter vibrate and vibrating matter can make sound. **PS4.C Information Technologies and Instrumentation** People also use a variety of devices to communicate (send and receive information) over long distances.	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes of phenomena.

Possible Preconceptions/Misconceptions regarding Sounds and Vibrations

- Sound can be produced without using any materials.
- Hitting an object harder changes the pitch of the sound produced.
- Loudness and pitch of sound are the same thing.

1st Grade CCSS-Writing Standards

W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about a topic, and provide some sense of closure.

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Assessment – What will be the evidence of learning?

Science Formative Assessment

The Sound Map of Questions is intentionally designed to have layers of questions. The Driving Question and Class Questions organize the big ideas of the sound unit (e.g., Driving Question: What is happening when I make sounds as I play, dance, and sing? Class Question #1: How can I describe the sounds I hear?). Students' written responses to these questions make students' thinking and understanding visible.

The Investigation Questions frame all thirteen investigations that students conduct (e.g., Investigation Question #5: How can I change a drum to make different sounds?). Students will contribute to class, small group, or individual Science Investigation Notebooks for each of these investigations. Students record their Observations on Data Collection Sheets. Over the course of the Sound Unit, students will construct, with teacher guidance, Explanations about their investigations that include Claims (the answer to the Investigation Question) and Evidence (data collected in the investigation and analyzed afterward). **This NGSS science practice is detailed in Appendix F#6: Constructing Explanations and Designing Solutions (http://www.nextgenscience.org/next-generation-science-standards).** This type of informational writing enables teachers to monitor students' understanding based on the thinking revealed by writing and drawing labeled drawings. The quality of students' Explanations provides the teacher with perspective on misconceptions and levels of students' understanding of sound and vibration properties. Based upon information gained from students' writings and/or discussions, teachers can determine whether additional instruction is needed and whether groups of students need additional learning opportunities (e.g., re-teaching, a different investigation, video, books).

Writing Formative Assessment

The most important component to assess is the Explanation step: the Claim (answer to the Investigation Question) and Evidence (analyzed data students include to support their Claim). Assessing student Explanations provides insight into the depth of their ability to describe sounds and vibrations, answer the Investigation Question with a Claim, use their data as Evidence to support the Claim, and provide a sense of closure to the investigation. The K-2 Step Book from Van Andel Education Institute provides Evaluation criteria for all components of the Science Investigation Notebook.

Summative Assessment

Science Summative Assessment

Design and build something that makes sound that someone can hear from far away. (Application Step)

The intent of the Sound Unit Application is for first grade students to use what they know about how to think, act, and write like a scientist with a focus on sound/vibration.

Writing Summative Assessment

Write an informational book that describes what they have learned about how to think, act, and communicate as a scientist or what they learned about the concept of sound.

Students will independently reflect and write an informational book about sound and vibration, or about how they act, think, and write like a scientist.

Story Line

Thinking, Acting, and Writing Like a Scientist: Investigations Notebooks, Unit 7

This is a hybrid unit combining first grade writing standards from the Common Core State Standards with first grade standards from the Next Generation Science Standards. To think, act, and write like a scientist means students are actively *doing science*. In a first grade classroom, *doing science* entails students collaborating with their teachers and classmates to ask and answer questions by conducting investigations. The layers of questions for the unit are outlined in the Sound Map of Questions. Thirteen Investigation Questions frame the science lessons. The investigation process begins with a question, includes planning and conducting investigations, and analyzing the data collected. Next, students construct an Explanation by making a Claim (the answer to the Investigation Question), and select Evidence from their Observations to support their claims. Students' writing makes the complexity of scientific thinking and literacy visible to themselves, as well as to their classmates, parents, and teacher. In the role of student-scientists, first grade students develop skills in thinking, acting, and writing as scientists.

Big Picture

In keeping with current science education research (e.g., A Framework for K-12 Science Education[1], How Students Learn[2], Taking Science to School[3]), first grade students actively construct their own understandings of science concepts through investigations **prior** to reading about these concepts or being told about science concepts in a lecture or video, etc.

Investigations were intentionally designed to enable students to construct their own understandings of the **Disciplinary Core Ideas:** *Sound can make matter vibrate; Vibrating matter can make sound;* and *People can use a variety of devices to communicate over distances.* The process skills of conducting investigations are based on the **Science and Engineering Practices**: *Planning and Carrying Out Investigations* and *Constructing Explanations and Designing Solutions*. Using the **Crosscutting Concept** of *Cause and Effect*, students examine the results of their simple investigations. By examining data collected in their investigations, student-scientists are able to support or refute their ideas about sounds and vibrations.

Storyline Details

This Sound Unit is designed to provide students with opportunities to make sense of the world around them. The driving question for the Sound Unit is ***What is happening when I make sounds as I play, dance, and sing?*** Students learn how to generate answers for Investigation Questions using Evidence-based Claims about sound and vibrations.

Science investigations are more meaningful and authentic when recorded in **Science Investigation Notebooks** (or sometimes referred to as science journals) **that document** scientific inquiry (e.g., Investigation Plan, Observation, Data Analysis, and Explanations that answer the questions being investigated). **Writing makes scientific thinking visible** throughout the unit. **Writing also documents students' level of understanding** of Disciplinary Core Ideas through each investigation. The Disciplinary Core Ideas are divided into four areas: describing sounds, changing sounds, describing what is happening when making sound, and observing how sounds affect objects. The Unit concludes with two Application projects. In the science Application, students design and build a device that makes sound to communicate over a distance. For the writing Application, students write an informational piece that describes what they learned about how to think, act, and communicate as a scientist or share what they have learned about sound.

[1] Schweingruber, H., Keller, T., & Quinn, H. (Eds.). (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. National Academies Press.
[2] Bransford, J. D., & Donovan, M. S. (Eds.). (2004). *How Students Learn: History in the Classroom*. National Academies Press.
[3] Schweingruber, H. A., Duschl, R. A., & Shouse, A. W. (Eds.). (2007). *Taking Science to School: Learning and Teaching Science in Grades K-8*. National Academies Press.

Class Question #1: How can I describe the sounds I hear?

Overview: There are three lessons: Sound Hunt (Part 1), Sound Makers, and Wire Hanger with String (Part 1). Key parts of the science lessons will focus on one, two, or all of The Dimensions of the Framework for K-12 Education: Science and Engineering Practices, Disciplinary Core Ideas, and/or Cross-Cutting Concepts. The purposes of these three lessons are to:	
Science and Engineering Practices	*Scaffold student engagement in the investigation process.* Students conduct investigations following **Investigation Plans**. By the third investigation, students practice conducting three trials. Students gather and record their own data based upon what they see and hear during the investigations. The following vocabulary should be introduced and used with students: **Question**, **Knowledge Probe**, **Prediction**, **Investigation Plan**, **Observation**, **Explanation**, and **Claim**.
Science Disciplinary Core Ideas/ Crosscutting Concepts	*Provide students with a variety of experiences to actively construct scientific understandings.* In this lesson set, the investigations are about describing the **properties of sound:** ranging from **loud** to **quiet** and ranging from **high** to **low**.
Science Vocabulary	*Develop shared vocabulary:* • for talking and writing about sounds, including the terms loud, quiet, high, and low. • for conducting investigations with trials • for gathering and recording data
Writing Practices	*Record scientific thinking.* Students record data on the Data Collection Sheets and write their Claims as full sentences; these artifacts make students' scientific thinking visible. In addition, student writings give the teacher insight into students' developing language arts skills.
Note: Specific sound and vibration vocabulary is taught after the concepts are reinforced by the end of investigations #1 - #6. The writing and science standards are integrated in this unit.	

Note each of the following sections is also placed into the Teacher Guide for each Investigation to facilitate understanding.

Investigation Question	**Science Component**	**Writing Component**
Investigation #1 ***How can I describe the sounds I hear in the ___ ?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation and collecting data. In this lesson students take a short walk about the school carrying out an investigation. Students make Observations about sound, both naming sounds and describing sounds.	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Each student completes a Data Collection Sheet.
Investigation #2 ***How can I describe the sounds I make using materials I choose?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation and collecting data. In this lesson students choose two or three objects to use to make sounds. Students make Observations and record words to describe the sounds made.	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Each student completes a Data Collection Sheet using sketches and words to describe the sounds they make.
Investigation #3 ***How can I describe the sounds I hear when tapping a wire hanger with a pencil?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation collecting data, and constructing an Explanation using Evidence from data collected. As a class, students make a prediction based upon preceding investigations and prior knowledge. Students conduct an investigation with a partner to make Observations to describe the sounds they hear based on sound properties of volume and pitch. Students will use these descriptors: • Loud/ quiet • High/low	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Next, students make a prediction based on preceding investigations and prior knowledge. Each student completes a Data Collection Sheet. After gathering data, students contribute to a class Explanation to make a Claim that answers the Investigation Question.

	Then, as a class, students develop a Claim to answer the Investigation Question (How can I describe the sounds I hear when tapping a wire hanger with a pencil?). Finally, students reflect on the following question: ***How do I think, act, and write like a scientist?*** Encourage students to use many of the vocabulary words from Anchor Chart #4- Science Word List.	

#1 Sound Hunt (Part 1) – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #1: **How can I describe the sounds I hear?**

Investigation Question #1**: How can I describe the sounds I hear in the _____?**

Purpose of Lesson:

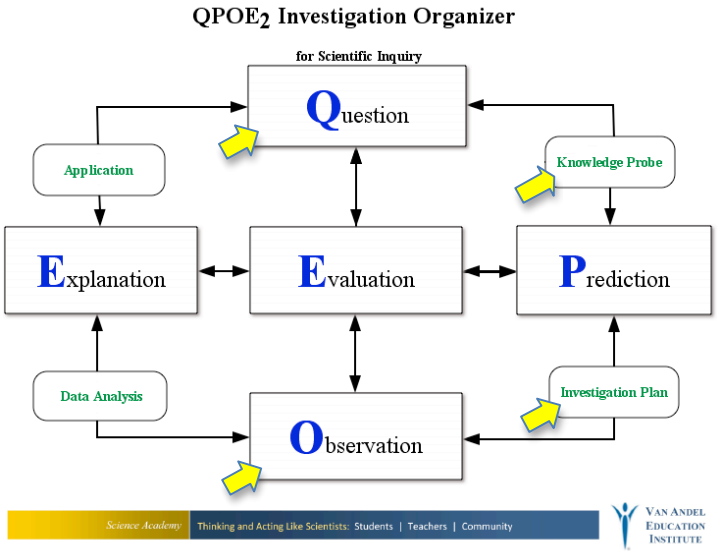
Investigation Question	Science Component	Writing Component
Investigation #1 ***How can I describe the sounds I hear in the _____ ?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation and collecting data. In this lesson students take a short walk about the school carrying out an investigation. Students make Observations about sound, both naming sounds and describing sounds.	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Each student completes a Data Collection Sheet.

Teacher Preparation:

- Create Anchor Charts:
  - Anchor Chart #1**- Class Science Investigation Notebook for #1 Sound Hunt (Part 1)**: Enlarge and display on the wall where students can read it.
  - Anchor Chart #2**- Sound Map of Questions:** Write Driving Question, Class Question #1, and Investigation Question #1 on sentence strips and post in classroom.

#1 Sound Hunt (Part 1) – Teacher Guide (continued)

- Anchor Chart #3- **Scientific Investigation Process**: Display chart, with emphasis on **Question**, **Knowledge Probe**, Investigation Plan, and **Observation**. Use removable paper or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4-**Science Word List.** Possible words to have on the Science Word List will come from both doing science (e.g., recording, student scientist, drawing, etc.) and science content (e.g., sound, loud, quiet, etc.). Have index cards ready to record students' word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Gather pencils and hard surface items for students to write on (e.g., cardboard, clipboard, books).
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.

Sound Hunt (Part 1) – Teacher Notes

	Investigation Process	Instructional Support
Question	How can I describe the sounds I hear in the _____?	Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Ask students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Words List.
Knowledge Probe	List what you know about describing sounds you hear. • •	Ask students to share with a partner what they know about sound or any other words underlined in the Investigation Question. Ask for two or three to volunteer responses to the Knowledge Probe.
Investigation Plan	1. Write the location of the sound hunt on the top line of the Data Collection Sheet. 2. Listen for sounds during the walk in hallways and/or on the playground. 3. List each sound and a word or phrase to describe the sound on the Data Collection Sheet. 4. Be prepared to share data with the group.	Model with examples of sounds occurring in the classroom. For example, clap hands together in a pattern of loud and/or quiet claps or close the classroom door gently and/or firmly.
Observation	Students gather and record Observations using the Data Collection Sheet.	Do the first sound on the Sound Hunt together as a class. **Encourage students to use "loud" or "quiet" as descriptors.** Students use Observations from their Data Collection Sheets to contribute to the class discussion. The teacher records class Observations on Anchor Chart #1: Class Science Investigation Notebook for #1 Sound Hunt (Part 1).

Sound Hunt (Part 1) Anchor Chart #1– Science Investigation Notebook

Question	How can I describe the sounds I hear in the _____?
Knowledge Probe	• • •
Investigation Plan	1. Write the location of the sound hunt on the top line of the Data Collection Sheet. 2. Listen for sounds during the walk in the hallways and/or on the playground. 3. List each sound and a word or phrase to describe the sound on the Data Collection Sheet. 4. Be prepared to share your data with the group.

Sound Hunt (Part 1) Anchor Chart #1– Science Investigation Notebook (continued)

Observation	Sound Hunt Student Data Collection Sheet  Sound Observations from: _____	
	Sounds I Hear	Words to Describe the Sounds I Hear
	1. clapping hands	quiet tap
	2. door closing	loud slam
	3.	
	4.	
	5.	
	6.	

Sound Hunt (Part 1) – Data Collection Sheet Student Scientist: _____

Question

How can I describe the sounds I hear in the _____?

Observation

Sounds	 Words to Describe the Sounds I Hear
clapping hands	quiet tap
door closing	loud slam

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#2 Sound Makers – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #1: **How can I describe the sounds I hear?**

Investigation Question #2**: How can I describe the sounds I make using materials I choose?**

Purpose of Lesson:

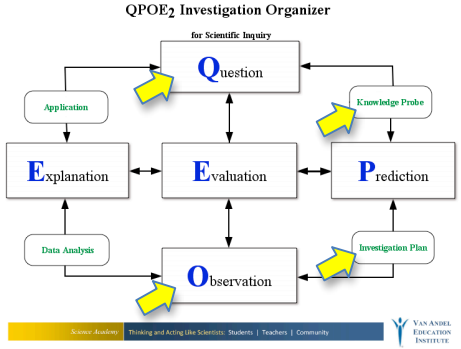
Investigation Question	Science Component	Writing Component
Investigation #2 ***How can I describe the sounds I make using materials I choose?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation and collecting data. In this lesson students choose two or three objects to use to make sounds. Students make Observations and record words to describe the sounds made.	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Each student completes a Data Collection Sheet using sketches and words to describe the sounds they make.

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #2 Sound Makers**: Enlarge and display on the wall where students can read it.
  - Anchor Chart #2**- Sound Map of Questions:** Display Driving Question, Class Question #1, and Investigation Question #2 on sentence strips and post in classroom.

#2 Sound Makers – Teacher Guide (continued)

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Question**, **Knowledge Probe**, Investigation Plan, and **Observation**. Use removable paper or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4-**Science Word List.** Possible words to have on the Science Word List will come from both doing science (e.g., describe, recording, student scientist, drawing) and science content (e.g., sound, materials, loud, quiet). Have index cards ready to use for students science word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Gather pencils.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Gather a variety of common materials for making sounds: plastic containers with lids or no lids, water, sand, strings, paper cups, sticks, rubber bands, pencils, popsicle sticks, plastic spoons, balloons, wire, foil, aluminum soup cans/variety of recyclable cans, etc. For additional ideas see Sound Unit Supply List for Science Equipment and Science Investigation Notebooks in the Resource Packet.
- Use lunch trays or cookie sheets to display a variety of objects per group of 4 or 5 students. Note: Each group does not need the same kind of objects.

Sound Makers – Teacher Notes

	Investigation Process	Instructional Support
Question	How can I describe the sounds I make using materials I choose?	Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Ask students to offer suggestions about the definitions. If no one is able, provide simple definitions and add to the Science Words List. In this Investigation Question the word "materials" is defined as *objects*.
Knowledge Probe	• • •	Ask students to think about what they know about describing sounds. Next ask them to think about what they know about making and causing sounds.
Investigation Plan	1. Look at all the materials on the tray/table. 2. Choose 1 - 3 materials to use to make sounds. 3. Record the materials you used and list words to describe the sounds you made on the Data Collection Sheet. 4. Repeat steps 1 – 3 with new materials.	Model with an example of two materials: paperclips inside a plastic container. Shake and describe the sound. While students are creating sound makers, the teacher circulates and records students' verbal Observations and questions on paper or a large board posted in the room.
Observation	Students gather and record Observations on the Student Data Collection Sheet.	Gather students' Observations in a class discussion and record Observations so thinking is visible to all. Observations should be recorded on a class list of Observations while students are creating sound makers. Examples from the field test include "clang, clang, clang" and "swishhhhh." The teacher records a summary of the class data on Anchor Chart #1: **Science Investigation Notebook for #2 Sound Makers**.

Sound Makers Anchor Chart #1– Science Investigation Notebook

Question	How can I describe the sounds I make using materials I choose?
Knowledge Probe	• • •
Investigation Plan	1. Look at all the materials on the tray/table. 2. Choose 1 - 3 materials to use to make a sound. 3. Record the materials you used and list words to describe the sounds you made on the Data Collection Sheet. 4. Repeat steps 1 – 3 with new materials.

Sound Makers Anchor Chart #1- Science Investigation Notebook (continued)

Observation	Sound Makers Student Data Collection Sheet			
		Materials	Sketch	 Words to Describe the Sounds I Hear
	1.			
	2.			
	3.			
	4.			

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Sound Makers – Data Collection Sheet Student Scientist: _____

Question

How can I describe the sounds I make using materials I choose?

Observation

	Materials	Sketch	 Words to Describe the Sounds I Hear
1.			
2.			
3.			
4.			

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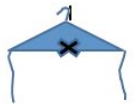
#3 Wire Hanger with Strings (Part 1) – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**



Class Question #1: **How can I describe the sounds I hear?**

Investigation Question #3**: How can I describe the sounds I hear when tapping a wire hanger with a pencil?**

Purpose of Lesson:

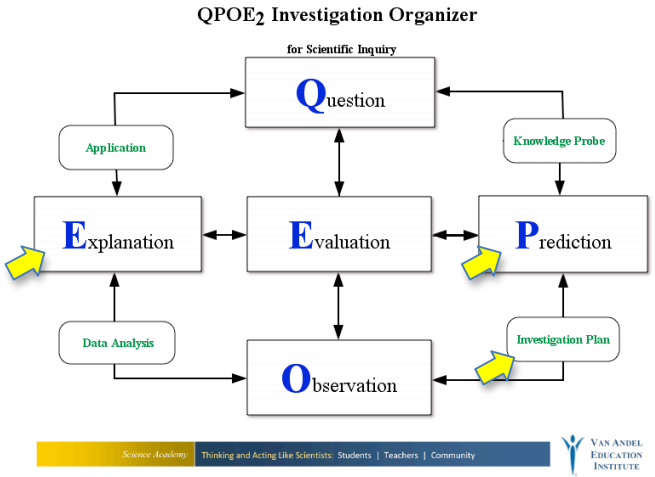
Investigation Question	Science Component	Writing Component
Investigation #3 ***How can I describe the sounds I hear when tapping a wire hanger with a pencil?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation collecting data, and constructing an Explanation using Evidence from data collected. As a class, students make a prediction based upon preceding investigations and prior knowledge. Students conduct an investigation with a partner to make Observations to describe the sounds they hear based on sound properties of volume and pitch. Students will use these descriptors: • Loud/ quiet • High/low Then, as a class, students develop a Claim to answer the Investigation Question (How can I describe the sounds I hear when tapping a wire hanger with a pencil?). Finally, students reflect on the following question: ***How do I think, act, and write like a scientist?*** Encourage students to use many of the vocabulary words from Anchor Chart #4- Science Word List.	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Next, students make a prediction based on preceding investigations and prior knowledge. Each student completes a Data Collection Sheet. After gathering data, students contribute to a class Explanation to make a Claim that answers the Investigation Question.

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #3 Wire Hanger with Strings (Part 1)**: Enlarge and display on the wall where students can read it.
  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Class Question #1, and Investigation Question #3 on sentence strips and post in the classroom.

#3 Wire Hanger with Strings (Part 1) – Teacher Guide (continued)

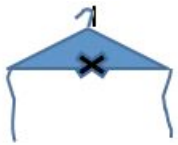
- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Prediction, Investigation Plan,** and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Explanation, Prediction, drawing) and science content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Gather unsharpened pencils.
- Prepare the wire hangers by tying two 12-inch pieces of yarn to the bottom wire of the hanger and securing each piece of yarn with tape.
- Distribute to each team of 2 students a wire hanger with two pieces of yarn, one unsharpened pencil, and two Data Collection Sheets.

Wire Hanger with Strings (Part 1): Teacher Notes

	Investigation Process	Instructional Support
Question	How can I describe the sounds I hear when tapping a wire hanger with a pencil?	Ask students if they are unfamiliar with of any words in the Investigation Question. Underline words that students do not know in the Investigation Question. Allow students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any underlined words to the Science Word List.
Knowledge Probe	• • •	Ask students to share three things they know about the question, or parts of the question, such as wire hanger, tapping something, etc.
Prediction	I predict _____ because _____	Ask students to use what they know about making sounds and describing sounds to Predict an answer to this Investigation Question.
Investigation Plan 	1. Gather materials: wire hanger with taped yarn and an unsharpened pencil. 2. Loop the ends of the yarn around index fingers of each hand. 3. Bend/Lean forward so hanger swings freely. 4. Gently put your index fingers in your ears. 5. Using a pencil, your partner gently taps once in the middle of the hanger. See **X** on diagram. 6. Record observations on Data Collection Sheet. 7. Trade with partner and repeat steps 2 – 6. This is trial #1. 8. Repeat steps 2 – 6 two more times to conduct trials #2 and #3.	First, read through the Investigation Plan with students. Second, read through the Investigation Plan while students role-play conducting the Investigation Plan without the materials. Finally, role-play the investigation with just the hanger with yarn. Do not demonstrate the tapping. While students conduct the investigation, the teacher circulates. **Completing steps 1-7 of the Investigation Plan is called one trial.** Three trials of steps 2-7 need to be completed (see step 8). Scientists often complete many hundreds of trials for a single investigation. Have all students conduct three trials. Remind students each trial is conducted by carefully following the steps of the Investigation Plan.

Wire Hanger with Strings (Part 1): Teacher Notes (continued)

Observation	Students gather and record Observations using their individual Data Collection Sheets.	Students take turns with their partners, conducting trials and recording Observations on their individual Data Collection Sheets. The teacher records class data on Anchor Chart #1.
Explanation	**Claim** I can describe the sounds I hear when I tap a wire hanger as _____.	Conduct a class discussion to develop the Claim, which is the answer to the Investigation Question. Use part of the Investigation Question to start the answer. *I can describe the sounds I hear when I tap a wire hanger* as _____. Students use their data from their Observations to create the answer to the Investigation Question. **Student Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanations might include:** * I can describe the sounds I hear when I tap a wire hanger as loud bonging sounds. * When I tap a wire hanger with a pencil, I hear (loud/quiet, high/low) sounds.

Wire Hanger with Strings (Part 1) Anchor Chart #1– Science Investigation Notebook

Question	How can I describe the sounds I hear when tapping a wire hanger with a pencil?
Knowledge Probe	• • •
Prediction	I predict _____ because _____

Wire Hanger with Strings (Part 1) Anchor Chart #1– Science Investigation Notebook (continued)

Investigation Plan	1. Gather materials: wire hanger with taped yarn and an unsharpened pencil. 2. Loop the ends of the yarn around index fingers of each hand. 3. Bend/Lean forward so hanger swings freely. 4. Gently put your index fingers in your ears. 5. Using a pencil, your partner gently taps once in the middle of the hanger. See **X** on diagram. 6. Record Observations on the Data Collection Sheet. 7. Trade with partner and repeat steps 2 – 6. This is trial #1. 8. Repeat steps 2-7 two more times to conduct trials #2 and #3.

Wire Hanger with Strings (Part 1) – Class Science Investigation Notebook Anchor Chart (continued)

Observation		Loud	Quiet	High	Low
	Trial 1				
	Trial 2				
	Trial 3				
Explanation	**Claim** I can describe the sounds I hear when I tap a wire hanger as _____.				

Wire Hanger with Strings (Part 1) Data Collection Sheet Student Scientist: _____

Question

How can I describe the sounds I hear when tapping a wire hanger with a pencil?

Observation

	Loud	Quiet	High	Low	 Sounds like
Trial 1					
Trial 2					
Trial 3					

Sound Wire Hanger with Strings (Part 1)

Class Question #2: *How can I change the sounds I make?*

Overview: There are three lessons: Wire Hanger with String (Part 2), Drums (Part 1), and Drums (Part2). Key parts of the science lessons will focus on one, two, or all of The Dimensions of the Framework for K-12 Education: Science and Engineering Practices, Disciplinary Core Ideas, and/or Cross-Cutting Concepts. The purposes of these three lessons are to:	
Science and Engineering Practices	*Deepen student skills in the science and engineering practices by scaffolding student engagement in various components of the investigation process.* Students focus on the science practice of making **Predictions** based on prior knowledge. After carrying out their **Investigation Plans** and collecting data, students make **Claims** that answer their **Investigation Questions**. Students have opportunities to conduct sound investigations with several trials and to practice intentionally gathering and recording data. Students gather and record their own data based upon what they see and hear during the investigations. Students' Claims are supported with a "because" statement as students begin to identify how the data help to answer to the Investigation Question. The following vocabulary should be used with students during these three investigations: **Question**, **Knowledge Probe**, **Prediction**, **Investigation Plan**, **Observation**, **Explanation**, and **Claim**.
Science Disciplinary Core Ideas/ Crosscutting Concepts	*Build on student experiences with loud, quiet, high, and low sounds as students uncover concepts associated with changes in sounds.* Investigations also reveal how sound properties change based on the materials and conditions used to create sound in a **Cause and Effect** relationship. Investigations begin to explore the Cross-Cutting Concept of Cause and Effect as students discover ways to change properties of the sounds they make by varying the materials with which sounds are made.
Science Vocabulary	*Develop shared vocabulary for talking and writing about sound: loud, quiet, high, low, cause and effect.* The investigations are about the properties of sound**:** volume (ranging from **loud** to **quiet**) and pitch (ranging from **high** to **low**). The terms "volume" and "pitch" do not need to be introduced at this grade level.
Writing Practices	*Support students to record science observations and share thinking with others.* Students record Observations on their own Data Collection Sheets, and at the end of this investigation set, they independently answer Class Question #2. Students continue to develop and reinforce a shared vocabulary for describing sound. Reflection questions provide students opportunities to develop writing and communication skills in science.
Note: Specific sound vocabulary is taught after the concepts are reinforced by the end of investigations #1 - #6. The writing and science standards are integrated in this unit.	

Investigation Question	Science Component	Writing Component
Investigation #4 ***How can I change the sound I make by tapping a wire hanger with _____?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation, collecting data, and constructing an Explanation using Evidence from data collected. As a class, students make a Prediction based upon preceding investigations and prior knowledge. Students conduct an investigation with a partner to make Observations to describe the sounds they hear based on sound properties of volume and pitch using these descriptors: • Loud/ quiet • High/low Then, as a class, students develop a Claim to answer the Investigation Question (How can I change the sound I make by tapping a wire hanger with ____?). Finally, students reflect on the following question: ***How do I think, act, and write like a scientist?*** Encourage students to use many of the vocabulary words from Anchor Chart #4- Science Word List.	Students use Class Science Investigation Notebook pages from Investigations #1, 2, & 3 to contribute data about describing sounds they hear to their increasing prior knowledge. Each student completes an individual Data Collection Sheet.
Investigation #5 ***How can I change a drum to make different sounds?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation, collecting data, and constructing an Explanation using Evidence from data collected. As a class students make a Prediction based upon preceding investigations and prior knowledge. Students conduct a group investigation to make Observations to describe the sounds they hear based on the sound property of volume. Using an unsharpened pencil, students lightly tap drums with different	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Next, students make a Prediction based on prior knowledge referencing Class Science Investigation Notebook pages from Investigations #1, 2, 3, & 4. Each student completes a Data Collection Sheet. After gathering data, students contribute to a class Explanation to make a Claim that answers the Investigation Question.

	surfaces (parchment paper, aluminum foil, balloon, and plastic wrap). Then, as a class, students develop a Claim to answer the Investigation Question. Note: If not doing Optional Investigation Drums (Part 2), students reflect on: ***How do I think, act and write like a scientist?*** Encourage students to use many of the vocabulary words from the Science Word List in their verbal and written answers. *Remind students to* ***pull data from at least two investigations to support the answer to the class question.***	Note: If not doing Optional Investigation Drums (Part 2), students independently answer Class Question #2 ***How can I change the sounds I make?*** *Remind students to* ***pull data from at least two investigations to support the answer to the class question.*** **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**
Optional Investigation Investigation #6 ***How can I change the sound I make by tapping a drum with _____?***	This is an optional lesson. Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation, collecting data, and constructing an Explanation using Evidence from data collected. As a class, students make a Prediction based upon preceding investigations and prior knowledge**.** In this optional investigation, students will choose different tapping tools to tap the balloon surface drum only. Students continue to make Observations to describe the sounds they hear based on sound properties: loud and quiet sounds, high and low sounds. Then, as a class, students develop a Claim to answer the Investigation Question. ***Students reflect on: How do I think, act and write like a scientist?*** Encourage students to use many of the vocabulary words from the Science Word List in their verbal and written answers. *Remind students to* ***pull data from at least two investigations to support the answer to the class question.***	Class Science Notebook: Students use Class Science Notebooks from Investigations #1, 2, 3, 4, & 5. Students make a class Prediction based on previous investigations and prior knowledge. Each student completes an individual Data Collection Sheet. Students discuss and write a Claim (answer to the Investigation Question) together. After conducting these investigations, students independently answer Class Question #2 ***How can I change the sounds I make?*** **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**

#4 Wire Hanger with Strings (Part 2) – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #2: **How can I change the sounds I make?**

Investigation Question #4**: How can I change the sound I make by tapping a wire hanger with _____?**

Purpose of Lesson:

Investigation Question	Science Component	Writing Component
Investigation #4 ***How can I change the sound I make by tapping a wire hanger with _____?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation, collecting data, and constructing an Explanation using Evidence from data collected. As a class, students make a Prediction based upon preceding investigations and prior knowledge. Students conduct an investigation with a partner to make Observations to describe the sounds they hear based on sound properties of volume and pitch using these descriptors: • Loud/ quiet • High/low Then, as a class, students develop a Claim to answer the Investigation Question (How can I change the sound I make by tapping a wire hanger with ____?). Finally, students reflect on the following question: ***How do I think, act, and write like a scientist?*** Encourage students to use many of the vocabulary words from Anchor Chart #4- Science Word List.	Students use Class Science Investigation Notebook pages from Investigations #1, 2, & 3 to contribute data about describing sounds they hear to their increasing prior knowledge. Each student completes an individual Data Collection Sheet.

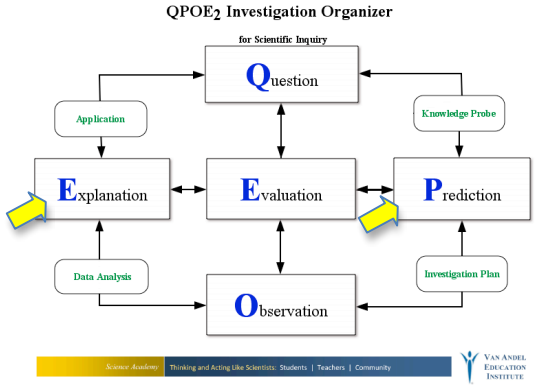
#4 Wire Hanger with Strings (Part 2) – Teacher Guide (continued)

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #4 Wire Hanger with Strings (Part 2)**: Enlarge and display on the wall where students can read it.

  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Class Question #2, and Investigation Question #4 on sentence strips and post in the classroom.

  - Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Prediction** and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.

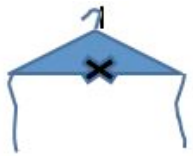


  - Anchor Chart #4- **Science Word List.** Possible words to have on the Science Word List will come from The Three Dimensions of the Framework of doing science (e.g., Explanation, Prediction, drawing) and science content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

#4 Wire Hanger with Strings (Part 2) – Teacher Guide (continued)

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Have a variety of tools for students to select. Possible items might be metal spoons, plastic spoons, wooden spoons, pipe cleaners, cotton swabs, etc.
- Each pair of students needs a wire hanger with two pieces of yarn taped onto the hanger, tapping tools of choice, and two Data Collection Sheets.

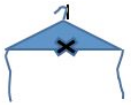
Wire Hanger with Strings (Part 2) – Teacher Notes

	Investigation Process	Instructional Support
Question	How can I change the sound I make by tapping a wire hanger with _____?	In this investigation, students will tap the hanger with tools of choice. **Changing the force of the tap is not the intent of this investigation.** Students will follow the Investigation Plan provided. Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Allow students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	• • •	Ask students to share three things they know about the Investigation Question or items in the question such as wire hanger, tapping something, or Observations they made conducting Investigation #3.
Prediction	I predict _____ because _____.	Ask students to use what they know about making sounds and describing sounds to Predict an answer to this Investigation Question.
Investigation Plan 	1. Gather materials: wire hangers with taped yarn, tapping tools, and Data Collection Sheets. 2. Wrap the ends of the yarn around index fingers of each hand. 3. Bend/Lean forward so hanger swings freely. 4. Gently place your index fingers in your ears. 5. Using a _____, your partner gently taps once in the middle of the hanger. See **X** on diagram. 6. Record Observations on Data Collection Sheet. 7. Trade with partner and repeat steps 2–6. This is trial #1. 8. Repeat steps 2 – 7 two more times to conduct trials #2 and #3.	Students decide what items to use as tapping tools. Read through the Investigation Plan while students follow along together. Then, let students conduct the Investigation Plan with a partner while the teacher circulates.

Wire Hanger with Strings (Part 2) – Teacher Notes (continued)

Observation		Students take turns with their partner conducting trials and recording Observations on their individual Data Collection Sheets.
Explanation	**Claim** I can change the sound I make when I tap a wire hanger with _____ because _____.	Have students sit in groups based upon the tapping tool (metal spoon, etc.) students used. Conduct a class discussion to develop the Claim (answer to the Investigation Question). Use part of the Investigation Question to start the answer, *I can change the sound I make when I tap a wire hanger with* _____. Next, ask students to look at their Data Collection Sheets to find data that helps them to answer the "because" section of the Explanation. **Students Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** * I can change the sound I make when I tap a wire hanger with a metal teaspoon instead of a pencil because when I used the teaspoon to tap the hanger it was a louder sound. The sound lasted longer than when I tapped the hanger with the pencil. * I can change the sound I make when I tap a wire hanger with different materials/objects. I know this because when I used different materials, I heard different loud and quiet sounds.

Wire Hanger with Strings (Part 2) Anchor Chart #1– Class Science Investigation Notebook

Question	How can I change the sound I make by tapping a wire hanger with _____?
Knowledge Probe	• • •
Prediction	I predict _____ because _____.
Investigation Plan	1. Gather materials: wire hanger with taped yarn, tapping tools, and Data Collection Sheets. 2. Wrap the ends of the yarn around index fingers of each hand. 3. Bend/Lean forward so hanger swings freely. 4. Gently place your index fingers in your ears. 5. Using a _____, your partner gently taps once in the middle of the hanger. See diagram.  6. Record Observations on the Data Collection Sheet. 7. Trade with partner and repeat steps 2 – 6. This is trial #1. 8. Repeat steps 2 – 7 two more times to conduct trials #2 and #3.

Wire Hanger with Strings (Part 2) Anchor Chart #1– Class Science Investigation Notebook (continued)

Observation		Loud	Quiet	High	Low	 Sounds like
	Trial 1					
	Trial 2					
	Trial 3					
Explanation	**Claim**	I can change the sound I make by tapping a wire hanger with _____ because _____.				

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Wire Hanger with Strings (Pt. 2) Data Collection Sheet Student Scientist_____

Question

How can I change the sound I make by tapping a wire hanger with _____?

Observation

	Loud	Quiet	High	Low	 Sounds like
Trial 1					
Trial 2					
Trial 3					

Sound Wire Hanger with Strings (Part 2)

#5 Drums (Part 1) – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #2: **How can I change the sounds I make?**

Investigation Question #5**: How can I change a drum to make different sounds?**

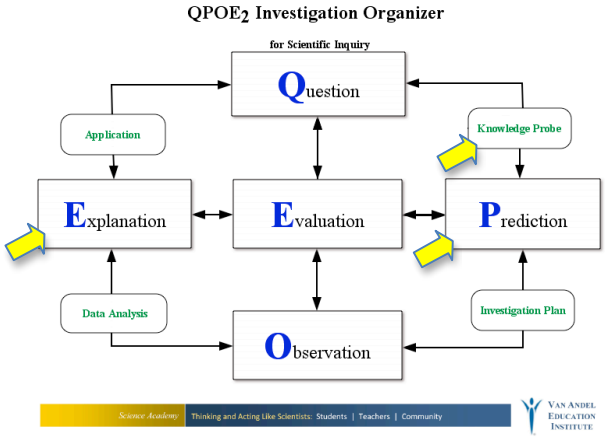
Purpose of Lesson:

Investigation Question	Science Component	Writing Component
Investigation #5 ***How can I change a drum to make different sounds?***	Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation, collecting data, and constructing an Explanation using Evidence from data collected. As a class students make a Prediction based upon preceding investigations and prior knowledge. Students conduct a group investigation to make Observations to describe the sounds they hear based on the sound property of volume. Using an unsharpened pencil, students lightly tap drums with different surfaces (parchment paper, aluminum foil, balloon, and plastic wrap). Then, as a class, students develop a Claim to answer the Investigation Question. Note: If not doing Optional Investigation Drums (Part 2), students reflect on: ***How do I think, act and write like a scientist?*** Encourage students to use many of the vocabulary words from the Science Word List in their verbal and written answers. *Remind students to* ***pull data from at least two investigations to support the answer to the class question.***	Class Science Investigation Notebook: Students contribute to the list of what they know about describing sounds they hear. Next, students make a Prediction based on prior knowledge referencing Class Science Investigation Notebook pages from Investigations #1, 2, 3, & 4. Each student completes a Data Collection Sheet. After gathering data, students contribute to a class Explanation to make a Claim that answers the Investigation Question. Note: If not doing Optional Investigation Drums (Part 2), students independently answer Class Question #2 ***How can I change the sounds I make?*** *Remind students to* ***pull data from at least two investigations to support the answer to the class question.*** **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**

#5 Drums (Part 1) – Teacher Guide (continued)

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #5 Drums (Part 1)**: Enlarge and display on the wall where students can read it.
  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Class Question #2, and Investigation Question #5 on sentence strips and post in classroom.
  - Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Knowledge Probe**, **Prediction** and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



  - Anchor Chart #4- **Science Word List.** Possible words to have on the Science Word List will come from The Three Dimensions of the Framework of doing science (e.g., Explanation, Prediction, drawing) and science content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

#5 Drums (Part 1) – Teacher Guide (continued)

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Prepare the drums: Use 2 or 4 oz. plastic cups (available at grocery stores, or substitute with soup or vegetable cans). Cover the surface of each cup or can with **two layers** of aluminum foil, plastic wrap, parchment paper, or a cut rubber balloon. Secure the surface with a rubber band and then cover the rubber band with duct tape. The duct tape secures the rubber band. Parents may help make the drums prior to the lesson. The drum surface needs to be tight and smooth. The tapping tool can be an unsharpened pencil.
- Each group of four students needs a set of drums with surfaces of parchment paper, aluminum foil, balloon, and plastic wrap; four tapping tools (unsharpened pencils); and four Data Collection Sheets.

Drums (Part 1) – Teacher Notes

	Investigation Process	Instructional Support
Question	How can I change a drum to make different sounds?	In this investigation, students tap drums that have surfaces made of different materials. **The focus of this Investigation Plan is observing the changes in sound when a different drum surface is used. Changing the force of the tap is not the intent of this investigation. Students should follow the Investigation Plan provided.** The **wording of the Investigation Question is broad.** This allows students to go back to this question again and create another Investigation Plan designed to investigate different changes to a drum. Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Allow students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	• • •	Ask students to share three things they know about the Investigation Question or items in the question such drums, changing sounds, etc.
Prediction	I predict _____ because _____.	Ask students to use what they know about making sounds and describing sounds to Predict an answer to this Investigation Question.

Drums (Part 1) – Teacher Notes (continued)

Investigation Plan	1. Gather materials: cans with plastic wrap drum surface, cans with aluminum foil drum surface, cans with balloon drum surface, cans with paper drum surface, unsharpened pencils, and Data Collection Sheets. 2. Each student chooses a drum. 3. Students with plastic wrap drums tap the plastic drum with a pencil. 4. All members of the group record Observations. 5. Students with paper drums tap the paper drum with a pencil. 6. All members of the group record Observations. 7. Continue steps 5 and 6 with the other drums.	Read through the Investigation Plan while students follow along together. Do the plastic wrap drum first together. Continue in that manner with the parchment paper drum next, then the aluminum foil drum, and finally the balloon drum. The teacher encourages students to place an X in the loud or quiet box in the Data Collection Sheet.
Observation	Students gather and record Observations using Data Collection Sheets.	Students take turns within their group conducting trials and recording Observations on their individual Data Collection Sheets. Encourage students to compare the sounds made to other sounds they know.
Explanation	**Claim** I can **change a drum** to make different sounds by _____. I know this because _____	Conduct a class discussion to develop the Claim (answer to the Investigation Question). To start the answer, provide a stem: I can change a drum to make different sounds by _____. I know this because_____. Ask students to find data on their Data Collection Sheets that helps them answer the "because" section of the Explanation. **Students Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** * I can change a drum to make different sounds by changing the drum top. I know this because I tested different drum tops and they made different sounds. * I can change a drum to make different sounds by changing the materials I use for the top of my drum. I know this because when I used paper for the top of my drum the sound was…

Drums (Part 1) Anchor Chart #1–Science Investigation Notebook

Question	How can I change a drum to make different sounds?
Knowledge Probe	• • •
Prediction	I predict _____ because _____.
Investigation Plan	1. Gather materials: cans with plastic wrap drum surface, cans with aluminum foil drum surface, cans with balloon drum surface, cans with paper drum surface, unsharpened pencils, and Data Collection Sheets. 2. Each student chooses a drum. 3. Students with plastic wrap drums tap the plastic drum with a pencil. 4. All members of the group record Observations. 5. Students with paper drums tap the paper drum with a pencil. 6. All members of the group record Observations. 7. Continue steps 5 and 6 with the other drums.

Drums (Part 1) Anchor Chart #1–Science Investigation Notebook (continued)

Observation		Loud	Quiet	 Sounds Like
	Trial 1 **Plastic Wrap Drum**			
	Trial 2 **Paper Drum**			
	Trial 3 **Aluminum Foil Drum**			
	Trial 4 **Balloon Drum**			
Explanation	**Claim**			

I can **change a drum to make different** sounds by _____.

I know this because_____.

Drums (Part 1) Data Collection Sheet Student Scientist _____

Question

How can I change a drum to make different sounds?

Observation

	Loud	Quiet	 Sounds Like
Trial 1 **Plastic Wrap Drum**			
Trial 2 **Paper Drum**			
Trial 3 **Aluminum Foil Drum**			
Trial 4 **Balloon Drum**			

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#6 Drums (Part 2) – Teacher Guide
Optional Lesson

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #2: **How can I change the sounds I make?**

Investigation Question #6**: How can I change the sound I make by tapping a drum with_____?**

Purpose of Lesson:

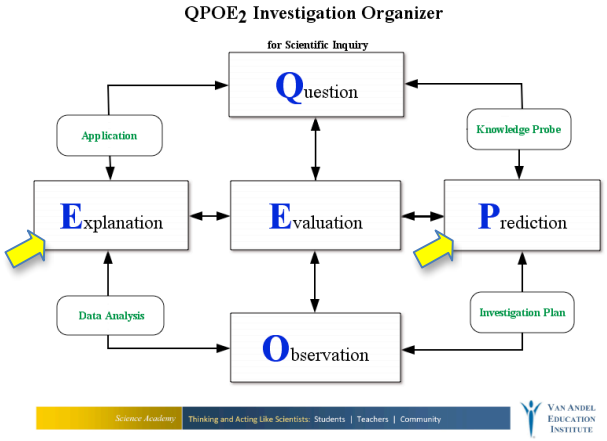
Investigation Question	Science Component	Writing Component
Optional Investigation Investigation #6 ***How can I change the sound I make by tapping a drum with _____?***	This is an optional lesson. Key parts of the science lesson will focus on the Science and Engineering Practices of carrying out an investigation, collecting data, and constructing an Explanation using Evidence from data collected. As a class, students make a Prediction based upon preceding investigations and prior knowledge**.** In this optional investigation, students will choose different tapping tools to tap the balloon surface drum only. Students continue to make Observations to describe the sounds they hear based on sound properties: loud and quiet sounds, high and low sounds. Then, as a class, students develop a Claim to answer the Investigation Question. ***Students reflect on: How do I think, act and write like a scientist?*** Encourage students to use many of the vocabulary words from the Science Word List in their verbal and written answers. *Remind students to* ***pull data from at least two investigations to support the answer to the class question.***	Class Science Notebook: Students use Class Science Notebooks from Investigations #1, 2, 3, 4, & 5. Students make a class Prediction based on previous investigations and prior knowledge. Each student completes an individual Data Collection Sheet. Students discuss and write a Claim (answer to the Investigation Question) together. After conducting these investigations, students independently answer Class Question #2 ***How can I change the sounds I make?*** **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1**- Class Science Investigation Notebook for #6 Drums (Part 2)**: Enlarge and display on the wall where students can read it.
  - Anchor Chart #2**- Sound Map of Questions:** Display Driving Question, Class Question #2, and Investigation Question #6 on sentence strips and post in the classroom.

#6 Drums (Part 2) – Teacher Guide (continued)
Optional Lesson

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Prediction** and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4- **Science Word List.** Possible words to have on the Science Word Lists will come from The Three Dimensions of the Framework of doing science (e.g., Explanation, Prediction, drawing) and content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word Lists.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.

#6 Drums (Part 2) – Teacher Guide (continued)
Optional Lesson

- Make enough balloon surface drums so that students are able to conduct the investigation with a partner. Use the directions from Drums (Part 1).

- The recommended tapping tools are plastic spoons and two additional tapping tools. Examples of tapping tools are pipe cleaners, paper straws, plastic straws, twigs, etc.

- Each group of two or three students needs a drum with a balloon surface, 3 different tapping tools (plastic spoons, etc.), and individual Data Collection Sheets.

Drums (Part 2) – Teacher Notes

	Investigation Process	Instructional Support
Question	How can I change the sound I make by tapping a drum with_____?	Ask students if they are unsure of any words in the Investigation Question. Underline words in questions students do not know. Add any words underlined to the Science Word List. **Students use the Investigation Plan provided. This Investigation Plan focuses on the change of tapping tools used.**
Knowledge Probe	• • •	Ask students to share three things they know about the question, such as: drums, tapping tools, or changing sounds.
Prediction	I predict _____ because _____.	Ask students to use what they know about making sounds and describing sounds to Predict an answer to this Investigation Question.
Investigation Plan	1. Gather materials: balloon surface drums, plastic spoons, other tapping tools, and Data Collection Sheets. 2. Taking turns, lightly tap the surface of your balloon drum using a plastic spoon as a tapping tool. Pass the drum and plastic spoon to the person on your right. 3. Continue taking turns tapping the balloon drum with a plastic spoon, listening carefully to the sound the drum makes. 4. Place an X in the loud sound or quiet sound box on the Data Collection Sheet. Describe the sound you make. 5. Repeat steps 2-4 using two different tapping tools.	Read through the Investigation Plan while students follow along together. Students should practice how to follow Investigation Plans step by step and how to record Observations on their individual Data Collection Sheets. Support student groups as needed.

Drums (Part 2) – Teacher Notes (continued)

	Investigation Process	Instructional Support
Observation	See Data Collection Sheet for Drums (Part 2) Investigation.	Encourage students to record Observations on their individual Data Collection Sheets. Remind students to compare the sound they made to other sounds they know.
Explanation	**Claim** I can change the sound I make by tapping a drum with _____. I know this because _____.	Have students sit in groups based on tapping tool used (e.g., plastic spoon, pipe cleaner). Conduct a class discussion to develop the Claim (answer to the Investigation Question): *I can change the sound I make by tapping with a drum* _____ (name the tapping tools). *I know this because* _____ (describe how). Have students share their Claims in a class discussion. Ask students to look at their Data Collection Sheets to find data that helps them to answer the "because" section of the Explanation. **Students Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** * I can change the sound I make by tapping a drum with different materials/objects. I know this because I tested different tapping tools and they made different sounds. * I can change the sound I make by tapping a drum with a pipe cleaner instead of a plastic spoon. I know this because when I tapped the drum with a pipe cleaner it make a quiet sound and when I used a plastic spoon the drum made a louder sound.

Drums (Part 2) Anchor Chart #1–Science Investigation Notebook

Question	How can I change the sound I make by tapping a drum with _____?
Knowledge Probe	• • •
Prediction	I predict _____ because _____.
Investigation Plan	1. Gather materials: balloon surface drums, plastic spoons, other tapping tools, and Data Collection Sheets. 2. Taking turns, lightly tap the surface of your balloon drum using a plastic spoon. Pass the drum and plastic spoon to the person on your right. 3. Continue taking turns tapping the balloon drum, listening carefully to the sound the drum makes. 4. Place an X in the loud sound or soft sound box on the Data Collection Sheet. Describe the sound you make. 5. Repeat steps 2-4 using two different tapping tools.

Drums (Part 2) Anchor Chart #1–Science Investigation Notebook (continued)

Observation		Loud	Quiet	 Describe the sounds
	_____ (tapping tool used)			
	_____ (tapping tool used)			
	_____ (tapping tool used)			

Explanation	**Claim**
	I can change the sound I make by tapping a drum with _____.
	I know this because _____.

Drums (Part 2) Data Collection Sheet

Question

Student Scientist_____

How can I change the sound I make by tapping a drum with_____?

Observation

	Loud	Quiet	 Describe the sounds
_____ (tapping tool used)			
_____ (tapping tool used)			
_____ (tapping tool used)			

Drums (part 2)

Class Question #3: *What is happening when I make sounds?*

<table>
<tr><td colspan="2">Overview: There are three lessons: Meter Stick, Ruler, and Rubber Band Instrument. Key parts of the science lessons will focus on one, two, or all of The Dimensions of the Framework for K-12 Education: Science and Engineering Practices, Disciplinary Core Ideas, and or Cross-Cutting Concepts.

The purposes of these three lessons are to:</td></tr>
<tr><td>Science and Engineering Practices</td><td>Continue to develop student skills in the practices by scaffolding student engagement in components of the investigation process. Students continue to use the science practices of making Predictions based on prior knowledge, carrying out their Investigation Plans, and collecting and recording their own data. Students gather and record their own data based upon what they see and hear during the investigations. Students focus on Data Analysis by organizing data in ways that help them look for patterns. Students use the information revealed in their Data Analysis to make Claims supported with Evidence to answer their Investigation Questions.
The following vocabulary should be introduced and used with students during the next three investigations: Data Analysis and Evidence.
The following vocabulary should be reinforced with students during these three investigations: Question, Knowledge Probe, Prediction, Investigation Plan, Observation, Explanation, and Claim.</td></tr>
<tr><td>Science Disciplinary Core Ideas/
Crosscutting Concepts</td><td>Support students as they uncover/discover how materials move back and forth rapidly (vibrate) when they make sound, and how sound stops when materials stop moving. Investigations in this set address the concept that vibrating materials cause sounds.
Students deepen their understanding of the Cross-Cutting Concept Cause and Effect when they collect and analyze data, connecting movement of materials (back and forth) with the presence of sound.</td></tr>
<tr><td>Science Vocabulary</td><td>Develop shared vocabulary for talking and writing about vibration and sound. This investigation set focuses on Cause and Effect and movement of materials (back and forth, slowly, and quickly). Students continue to describe the sounds made by using the properties of sound: (loud, quiet, high, low, etc.).</td></tr>
<tr><td>Writing Practices</td><td>Continue to support students writing more independently.
Students record their science thinking in a Group, Partner, or Individual Science Investigation Notebooks. (Note: Teachers may choose to continue with a Class Science Investigation Notebook based on the needs of the students.)
The science writing reveals the complexity of students' thinking as they examine what happens as they make sound by carefully describing the sounds made and changed.
Students independently answer Class Question #3 in writing. Reflection questions provide students opportunities to develop additional writing and communication skills in science.</td></tr>
<tr><td colspan="2">Note: Specific vibration vocabulary is taught after the concept of vibration is reinforced by the end of investigations #7 - #8. The writing and science standards are integrated in this unit.</td></tr>
</table>

Investigation Question	Science Component	Writing Component
Investigation #7: ***What happens when I use a meter stick to make sounds?***	Students make Observations about what is happening to a meter stick as it is tapped and makes a sound. Students use the Investigation Plan provided. The meter stick makes sounds as it vibrates, or moves back and forth. The size of the meter stick makes it easier for children to see the back and forth movements that occur when sound is made. **It is critical to allow *vibration* and its definition to arise from the student Observations**, rather than provide the term to students before they investigate. Students work collaboratively in groups, follow an Investigation Plan, and record Observations on a Data Collection Sheet. Next, they reorganize class data to look for patterns. Finally, students construct an Explanation, making a Claim (the answer to the Investigation Question) supported by Evidence selected from analyzed data.	Group Science Investigation Notebook: Students work together to construct the Group Science Investigation Notebook. (Some students may keep their own Science Investigation Notebook for the Meter Stick investigation.) Students need to use the Investigation Plan provided by the teacher. Each student completes an individual Data Collection Sheet. Students reorganize the data on paper or white boards looking for patterns, and **write a summary** of what the reorganized data show. Finally, **students construct an Explanation** that answers the Investigation Question and supports the answer by providing specific Evidence, using data from their data analysis. **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**
Investigation #8 ***What happens when I use a ruler to make sounds?***	Students make Observations about what is happening to the ruler as it is tapped and makes a sound. Students use the Investigation Plan provided. The ruler makes sounds as it vibrates, or moves back and forth. The size of the ruler makes it harder for children to see the back and forth movements of the ruler (compared to the meter stick in Investigation #7). The ruler investigation can be used to demonstrate high and low sounds as the ruler vibrates. It is critical to allow vibration and its definition to arise from the student Observations, rather than provide the term to students before they investigate. At the end of this investigation, if students have not come up with the term vibration or vibrate, provide the definition of	Group Science Investigation Notebook: Students work together to construct the Group Science Investigation Notebook. (Some students may keep their own Science Investigation Notebook for the Ruler investigation.) Students need to use the Investigation Plan provided by the teacher. Each student completes an individual Data Collection Sheet. With the teacher's help, students reorganize data on paper or white boards looking for patterns and write a summary of what the reorganized data show. Finally, students construct an Explanation that answers the Investigation Question and supports the answer by providing specific Evidence from their analyzed data. **Encourage students to use many of the vocabulary words**

	vibration to the students. Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question) supported by Evidence selected from analyzed data.	**from #4 Anchor Chart Science Word List.**
Investigation #9 ***What happens when I pluck a rubber band to make sounds?***	Students make Observations about what is happening to a rubber band as it is plucked and released. The rubber band makes sounds as it vibrates, or moves back and forth. By using different sizes of rubber bands, the Rubber Band Instrument Investigation can be used to demonstrate loud or quiet, and high or low sounds. Encourage students to use these terms in their work. Use student examples to create a class Explanation. Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question), supported by Evidence selected from analyzed data. Students reflect on: What is happening when I make sounds as I play, dance, and sing? Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List**.	Group Science Notebook pages: Students work together to construct the Group Science Notebook pages for the Rubber Band Instrument Investigation. (Some students may keep their own Science Notebook for this investigation.) Each student completes an individual Data Collection Sheet. Students write a summary of the analyzed data. Then students construct an Explanation that answers the Investigation Question and supports the answer by providing specific Evidence from their analyzed data. After conducting this investigation, students independently write answers to Class Question #3: What is happening when I make sounds? Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List**.

#7 Meter Stick– Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #3: **What is happening when I make sounds?**

Investigation Question #7**: What happens when I use a meter stick to make sounds?**

Purpose of Lesson:

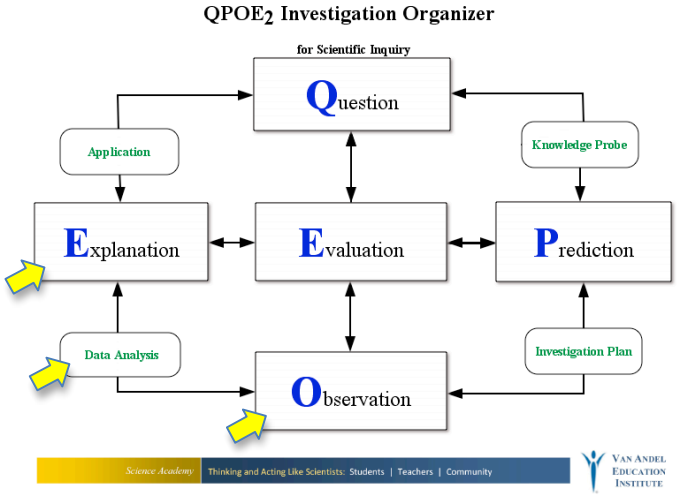
Investigation Question	Science Component	Writing Component
Investigation #7: ***What happens when I use a meter stick to make sounds?***	Students make Observations about what is happening to a meter stick as it is tapped and makes a sound. Students use the Investigation Plan provided. The meter stick makes sounds as it vibrates, or moves back and forth. The size of the meter stick makes it easier for children to see the back and forth movements that occur when sound is made. **It is critical to allow *vibration* and its definition to arise from the student Observations**, rather than provide the term to students before they investigate. Students work collaboratively in groups, follow an Investigation Plan, and record Observations on a Data Collection Sheet. Next, they reorganize class data to look for patterns. Finally, students construct an Explanation, making a Claim (the answer to the Investigation Question) supported by Evidence selected from analyzed data.	Group Science Investigation Notebook: Students work together to construct the Group Science Investigation Notebook. (Some students may keep their own Science Investigation Notebook for the Meter Stick investigation.) Students need to use the Investigation Plan provided by the teacher. Each student completes an individual Data Collection Sheet. Students reorganize the data on paper or white boards looking for patterns, and **write a summary** of what the reorganized data show. Finally, **students construct an Explanation** that answers the Investigation Question and supports the answer by providing specific Evidence, using data from their data analysis. **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1**- Class Science Investigation Notebook for #7 Meter Stick:** Enlarge and display on the wall where students can read it.
  - Anchor Chart #2**- Sound Map of Questions:** Display Driving Question, Class Question #3, and Investigation Question #7 on sentence strips and post in the classroom.

#7 Meter Stick– Teacher Guide (continued)

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Observation**, **Data Analysis**, and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Data Analysis, Explanation) and science content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

- Use both the Lesson Plan Packet and Teacher Guide for each lesson.

- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.

#7 Meter Stick– Teacher Guide (continued)

- Prepare the small groups' copies of the Science Investigation Notebook pages. For example, use large sheets of paper that are at least 17" by 22". Begin with only the Investigation Question and the Knowledge Probe.
- See photos of classroom examples from the pilot projects in the Appendix.
- Note: The teacher always has the discretion to teach the class as a whole group and use the Class Science Investigation Notebook or to offer individual students the opportunity to keep an individual Science Investigation Notebook.
- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Divide students into groups. Size of groups is determined by the teacher.
- Gather meter sticks (or yard sticks) one per group of students, and pencils for each student.
- Distribute to each group of students a meter stick, copies of the Investigation Plan, and one Data Collection Sheet per student.

Meter Stick– Teacher Notes

	Investigation Process	Instructional Support
Question	What **happens** when I use a meter stick to make sounds?	**Always construct the Science Investigation Notebooks together when possible.** Put a sheet of paper with Investigation Question #7 (What happens when I use a meter stick to make sounds?) written on it under a document camera. **Model aloud** how to make a Science Investigation Notebook so that students can see and hear the thinking and writing processes involved. Begin with only the Investigation Question and the Knowledge Probe labels. Ask students if they are unsure of any words in the Investigation Question. Underline words students do not know in the Investigation Question. Allow students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	• • •	Ask students to share three things they know about the Investigation Question or parts of the question, such as meter stick and "happens." Show students the equipment. Demonstrate how to tap the meter stick.
Prediction	I predict the meter stick will _____ because _____.	Ask students to use what they know about making sounds and describing sounds to Predict an answer to this Investigation Question.

Meter Stick– Teacher Notes (continued)

	Investigation Process	Instructional Support
Investigation Plan	1. Gather materials: meter stick, copy of the Investigation Plan, and Data Collection Sheets. 2. Place the meter stick on the table with half of the meter stick extending over the edge of the table. 3. Have one student hold the end of the meter stick on the table. 4. Have another student place a thumb on the edge of the meter stick (portion extending beyond the tabletop), and gently allow the thumb to slide off the meter stick. 5. Draw/describe the movement of the meter stick on the Data Collection Sheet. 6. Listen for sounds. Describe sounds on the Data Collection Sheet. 7. Repeat steps 2-6 placing the meter stick so that more than half extends over the edge of the table. 8. Repeat steps 2-6 placing meter stick so that less than half extends over the edge of the table.	**Read through the Investigation Plan** while students follow along. Next, have all students **role-play conducting the Investigation Plan without the actual materials** as the teacher reads the Investigation Plan again. Finally, **role-play the investigation using a pencil instead of a meter stick.** Then, let groups of students conduct the Investigation Plan while the teacher circulates. If needed, the teacher can provide further scaffolds by reading the steps of the Investigation Plan while students conduct the investigation. Consider using yard sticks if no meter sticks are available. **Decide as a class what the approximate placement of the meter sticks** will look like in steps 7 and 8.
Observation	Students gather and record Observations using Data Collection Sheets.	Students take turns in their group conducting trials and recording Observations on their individual Data Collection Sheets.
Data Analysis	My Data Analysis shows:	Working together, reorganize data on paper or white boards, look for patterns, and write a summary of what the patterns reveal.

Meter Stick– Teacher Notes (continued)

Explanation	**Claim** When I use a meter stick to make sounds, the meter stick _____. **Evidence** My evidence is _____.	Conduct a class discussion to develop the Claim, supported by Evidence, to answer the Investigation Question. Use part of the Investigation Question to start the Claim. Next ask students to look at their Data Analysis to choose the data that provides Evidence for their Claim. Encourage students to use their Data Analysis, coupled with notes from Observations recorded on their Data Collection Sheets, to support their Claim. **Students' Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: When I use a meter stick to make sounds, the meter stick_____ (moves back and forth/moves up and down/vibrates). Evidence: My evidence is that the meter stick slows down and the sound changes. When the meter stick stops moving, the sound stops.

Meter Stick Anchor Chart #1– Science Investigation Notebook

Question	What **happens** when I use a meter stick to make sounds?
Knowledge Probe	• • •
Prediction	I predict the meter stick will _____. I predict this because _____.
Investigation Plan	1. Gather materials: meter stick, copy of the Investigation Plan, and Data Collection Sheets. 2. Place the meter stick on the edge of the table with half of the meter stick extending over the edge of the table. 3. Have one student hold the end of the meter stick on the table. 4. Have another student place a thumb on the edge of the meter stick extending beyond the tabletop, and gently allow the thumb to slide off the meter stick. 5. Draw/describe the movement of the meter stick on the Data Collection Sheet. 6. Listen for sounds. Describe sounds on the Data Collection Sheet. 7. Repeat steps 2-6 placing meter stick so that more than half extends over the edge of the table. 8. Repeat steps 2-6 placing meter stick so that less than half extends over the edge of the table.

Meter Stick – Anchor Chart #1- Science Investigation Notebook (continued)

Observation	Meter Stick	 What is moving?	Draw/Describe the movement.	 Is there a sound?	Describe the sound made. (loud/quiet, high/low)
	Trial 1				
	Trial 2				
	Trial 3				
Data Analysis	My Data Analysis shows:				
Explanation	**Claim** When I use a meter stick to make sounds, the meter stick _____. **Evidence** My evidence is _____.				

Meter Stick Data Collection Sheet Student Scientist_____

Question: **What happens when I use a meter stick to make sounds?**

Observation

Meter Stick	 What is moving?	Draw/Describe the movement.	 Is there a sound?	Describe the sound made. (loud/quiet, high/low)
Trial 1				
Trial 2				
Trial 3				

Sound Meter Stick

#8 Ruler – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #3: **What happens when I make sounds?**

Investigation Question #8**: What happens when I use a ruler to make sounds?**

Purpose of Lesson:

Investigation Question	Science Component	Writing Component
Investigation #8 ***What happens when I use a ruler to make sounds?***	Students make Observations about what is happening to the ruler as it is tapped and makes a sound. Students use the Investigation Plan provided. The ruler makes sounds as it vibrates, or moves back and forth. The size of the ruler makes it harder for children to see the back and forth movements of the ruler (compared to the meter stick in Investigation #7). The ruler investigation can be used to demonstrate high and low sounds as the ruler vibrates. It is critical to allow vibration and its definition to arise from the student Observations, rather than provide the term to students before they investigate. At the end of this investigation, if students have not come up with the term vibration or vibrate, provide the definition of vibration to the students. Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question) supported by Evidence selected from analyzed data.	Group Science Investigation Notebook: Students work together to construct the Group Science Investigation Notebook. (Some students may keep their own Science Investigation Notebook for the Ruler investigation.) Students need to use the Investigation Plan provided by the teacher. Each student completes an individual Data Collection Sheet. With the teacher's help, students reorganize data on paper or white boards looking for patterns and write a summary of what the reorganized data show. Finally, students construct an Explanation that answers the Investigation Question and supports the answer by providing specific Evidence from their analyzed data. **Encourage students to use many of the vocabulary words from #4 Anchor Chart Science Word List.**

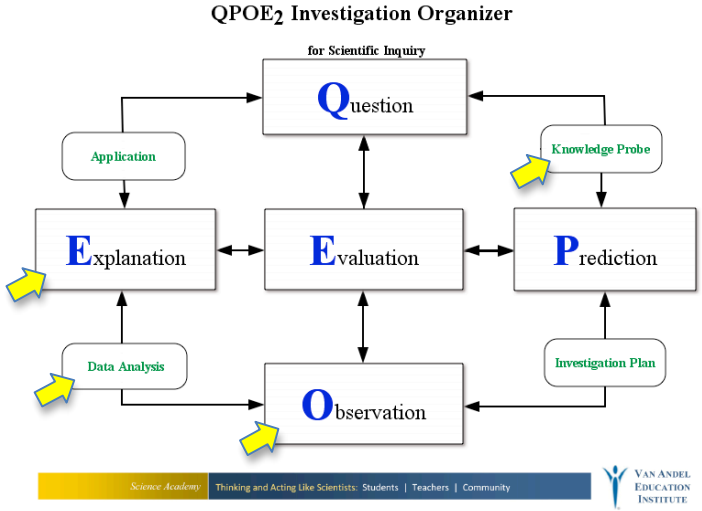
Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1**- Class Science Investigation Notebook for #8 Ruler:** Enlarge and display on the wall where students can read it.

#8 Ruler – Teacher Guide (continued)

- Anchor Chart #2**- Sound Map of Questions:** Display Driving Question, Class Question #3, and Investigation Question #8 on sentence strips and post in the classroom.

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Knowledge Probe**, **Observation**, **Data Analysis**, and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Data Analysis, Explanation) and science content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

#8 Ruler – Teacher Guide (continued)

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Prepare the small groups' copies of the Science Investigation Notebook pages. For example, use large sheets of paper that are at least 17" by 22". Begin with only the Investigation Question and the Knowledge Probe.
- See photos of classroom examples from the Sound Unit pilot test in the Appendix.
- Note: The teacher always has the discretion to teach the class as a whole group and use the Class Science Investigation Notebook, or to offer individual students the opportunity to keep individual Science Investigation Notebook pages.
- Gather pencils (one for each student) and rulers (one per pair of students).
- Divide students into groups of two. Post list of student pairings on the wall.
- Distribute to each pair of students a ruler, two copies of the Investigation Plan, and two Data Collection Sheets.

Ruler– Teacher Notes

	Investigation Process	Instructional Support
Question	What happens when I use a ruler to make sounds?	**Always construct the science investigation notebooks together when possible.** Put a sheet of paper with Investigation Question #8 written on it under a document camera. **Model aloud** how to make a Science Investigation Notebook so that students can see and hear the thinking and writing processes involved. Begin with only the Investigation Question and the Knowledge Probe labels. Ask students if they are unsure of any words in the Investigation Question. Underline words students do not know in the Investigation Question. Allow students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	• • •	Ask students to share three things they know about the Investigation Question or parts of the question, such as ruler and "happens." Show students the equipment. Demonstrate how to tap the ruler.
Prediction	I predict the ruler will _____ because _____.	Ask students to use what they know about making and describing sounds to Predict an answer to this Investigation Question.

Ruler– Teacher Notes (continued)

Investigation Plan	1. Gather materials (ruler, Data Collection Sheets, pencils). 2. Place the ruler on the edge of the table with half of the ruler sticking out over the edge of the table. 3. Have one partner hold the end of the ruler on the table. 4. Have the other partner place a thumb on the edge of the part of the ruler that extends beyond the table top, and gently allow the thumb to slide off the ruler. 5. Have both partners draw/describe the movement of the ruler on the Data Collection Sheets. 6. Listen for sounds. Describe sounds on the Data Collection Sheets. 7. Repeat steps 2-6 with more than half of the ruler sticking out over the edge of the table. 8. Repeat steps 2-6 with less than half of the ruler sticking out over the edge of the table.	Read through the Investigation Plan while students follow along. Next, have all students role-play conducting the Investigation Plan without the actual materials as the teacher reads the Investigation Plan again. Then, let students conduct the Investigation Plan with a partner while the teacher circulates. Further scaffolds can be provided by the teacher, such as, reading the steps of the Investigation Plan while students conduct the investigation. **Decide as a class what the approximate placement of the rulers will look like in steps 7 and 8.**

Ruler– Teacher Notes (continued)

	Investigation Process	Instructional Support
Observation	Students gather and record Observations using Data Collection Sheets.	Students take turns helping each other conduct trials and record Observations on their individual Data Collection Sheets.
Data Analysis	My Data Analysis shows:	Reorganize data on paper or white boards, then, look for patterns. Working together, write a summary of what the patterns show.
Explanation	**Claim** When I use a ruler to make sounds, the ruler _____. **Evidence** My evidence is _____.	As partners, students write an Explanation using both the Claim and Evidence. Conduct a class discussion to share students' Claims, supported by Evidence, to answer the Investigation Question. Remind students to use part of the Investigation Question to start the Claim. Next ask students to look at their Data Analysis to choose the data that provides the Evidence for their Claim. Encourage students to use their Data Analysis, coupled with notes from Observations recorded on their Data Collection Sheets, to support their Claim. Have students share out their Explanations in a class discussion. (Teacher may choose to have only a few groups share.) **Students' Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: When I use a ruler to make sounds, the ruler _____ (moves back and forth/moves up and down/vibrates). Evidence: My evidence is that when I use a ruler to make a sound, the meter stick moves up and down and I hear a high sound. As the ruler slows down, the sound changes to a lower sound. When the ruler stops moving, the sound stops.

Ruler Anchor Chart #1– Science Investigation Notebook

Question	What happens when I use a ruler to make sounds?
Knowledge Probe	
Prediction	I predict the ruler will _____ because _____.
Investigation Plan	1. Gather materials: ruler, Data Collection Sheets, pencils. 2. Place the ruler on the table so that half of the ruler sticks out over the edge of the table. 3. Have one partner hold the end of the ruler on the table. 4. Have the other partner place a thumb on the part of the ruler that extends beyond the table top, and gently allow the thumb to slide off the ruler. 5. Have both partners draw/describe the movement of the ruler on their Data Collection Sheets. 6. Listen for sounds. Describe sounds on the Data Collection Sheets. 7. Repeat steps 2-6 with more than half of the ruler sticking out over the edge of the table. 8. Repeat steps 2-6 with less than half of the ruler sticking out over the edge of the table.

Observation

Ruler	 **What is moving?**	**Draw/Describe the movement.**	 **Is there a sound?**	**Describe the sound made.** **(loud, quiet, high, low)**
Trial 1				
Trial 2				
Trial 3				

Ruler – Anchor Chart #1- Science Investigation Notebook (continued)

Data Analysis	My Data Analysis shows:
Explanation	**Claim** When I use a ruler to make sounds, the ruler _____. **Evidence** My evidence is _____.

Ruler Data Collection Sheet **Student Scientist_____**

Question: **What happens when I use a ruler to make sounds?**

Observation

Ruler	 **What is moving?**	**Draw/Describe the movement.**	 **Is there a sound?**	**Describe the sound made. (loud, quiet, high, low)**
Trial 1				
Trial 2				
Trial 3				

Sound Ruler

#9 Rubber Band Instrument – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #3: **What is happening when I make sounds?**

Investigation Question #9**: What happens when I pluck a rubber band to make sounds?**

Purpose of Lesson:

Investigation Question	Science Component	Writing Component
Investigation #9 ***What happens when I pluck a rubber band to make sounds?***	Students make Observations about what is happening to a rubber band as it is plucked and released. The rubber band makes sounds as it vibrates, or moves back and forth. By using different sizes of rubber bands, the Rubber Band Instrument Investigation can be used to demonstrate loud or quiet, and high or low sounds. Encourage students to use these terms in their work. Use student examples to create a class Explanation. Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question), supported by Evidence selected from analyzed data. Students reflect on: What is happening when I make sounds as I play, dance, and sing? Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List**.	Group Science Notebook pages: Students work together to construct the Group Science Notebook pages for the Rubber Band Instrument Investigation. (Some students may keep their own Science Notebook for this investigation.) Each student completes an individual Data Collection Sheet. Students write a summary of the analyzed data. Then students construct an Explanation that answers the Investigation Question and supports the answer by providing specific Evidence from their analyzed data. After conducting this investigation, students independently write answers to Class Question #3: What is happening when I make sounds? Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List**.

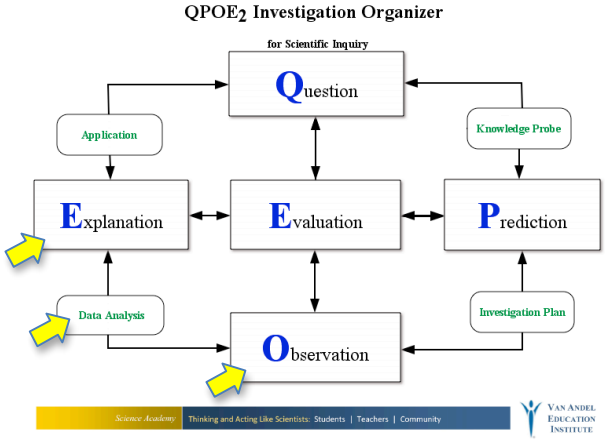
#9 Rubber Band Instrument – Teacher Guide (continued)

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #9 Rubber Band Instrument:** Enlarge and display on the wall where students can read it.

  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Class Question #3, and Investigation Question #9 on sentence strips and post in the classroom.

  - Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Observation**, **Data Analysis**, and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



  - Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Data Analysis, Explanation) and science content (e.g., sound, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

#9 Rubber Band Instrument – Teacher Guide (continued)

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Prepare the small groups' copies of the Science Investigation Notebook pages. For example, use large sheets of paper that are at least 17" by 22". Begin with the Investigation Question and the Knowledge Probe.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Prepare the rubber band instruments by placing rubber bands around a study container (e.g., cardboard tissue box, gift box, plastic container). Use a variety of sizes and thicknesses of rubber bands to make the instruments. Secure the rubber bands with duct tape on the sides and the bottom of the container. Pilot teachers recommended using a variety of facial tissue boxes and a variety of rubber bands with different widths.
- Distribute to each team of 2 students a rubber band instrument, two pairs of safety glasses, and two Data Collection Sheets.

Rubber Band Instrument – Teacher Notes

	Investigation Process	Instructional Support
Question	What happens when I pluck a rubber band to make sounds?	**Always construct the Science Investigation Notebooks together when possible.** Put a sheet of paper with Investigation Question #9 written on it under a document camera. **Model aloud** how to make a Science Investigation Notebook so that students can see and hear the thinking and writing processes involved. Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Ask students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Words List.
Knowledge Probe	pluck, vibration, rubber bands • • •	Ask students to think about what they know about the word "pluck." Next ask them to think about what they know about making and causing sounds. Encourage students to think about what they learned in the previous investigations using meter sticks and rulers.
Prediction	I think when I pluck the rubber band the rubber band will _____ because _____.	Encourage students to use information from their Knowledge Probe within their Prediction.
Investigation Plan	1. Gather materials: box with rubber bands, safety glasses, and Data Collection Sheets. 2. Place safety glasses on face covering eyes. 3. Place a finger on a rubber band; press down while partner holds box in place on the table. 4. Gently let the finger slide off. 5. Record Observations on Data Collection Sheet. 6. Repeat steps 3-5 three times. 7. Trade roles so partner can conduct Steps 3 -6.	Role-play how to pluck the rubber band. Teachers may choose to demonstrate while students record data.

Rubber Band Instrument – Teacher Notes (continued)

Observation	Students gather and record Observations using student Data Collection Sheet.	Encourage students to think about the following: *How does the rubber band make a sound?* *Does the rubber band move?*
Data Analysis	My Data Analysis shows:	Working together, reorganize data on paper or whiteboards, look for patterns, and write a summary of what the patterns show.
Explanation	**Claim** When I pluck a rubber band to make sounds, _____. **Evidence** My evidence is _____.	Have students sit in groups based upon the style of rubber band instrument students used. Conduct a class discussion to develop the Claim (answer to the Investigation Question). Use part of the Investigation Question to start the answer, *When I pluck a rubber band to make sounds,* _____. Next, ask students to look at their Data Analysis to choose data that provides Evidence for their Claim. Encourage students to use their Data Analysis, coupled with notes from Observations recorded on their Data Collection Sheets, to support their Claim. **Students' Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: When I pluck a rubber band to make sounds, the rubber band _____ (moves back and forth/moves up and down/vibrates). Evidence: When I pluck a rubber band by lifting the rubber band up and releasing it, the rubber band moves up and down and makes a sound. The sound stops when the rubber band stops moving. This happened during all three trials that I conducted.

Rubber Band Instrument Anchor Chart #1– Science Investigation Notebook

Question	What happens when I pluck a rubber band to make sounds?
Knowledge Probe	sounds, vibration, rubber bands, pluck • • •
Prediction	I think when I pluck the rubber band the rubber band will _____ because _____.
Investigation Plan	1. Gather materials: box with rubber bands, safety glasses, and Data Collection Sheets. 2. Place safety glasses on face covering eyes. 3. Place a finger on a rubber band; press down while partner holds box in place on the table. 4. Gently let the finger slide off. 5. Record Observations on the Data Collection Sheet. 6. Repeat steps 3-5 three times. 7. Trade roles so partner can conduct Steps 3 -6.

Rubber Band Instrument Anchor Chart #1– Science Investigation Notebook (continued)

Observation	Rubber Band	 What is moving?	Draw/Describe the movement.	 Is there a sound?	Describe the sound made. (high, low, loud, quiet)
	Trial 1				
	Trial 2				
	Trial 3				
Data Analysis	My Data Analysis shows:				

Rubber Band Instrument Anchor Chart #1– Science Investigation Notebook (continued)

Explanation	Claim When I pluck a rubber band to make sounds, _____. Evidence My evidence is _____.

Rubber Band Instrument Data Collection Sheet Student Scientist_____

Question

What happens when I pluck a rubber band to make sounds?

Observation

Rubber Band	 What is moving?	Draw/Describe the movement.	 Is there a sound?	Describe the sound made. (high, low, loud, quiet)
Trial 1				
Trial 2				
Trial 3				

Sound Rubber Band Instrument

VAN ANDEL EDUCATION INSTITUTE SCIENCE ACADEMY

Class Question #4: ***How do sounds affect objects?***

Overview: There are four lessons: Salt Crystals (Part1), Salt Crystals(Part 2), Balloon, and Sound Hunt (Part 2). Key parts of the science lessons will focus on one, two, or all of The Dimensions of the Framework for K-12 Education: Science and Engineering Practices, Disciplinary Core Ideas, and/or Cross-Cutting Concepts. The purposes of these four lessons are to:	
Science and Engineering Practices	*Continue to develop student skills in the practices by scaffolding student engagement in components of the investigation process.* Students continue to use the science practices of making Predictions based on prior knowledge, carrying out their Investigation Plans, and collecting their own data. Students gather and record their own data based on what they see, hear, and feel during the investigations. Students continue to focus on Data Analysis by organizing data in useful ways looking for patterns. Students also continue to use the information revealed in their Data Analysis to make **Claims supported with Evidence** to answer their Investigation Questions. Students begin to **Evaluate** their investigation by answering one or two questions provided by teacher. Refer to the K-2 Investigation Organizer Step Book for additional Evaluation questions. The following vocabulary should be introduced and used with students during these investigations: **Evaluation**. The following vocabulary should be reinforced with students during these investigations: **Question**, **Knowledge Probe**, **Prediction**, **Investigation Plan**, **Observation**, **Data Analysis**, **Explanation**, **Claim**, and **Evidence**.
Science Disciplinary Core Ideas/ Crosscutting Concepts	*Support students as they discover that sounds can cause other materials to vibrate (move back and forth, sideways, etc.).* These investigations show when materials are near a source of sound the materials vibrate. Students discover when the sound begins it causes the materials to vibrate and when the music stops the effect is that the materials stop moving. The following vocabulary should be introduced: **source of sound** (computer speakers, iPod speakers, CD player speakers etc.).
Science Vocabulary	*Deepen shared vocabulary for talking and writing about vibration and sound*. Key terms to emphasize include **Cause and Effect**, **source of sound**, and terms related to describing movement of materials: **back and forth**, **slowly**, and **quickly**. Investigations show sounds can cause materials to vibrate. Students observe vibrations using the sense of touch, and develop descriptors for what they feel.
Writing Practices	*Continue to support students becoming more independent in their science writings.* Students record their science thinking in a Group, Partner, or Individual Science Investigation Notebooks. (Note: Teachers may choose to continue with a Class Science Investigation Notebook based upon needs of students.) Students record Observations on their own Data Collection Sheets and, at the end of this investigation set, independently answer the Class Question #4 ***How do sounds affect objects?*** Students continue to reinforce and develop shared vocabulary for explaining vibrations and describing sounds. Reflection questions provide students additional opportunities to develop writing and communication skills in science.
Note: The writing and science standards are integrated in this unit.	

Investigation Question	Science Component	Writing Component
Investigation #10: ***What happens when I place salt crystals near a source of sound?***	Students observe sounds causing materials to vibrate or move when the materials are near a sound source (CD player, iPod speakers, etc.). The salt crystals vibrate, moving back and forth and up and down. When a sound emitted from a sound source stops, the salt crystals stop moving (vibrating). Encourage students to use the words of sound to describe what they observe. Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question), supported by Evidence selected from analyzed data. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**	Group Science Notebook pages: Students work together to construct the Group Science Notebook pages for the Salt Crystals (Part 1) Investigation. (Some students may keep their own Science Notebook for this investigation.) Each student completes an individual Data Collection Sheet. Working in groups, students construct a written Explanation that answers the Investigation Question and supports the answer by providing specific Evidence from their analyzed data. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**
Optional Investigation: Investigation #11 ***What happens when I place _____ near a source of sound?***	Students experience more materials that clearly demonstrate that sounds can cause materials to vibrate or move when the materials are near the sound source. The use of a second material (pepper, corn meal, rice, etc.) will deepen understanding that sound can cause matter to vibrate (move back and forth and/or up and down). Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question), supported by Evidence selected from analyzed data. Finally, students Evaluate their investigations using 1-3 questions provided by the teacher.	Science Investigation Notebook pages: Working in groups or as a class, students collect and record Observations on their individual Data Collection Sheets. In groups, students reorganize data on white boards. Students write a data summary as a class. In groups, students write and discuss Explanations with Claims supported by Evidence. Students reflect on their investigations by writing and discussing Evaluation questions provided by the teacher. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

Investigation #12 ***What happens when I place a balloon near a source of sound?***	Students observe sounds that can cause a balloon to vibrate or move when it is near the sound source (CD player, iPod speakers, etc.). By using the **sense of touch**, students make Observations about what is happening to a balloon when it is placed near a source of sound. In Salt Crystals Parts 1 and 2, students used their sense of sight to make Observations. In this investigation, they use their sense of touch to feel the balloon vibrate when the sound is heard, and feel the vibration stop when the sound cannot be heard. Students work collaboratively with a partner to construct an Explanation, making a Claim (the answer to the Investigation Question) supported by Evidence selected from the analyzed data.	Science Investigation Notebook: Students work with partners to construct the Science Notebook for the Balloon Investigation. (Some students may keep their own Science Notebook for this investigation.) Each student completes an individual Data Collection Sheet. In partners, students write and discuss Explanations with Claims supported by Evidence. Finally, students individually reflect on their investigations using 1-3 Evaluation questions provided by the teacher. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**
Investigation #13 ***How can I describe the sounds and vibrations I hear, see, and feel, in the _____?***	Students take a short walk about the school identifying sounds, describing sounds using science concepts and science vocabulary, and noting causes and effects of vibrations and sounds.	Science Investigation Notebook: Students work together to construct the Team Science Notebook. (Some students may keep their own Science Notebook for this investigation.) Student responses should include sound and vibration vocabulary they have learned throughout the investigations in this unit. Terms should include the causes and effects of sound and vibrations, as well as properties of sound: loud/quiet and high/low, moving back and forth, etc. *Together, students answer the **Driving Question:*** ***What is happening when I make sounds as I play, dance, and sing?*** Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

#10 Salt Crystals (Part 1) – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #4: **How do sounds affect objects?**

Investigation Question #10: **What happens when I place salt crystals near a source of sound?**

Purpose of Lesson:

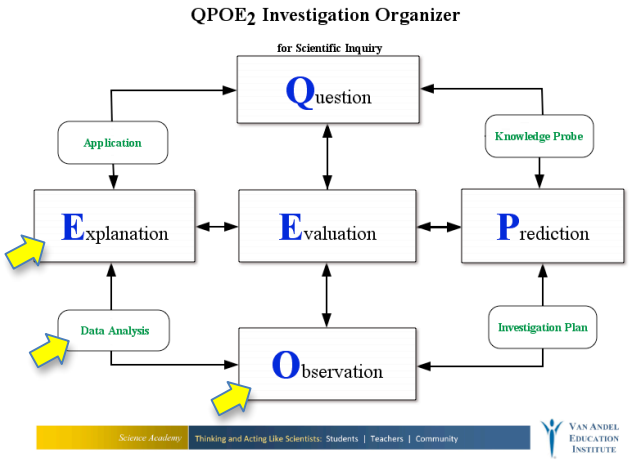
Investigation Question	Science Component	Writing Component
Investigation #10: ***What happens when I place salt crystals near a source of sound?***	Students observe sounds causing materials to vibrate or move when the materials are near a sound source (CD player, iPod speakers, etc.). The salt crystals vibrate, moving back and forth and up and down. When a sound emitted from a sound source stops, the salt crystals stop moving (vibrating). Encourage students to use the words of sound to describe what they observe. Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question), supported by Evidence selected from analyzed data. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**	Group Science Notebook pages: Students work together to construct the Group Science Notebook pages for the Salt Crystals (Part 1) Investigation. (Some students may keep their own Science Notebook for this investigation.) Each student completes an individual Data Collection Sheet. Working in groups, students construct a written Explanation that answers the Investigation Question and supports the answer by providing specific Evidence from their analyzed data. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #10 Salt Crystals (Part 1):** Enlarge and display on the wall where students can read it.
  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Class Question #4, and Investigation Question #10 on sentence strips and post in the classroom.

#10 Salt Crystals (Part 1) – Teacher Guide

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Observation**, **Data Analysis**, and **Explanation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Observation, Data Analysis, Explanation) and science content (e.g., sound source, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Prepare copies of the Science Investigation Notebook for each pair of students.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Locate a sound source (CD player, iPod speakers, etc.) and music.
- Cover small plastic containers with plastic wrap and secure the plastic wrap with a rubber band. Secure the rubber band with masking tape or duct tape.
- Use a permanent marker to label each container with a pair of students' names.
- Distribute to each pair of students a container with their names, a small amount of salt, a Student Investigation Notebook, a copy of the Investigation Plan, and a Data Collection Sheet.

Salt Crystals (Part 1) – Teacher Notes

	Investigation Process	Instructional Support
Question	What happens when I place salt crystals near a source of sound?	Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Ask students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	(sounds, vibration, salt crystals, sound source)	Ask students to think about what they know about the word "source." Next, ask them to think about what they know about making and causing sounds. Encourage students to think about what they learned in previous investigations.
Prediction	I predict the salt crystals will _____ because _____.	Encourage students to use information from their Knowledge Probe within their Prediction.
Investigation Plan	1. Gather materials: plastic container covered with plastic wrap, pinch of salt crystals, Data Collection Sheet, pencil. 2. Put salt crystals on plastic wrap. 3. On a table, position containers with salt in a semi-circle around the speaker. 4. Play music. 5. Record Observations about the movement of the salt crystals on the Data Collection Sheet. 6. Record Observations about the sound: loud, quiet, high, low. Record with an X on the Data Collection Sheet. 7. Repeat steps 3-7 two times.	Role-play how to position containers in a semi-circle. Salt crystals used should be spread out over the top of the container. Teachers may choose to demonstrate while students record data. Teachers may choose to have students work in large groups or as a whole class.

Salt Crystals (Part 1) – Teacher Notes (continued)

Observation	Students gather and record Observations using student Data Collection Sheet.	Encourage students to think about the following: *Do the salt crystals move? How do the salt crystals move? When do the salt crystals move?* *How can the sound be described?* Students complete Data Collection Sheets with a partner.
Data Analysis	My Data Analysis shows _____.	Working together, reorganize data on paper or white boards, look for patterns, and write a summary of the patterns.
Explanation	**Claim** *When I place salt crystals near a source of sound, the salt crystals _____.* **Evidence** *My evidence is _____.*	Have students sit in groups. Conduct a class discussion to develop the Claim (the answer to the Investigation Question). Use part of the Investigation Question to start the answer, *When I place salt crystals near a source of sound, the salt crystals _____.* Next, ask students to work as a group and look at their Data Collection Sheets to choose the data that provides Evidence for their Claim. **Students Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: When I place salt crystals near a source of sound, the salt crystals _____ (move back and forth/move up and down/vibrate). Evidence: My evidence is that the crystals moved up and down and also moved sideways and back and forth when the music was on. When the music stopped, the crystals stopped moving.

Salt Crystals (Part 1) – Science Investigation Notebook Page

Question	What happens when I place salt crystals near a source of sound?
Knowledge Probe	sounds, vibration, salt crystals, source of sound • • •
Prediction	I predict the salt crystals will _____ because _____.
Investigation Plan	1. Gather materials: plastic container covered with plastic wrap, pinch of salt crystals, Data Collection Sheet, pencil. 2. Put salt crystals on plastic wrap. 3. On a table, position containers with salt in a semi-circle around the speaker. 4. Play music. 5. Record Observations about the movement of the salt crystals on the Data Collection Sheet. 6. Record Observations about the sound: loud, quiet, high, low. 7. Record with an X on the Data Collection Sheet. 8. Repeat steps 3-7 two times.

Salt Crystals (Part 1) – Science Investigation Notebook Page (continued)

Observation	Salt Crystals	 Do you see anything moving?	Draw/Describe the movement.	 Is a sound made?	Describe the sound made by the source of sound. (high, low, loud, quiet)
	Trial 1				
	Trial 2				
	Trial 3				

Salt Crystals (Part 1) – Science Investigation Notebook Page (continued)

Data Analysis	My Data Analysis shows _____.
Explanation	**Claim** *When I place salt near a sound source the salt, _____.* **Evidence** *My evidence is _____.*

Salt Crystals (Part 1) Data Collection Sheet Student Scientist_____

Question: **What happens when I place salt crystals near a source of sound?**

Observation

Salt Crystals	 **Do you see anything moving?**	**Draw/Describe the movement.**	 **Is a sound made?**	**Describe the sound. (high, low, loud, quiet)**
Trial 1				
Trial 2				
Trial 3				

#11 Salt Crystals (Part 2) – Teacher Guide
Optional Lesson

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #4: **How do sounds affect objects?**

Investigation Question #11: **What happens when I place _____ near a source of sound?**

Purpose of Lesson:

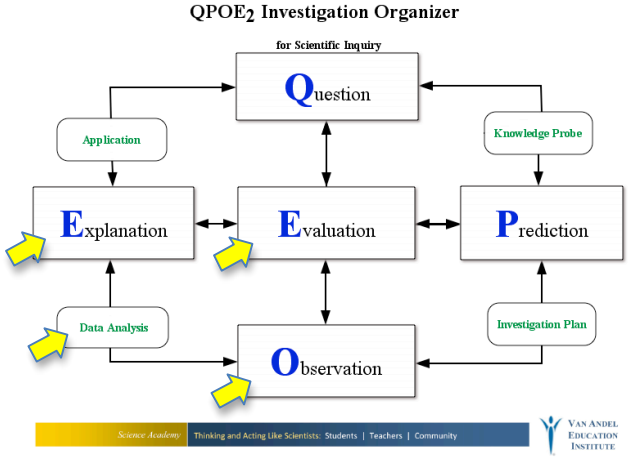
Investigation Question	Science Component	Writing Component
Optional Investigation: Investigation #11 ***What happens when I place _____ near a source of sound?***	Students experience more materials that clearly demonstrate that sounds can cause materials to vibrate or move when the materials are near the sound source. The use of a second material (pepper, corn meal, rice, etc.) will deepen understanding that sound can cause matter to vibrate (move back and forth and/or up and down). Students work collaboratively with a partner, follow an Investigation Plan, record Observations on a Data Collection Sheet, reorganize class data to look for patterns, and construct an Explanation making a Claim (the answer to the Investigation Question), supported by Evidence selected from analyzed data. Finally, students Evaluate their investigations using 1-3 questions provided by the teacher.	Science Investigation Notebook pages: Working in groups or as a class, students collect and record Observations on their individual Data Collection Sheets. In groups, students reorganize data on white boards. Students write a data summary as a class. In groups, students write and discuss Explanations with Claims supported by Evidence. Students reflect on their investigations by writing and discussing Evaluation questions provided by the teacher. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #11 Salt Crystals (Part2):** Enlarge and display on the wall where students can read it.
  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Class Question #4, and Investigation Question #11 on sentence strips and post in the classroom.

#11 Salt Crystals (Part 2) – Teacher Guide (continued)
Optional Lesson

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Observation**, **Data Analysis**, **Explanation and Evaluation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Observation, Data Analysis, Explanation, Evaluation) and science content (e.g., sound source, vibrating, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.

- Use both the Lesson Plan Packet and Teacher Guide for each lesson.

- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.

#11 Salt Crystals (Part 2) – Teacher Guide (continued)
Optional Lesson

- Locate a sound source (CD player, iPod speakers, etc.) and music.
- Cover small plastic cups with plastic wrap and secure the plastic wrap with a rubber band. Secure the rubber band with masking tape or duct tape.
- Use a permanent marker to label each container with a pair of students' names.
- Gather materials to use to investigate (e.g., cinnamon, pepper, small pieces of breadcrumbs).
- Distribute to each pair of students a container with the students' names, small amounts of materials, and two Data Collection Sheets.

Salt Crystals (Part 2) – Teacher Notes

	Investigation Process	Instructional Support
Question	What happens when I place _____ near a source of sound?	Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Ask students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	sounds, vibration, salt, sound source	Ask students to think about what they know about the words "source of sound." Next, ask them to think about what they know about making and causing sounds. Encourage students to think about what they learned in previous investigations.
Prediction	I predict _____ will _____ because _____.	Encourage students to use information from their Knowledge Probe within their Prediction.
Investigation Plan	1. Gather materials: plastic container covered with plastic wrap, pinch of _____, Data Collection sheets, pencils. 2. Put ___ on surface of container. 3. Position containers in a semi-circle around the speaker on the table. 4. Play music. 5. Record class Observations about the movement of the ____ on the Data Collection Sheet. 6. Record class Observations about the sound: loud, quiet, low, high. Record with an X on the Data Collection Sheet. 8. Repeat steps 3-7 two times.	Role-play how to position containers in a semi-circle. Teachers may choose to demonstrate while students record data. Teacher may choose to have students work in large groups or as a whole class. The material used should be spread out over the top of the container.

Salt Crystals (Part 2) – Teacher Notes (continued)

	Investigation Process	Instructional Support
Observation	Students gather and record Observations using Data Collection Sheets.	Encourage students to think about the following: *Does the___ (material used) move?* *How does the ___ (material used) move?* *How does the movement change when the container is (closer, farther) from the sound source?* *How can the sound be described?*
Data Analysis	My Data Analysis shows _____.	Reorganize data on paper or white boards, look for patterns, and write a summary together.
Explanation	**Claim** *When I place _____ near a source of sound, _____.* **Evidence** *My evidence is _____.*	Working in groups, students create Explanations with a Claim. Use part of the Investigation Question to start the Claim: *When I place____ near a source of sound, _____.* Next, ask students to work as a group and look at their Data Collection Sheets to choose data that provides Evidence for their Claim. The teacher facilitates a class discussion of possible Explanations supported with Evidence. **Students Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: When I place ___ near a source of sound, the __ _____ (moves back and forth/moves up and down/vibrates).

Salt Crystals (Part 2) – Teacher Notes (continued)

Explanation Continued		Evidence: When I place a piece of puffed rice cereal near a source of sound, the puffed rice cereal moved up and down and also moved sideways and back and forth while the music was on. When the sound stopped, the puffed rice cereal stopped moving, just like the salt crystals. The container did not have to touch the source of sound for me to see the puffed rice cereal move. But when I moved the container far away from the sound source, I did not see the puffed rice cereal move as much as it did when it was close to the sound source.
Evaluation	*I did _____well.* *I could make my investigation better by _____.* *I was surprised by_____.* *Now I wonder: _____?*	Students Evaluate their investigations using 1-3 questions provided by the teacher. Sample questions: What did I do well? How could I make my investigation better? What surprised me? What do I wonder about now?

Salt Crystals (Part 2) –Science Investigation Notebook

Question	What happens when I place _____ near a source of sound?
Knowledge Probe	sounds, vibration, salt crystals, source of sound • • •
Prediction	I predict the _____ will _____ because _____.
Investigation Plan	1. Gather materials: plastic container covered with plastic wrap, pinch of _____, Data Collection Sheets, pencils. 2. Put ___ on surface of container. 3. Position containers in a semi-circle around the speaker on the table. 4. Play music. 5. Record class Observations about the movement of the __ on the Data Collection Sheet. 6. Record class Observations about the sound: loud, quiet, low, high. Record with an X on the Data Collection Sheet. 7. Repeat steps 3-7 two times.

Salt Crystals (Part 2) – Individual Science Investigation Notebook Page (continued)

Observation	_____ (material used)	 **Do you see anything moving?**	**Draw/Describe the movement.**	 **Is a sound made?**	**Describe the sound made by the source of sound. (high, low, loud, quiet)**
	Trial 1				
	Trial 2				
	Trial 3 _____				
Data Analysis	My data analysis shows _____.				
Explanation	**Claim** *When I place ____ near a source of sound, the _____.* **Evidence** *My evidence is _____.*				
Evaluation	*I did _____well.* *I could make my investigation better by _____.* *I was surprised by_____.* *Now I wonder: _____?*				

VAN ANDEL EDUCATION INSTITUTE SCIENCE ACADEMY

Salt Crystals (Part 2) Data Collection Sheet Student Scientist_____

Question: **What happens when I place _____near a source of sound?**

(material used)

Observation

_____ (material used)	 **Do you see anything moving?**	**Draw/Describe the movement.**	 **Is a sound made?**	**Describe the sound made by the source of sound. (high, low, loud, quiet)**
Trial 1				
Trial 2				
Trial 3				

Salt Crystals (Part 2)

#12 Balloon Investigation – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #4: **How do sounds affect objects?**

Investigation Question #12**: What happens when I place a balloon near a source of sound?**

Purpose of Lesson:

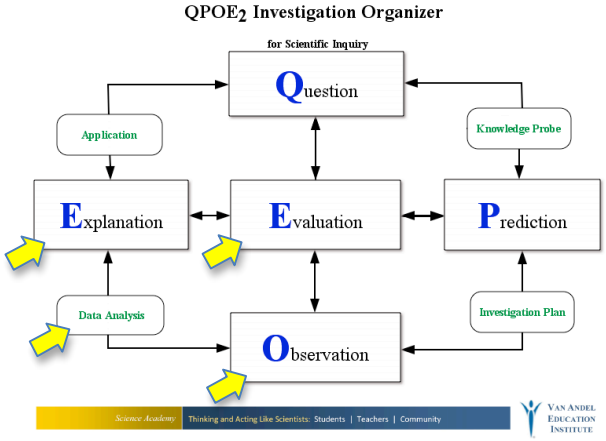
Investigation #12 ***What happens when I place a balloon near a source of sound?***	Students observe sounds that can cause a balloon to vibrate or move when it is near the sound source (CD player, iPod speakers, etc.). By using the **sense of touch**, students make Observations about what is happening to a balloon when it is placed near a source of sound. In Salt Crystals Parts 1 and 2, students used their sense of sight to make Observations. In this investigation, they use their sense of touch to feel the balloon vibrate when the sound is heard, and feel the vibration stop when the sound cannot be heard. Students work collaboratively with a partner to construct an Explanation, making a Claim (the answer to the Investigation Question) supported by Evidence selected from the analyzed data.	Science Investigation Notebook: Students work with partners to construct the Science Notebook for the Balloon Investigation. (Some students may keep their own Science Notebook for this investigation.) Each student completes an individual Data Collection Sheet. In partners, students write and discuss Explanations with Claims supported by Evidence. Finally, students individually reflect on their investigations using 1-3 Evaluation questions provided by the teacher. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1**- Class Science Investigation Notebook for #12 Balloon Investigation:** Enlarge and display on the wall where students can read it.
  - Anchor Chart #2**- Sound Map of Questions:** Display Driving Question, Class Question #4, and Investigation Question #12 on sentence strips and post in the classroom.

#12 Balloon Investigation – Teacher Guide (continued)

- Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Observation**, **Data Analysis**, **Explanation,** and **Evaluation**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Observation, Data Analysis, Explanation, Evaluation) and science content (e.g., sound source, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Prepare the small groups' copies of the Science Investigation Notebook. For example, use large sheets of paper that are at least 17" by 22". Begin with the Investigation Question and the Knowledge Probe.
- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Locate a sound source (CD player, iPod speakers, etc.) and music.
- Gather balloons so that each student has a balloon. Try to use the more durable 5 inch, 7 inch, or 12 inch helium quality balloons (available at dollar stores and local grocery stores).
- Inflate the balloons with air and store in a large mesh laundry bag or trash bag.
- Use a sound source such as a CD player or iPod speaker with a variety of music.

Balloon Investigation – Teacher Notes

	Investigation Process	Instructional Support
Question	What happens when I place a balloon near a source of sound?	**Always construct the Science Investigation Notebooks together when possible.** Put a sheet of paper with Investigation Question #12 written on it under a document camera. **Model aloud** how to make a Science Investigation Notebook so that students can see and hear the thinking and writing processes. Ask students if they are unfamiliar with any words in the Investigation Question. Underline words students do not know in the Investigation Question. Ask students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	sounds, vibration, balloon • • •	Ask students to think about what they know about the word "source." Next, ask them to think about what they know about making and causing sounds. Encourage students to think about what they learned in previous investigations.
Prediction	I predict the balloon will _____ because _____.	Encourage students to use information from their Knowledge Probe within their Prediction.
Investigation Plan	1. Gather materials: balloons, sound source, music, Data Collection Sheets, pencils. 2. Ask students to stand in a semi-circle, approximately 3 feet apart, around the speaker. 3. Ask students to hold the balloon with both hands (see diagram) while facing the speaker. 4. Play music for 30 seconds. 5. Record class Observations on the class Data Collection Sheet: "What do you hear? What do you feel? What do you see?" 6. Record class Observations about the sound: Loud, quiet, high, low. 7. Repeat steps 2-6 two times.	Note: A mylar balloon also works very well (one for the class). This type of balloon can be placed five feet in front of the speaker and moved away in increments of one foot. Students can take turns touching the balloon. A weight on the end of the ribbon allows students to see the balloon vibrating when the music is playing. In turn, the balloon stops vibrating when the music stops. Optional investigations could include students choosing to vary the distance of the balloon from the speaker, the type of music or the volume.

Balloon Investigation – Teacher Notes (continued)

	Investigation Process	Instructional Support
Observation	Students gather Observations using student Data Collection Sheets.	Encourage students to think about the following questions: *Does the balloon move? How does the balloon move?* *When does the balloon move?* *How can the sound be described?*
Data Analysis	My Data Analysis shows:	Working together, reorganize data on paper or white boards, look for patterns, and write a summary of the patterns.
Explanation	**Claim** *When I place a balloon near a source of sound, the balloon _____.* **Evidence** *My Evidence is _____.*	Have students sit in groups. Conduct a class discussion to develop the Claim (the answer to the Investigation Question). Use part of the Investigation Question to start the answer, *When I place a balloon near a source of sound, the balloon _____.* Next, ask students to look at their Data Analysis to choose data that provides Evidence for their Claim. Encourage students to use their Data Analysis, coupled with notes from Observations recorded on their Data Collection Sheets, to support their Claim. **Students' Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: When I place a balloon near a source of sound, the balloon vibrates. Evidence: When I place a balloon near a source of sound I feel the balloon move. I can feel the balloon go in and out and move faster and slower. When the sound stops, the balloon stops moving.

Balloon Investigation – Teacher Notes (continued)

Evaluation	*I did _____well.* *I could make my investigation better by _____.* *I was surprised by _____.* *Now I wonder: _____?*	Students Evaluate their investigations using 1-3 questions provided by the teacher. Sample questions: What did I do well? How could I make my investigation better? What surprised me? What do I wonder about now?

Balloon Investigation Anchor Chart #1– Science Investigation Notebook

Question	**What happens when I place a balloon near a source of sound?**
Knowledge Probe	sounds, vibration, balloon • • •
Prediction	I predict the balloon will _____ because _____.
Investigation Plan	1. Gather materials: balloons, sound source, music, Data Collection Sheets, pencils. 2. Ask students to stand in a semi-circle, approximately 3 feet apart, around the speaker. 3. Ask students to hold the balloon with both hands (see diagram) while facing the speaker. 4. Play music for 30 seconds. 5. Record class Observations on the class Data Collection Sheet: "What do you hear? What do you feel? What do you see?" 6. Record class Observations about the sound: loud, quiet, low, high. 7. Repeat steps 2-6 two times.

Balloon Investigation Anchor Chart #1– Science Investigation Notebook (continued)

Observation	Balloon	 Do you see anything moving?	Draw/Describe the movement.	 Do you hear anything?	Describe the sound made by the source of sound. (high, low, loud, quiet)	 Do you feel anything moving?	Describe how the movement felt. (fast, slow, back and forth)
	Trial 1						
	Trial 2						
	Trial 3						

Balloon Investigation Anchor Chart #1– Science Investigation Notebook (continued)

Data Analysis	My Data Analysis shows:
Explanation	**Claim** *When I place a balloon near a sound source, the balloon, _____.* **Evidence** *My evidence is _____.*
Evaluation	*I did _____well.* *I could make my investigation better by _____.* *I was surprised by _____.* *Now I wonder: _____?*

Balloon Investigation Data Collection Sheet Student Scientist_____

Question: **What happens when I place a balloon near a source of sound?**

Observation

Balloon	 **Do you see anything moving?**	**Draw/Describe the movement.**	 **Do you hear anything?**	**Describe the sound made by the sound source. (Loud, quiet high, low)**	 **Do you feel anything moving?**	**Describe how the movement felt. (fast, slow, back and forth)**
Trial 1						
Trial 2						
Trial 3						

VAN ANDEL EDUCATION INSTITUTE SCIENCE ACADEMY

#13 Sound Hunt (Part 2) – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #4: **How do sounds affect objects?**

Investigation Question #13**: How can I describe the sounds and vibrations I hear, see, and feel, in the _____?**

Purpose of Lesson:

Investigation Question	Science Component	Writing Component
Investigation #13 ***How can I describe the sounds and vibrations I hear, see, and feel, in the _____?***	Students take a short walk about the school identifying sounds, describing sounds using science concepts and science vocabulary, and noting causes and effects of vibrations and sounds.	Science Investigation Notebook: Students work together to construct the Team Science Notebook. (Some students may keep their own Science Notebook for this investigation.) Student responses should include sound and vibration vocabulary they have learned throughout the investigations in this unit. Terms should include the causes and effects of sound and vibrations, as well as properties of sound: loud/quiet and high/low, moving back and forth, etc. *Together, students answer the* ***Driving Question:*** ***What is happening when I make sounds as I play, dance, and sing?*** Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

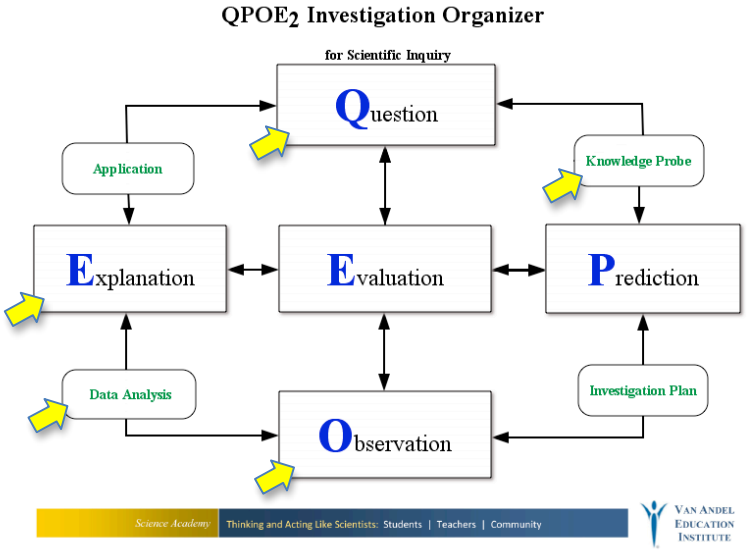
Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #13 Sound Hunt (Part 2)**: Enlarge and display on the wall where students can read it.

  - Anchor Chart #2**- Sound Map of Questions:** Write Driving Question, Class Question #4, and Investigation Question #13 on sentence strips and post in classroom.

#13 Sound Hunt (Part 2) – Teacher Guide (continued)

- Anchor Chart #3- **Scientific Investigation Process**: Display chart, with emphasis on **Question**, **Knowledge Probe**, **Observation, Data Analysis,** and **Explanation**. Use removable paper or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



- Anchor Chart #4 -**Science Word List.** Possible words to have on the Science Word List will come from doing science (e.g., Claim, Evidence), the big ideas/Cross Cutting Concepts (e.g., cause and effect), and science content (e.g., sound, vibration). Have index cards ready to record students' word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.

- Prepare copies of the Science Investigation Notebook for each pair of students.

#13 Sound Hunt (Part 2) – Teacher Guide (continued)

- Use both the Lesson Plan Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Gather pencils and hard surface items for students to write on (e.g., cardboard, clipboard, books).
- Distribute to each student a pencil, a Data Collection Sheet, and a hard surface item for the student to write on (e.g., cardboard, clipboard, book).

Sound Hunt (Part 2) – Teacher Notes

	Investigation Process	Instructional Supports
Question	How can I describe the sounds and vibrations I hear, see, and feel in the _____?	**Construct the Science Investigation Notebooks together when possible.** Put a sheet of paper with Investigation Question #13 written on it under a document camera. **Model aloud** how to make a Science Investigation Notebook so that students can see and hear the thinking and writing processes. Ask students if they are unsure of any words in the Investigation Question. Underline words students do not know in the Investigation Question. Allow students to offer suggestions about the definitions. If no one is able, provide simple definitions. Add any words underlined to the Science Word List.
Knowledge Probe	(sound and vibration)	Ask students to share with a partner what they know about sound or vibration.
Investigation Plan	1. Write the location of our Sound Hunt on the top line of the Data Collection Sheet. 2. Listen for sounds and vibrations in hallways and or playground during the walk. 3. List each sound or vibration and a word or phrase to describe the sound or vibration on the Data Collection Sheet. 4. *Be prepared to share your data with the group.*	Model with an example of a sound occurring in the classroom. For example, set a cell phone ringer to vibrate. Set the phone on a table and prearrange to have someone call or send a text message to the cell phone. Have students describe what happens during the incoming call or text message, including causes and effects. Take students on a sound hunt in an area of the school different from the location used in Investigation #1.
Observation	Students gather and record Observations using Student Data Sheet.	
Data Analysis	My Data Analysis shows _____.	Working together, reorganize data on paper or white boards, look for patterns, and write a summary of the patterns.

Sound Hunt (Part 2) – Teacher Notes (continued)

Explanation	Claim I can describe the sounds and vibrations I see, hear, and feel in _____ (location) by _____. Evidence My evidence is _____.	As a group, talk about Claims and Evidence. Then allow time for students to write. Circulate and invite various students to share ideas. Then allow more writing time. **Students' Explanations will vary based on the data collected by each group of student scientists.** **Possible samples of Explanation might include:** Claim: I can describe the sounds and vibrations I see, hear, and feel in (location) by using the words loud or soft, high or low, and moves back and forth/moves up and down/vibrates. Evidence: My evidence is that I can use words that tell how the sounds and vibrations look, sound, and feel to me, like "the loud crack of the log in the fireplace or campfire" and "moves up and down really fast."

Sound Hunt Anchor Chart #1– Individual Science Investigation Notebook

Question	How can I describe the sounds and vibrations I hear, see, and feel in the _____?
Knowledge Probe	• • •
Investigation Plan	1. Write the location of our Sound Hunt on the top line of the Data Collection Sheet. 2. Listen for sounds and vibrations in hallways and/or playground during the walk. 3. List each sound or vibration and a word or phrase to describe the sound or vibration on the Data Collection Sheet. 4. *Be prepared to share your data with the group.*

Sound Hunt Anchor Chart #1– Science Investigation Notebook (continued)

Observation	Sounds or Vibrations	 Do you see anything moving?	Draw/Describe the movement.	 Do you hear anything?	Describe the sound made. (High, low, loud, soft)	 Do you feel anything moving?	Describe how the movement felt. (fast, slow, back and forth)
	Trial #1						
	Trial #2						
	Trial #3						
Data Analysis	My Data Analysis shows _____.						
Explanation	**Claim** I can describe the sounds and vibrations I see, hear, and feel in _____ (location) by _____. **Evidence** My evidence is _____.						

Sound Hunt (Part 2) Data Collection Sheet Student Scientist_____

Question

How can I describe the sounds and vibrations I hear, see, and feel in the _____?

Observation

Sounds	Vibrations	 Do you see anything moving?	 Do you hear a sound?	 Do you feel anything moving?	Words to Describe the Sounds and Vibrations I Observe

VAN ANDEL EDUCATION INSTITUTE SCIENCE ACADEMY

Application: ***How can I design and build something that makes sound that someone can hear from far away?***

Overview: There are two application lessons: 1) Students design and build something that uses sound to communicate over a distance. 2) Students write an Information Book to teach others about what they learned in this sound unit. The purposes of the application lessons are to:	
Science and Engineering Practices	*Support students as they employ science and engineering practices to create and test sound makers*. Students use the science and engineering practices of making Predictions based on Evidence-based understandings from investigations conducted throughout the unit. Students design and build their own sound-making devices. Students collect their own data by testing their devices. Finally, students construct an Explanation and Evaluate their solution for their devices.
Science Disciplinary Core Ideas/ Crosscutting Concepts	*Provide opportunities for students to build on and apply knowledge about the causes and effects of sounds and vibrations from previously conducted investigations.* Using what they have learned, students design and build devices that create sound that can be heard from a distance. Students can work in groups, pairs, or individually.
Science Vocabulary	*Employ shared vocabulary for talking and writing about vibration and sound*. Key terms developed throughout the unit include **Cause and Effect, sound, vibration,** sound properties (**high/low** and **loud/quiet**) and movement descriptors (**back and forth**, **slowly**, and **quickly**).
Writing Practices	*Provide students an opportunity to independently communicate their learning by writing an Information Book.* Topics could range from teaching others about sound and vibration to what it means to think, act, and write like a scientist. The teacher should modify the writing application activity as needed. (Students typically learn informational writing concepts and standards in Writing Unit 6: Information Books.) Students should use vocabulary for explaining vibrations and describing sounds, and/or vocabulary for thinking, acting, and writing like a scientist (i.e., science practices).
Note: The writing and science standards are integrated in this unit.	

Application Challenge	Science Component	Writing Component
How can I change the sound of a _____ so that someone can hear the sound from far away?	**Design and build something that uses sound to communicate over a distance or that produces sound that someone can hear from far away.** Students use what they know about how to think and act like a scientist, with a focus on sound/vibration. Students can work in teams, pairs, or individually to design and conduct this investigation. Students could use ideas gathered from previous investigations (Sound Makers, Drums, and or Rubber Band Instrument) to create a new solution to this application challenge. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**	**Write an information article that describes how they have learned how to think, act, and communicate, as a scientist.** Students will independently reflect and write a 'how to" book about sound and vibration, or write a book about how they act, think, and write like a scientist. Alternatively, students may create their own sound Investigation Question, then plan and conduct their own investigation in their own Science Investigation Notebook. Students write and discuss Explanations with Claims supported by Evidence. Students reflect on their investigations by writing and discuss Evaluation questions provided by the teacher. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

#14 Sound Application Challenge – Teacher Guide

Driving Question: **What is happening when I make sounds as I play, dance, and sing?**

Class Question #5: **How can I design and build something that *uses sound that someone can hear far away?***

Investigation Application Question #14**: *How can I change the sound of a _____ so that someone can hear the sound from far away?***

Purpose of Lesson:

Application Challenge	Science Component	Writing Component
How can I change the sound of a _____ so that someone can hear the sound from far away?	**Design and build something that uses sound to communicate over a distance or that produces sound that someone can hear from far away.** Students use what they know about how to think and act like a scientist, with a focus on sound/vibration. Students can work in teams, pairs, or individually to design and conduct this investigation. Students could use ideas gathered from previous investigations (Sound Makers, Drums, and or Rubber Band Instrument) to create a new solution to this application challenge. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**	**Write an information article that describes how they have learned how to think, act, and communicate, as a scientist.** Students will independently reflect and write a 'how to" book about sound and vibration, or write a book about how they act, think, and write like a scientist. Alternatively, students may create their own sound Investigation Question, then plan and conduct their own investigation in their own Science Investigation Notebook. Students write and discuss Explanations with Claims supported by Evidence. Students reflect on their investigations by writing and discuss Evaluation questions provided by the teacher. Encourage students to use many of the vocabulary words from **#4 Anchor Chart Science Word List.**

#14 Sound Application Challenge – Teacher Guide (continued)

Background

The K-2 Step Book defines Application as ***"using what I am learning***." Furthermore, the K-2 Step Book identifies the purpose of the application as "using what I am learning in other ways."

The intent of the Application Challenge is for first grade students to use what they know about sound and vibration and how to think and act like a scientist to design, build, and use something that makes sound that can be heard from a distance.

The Class Question that guides this culminating project is*:* ***How can I design and build something that uses sound that someone can hear far away?***

The student Investigation Question is: ***How can I change the sound of a _____ so that someone can hear the sound from far away?***

There are many ways students can use what they have learned to answer this Investigation Question. Many designs of musical instruments could be used as examples. Students can also create their own musical instrument that creates a loud sound. The students decide how to define "far away." It could mean 3 feet, 30 feet, or perhaps 3000 feet. Be sure this definition of "far away" is doable in your setting.

There are many materials students can use. Refer back to the Sound Maker Investigation to introduce the Application Project to students. During the Sound Maker Investigation, students chose a variety of objects to use to make sounds. The purpose of the investigation was to describe the sounds they made using two or three objects (e.g., a stick and a balloon). Now, students need to use objects to make a sound that will help them communicate over the distance they select.

Perhaps students want to go back to the Drum Investigations and use a different size container or a container made of wood, metal, or cardboard. Maybe they want to explore changing the striking tool for the drum to create a louder sound. Maybe they want to design and make an instrument or device that makes loud sounds and/or vibrations. Examples of student Investigation Questions could be: ***How can I change the sound I make when using a drum so that someone can hear the sound from far away?*** or ***How can I change the sound I make striking a drum with a ____ so that someone can hear the sound from far away?***

#14 Sound Application Challenge – Teacher Guide (continued)

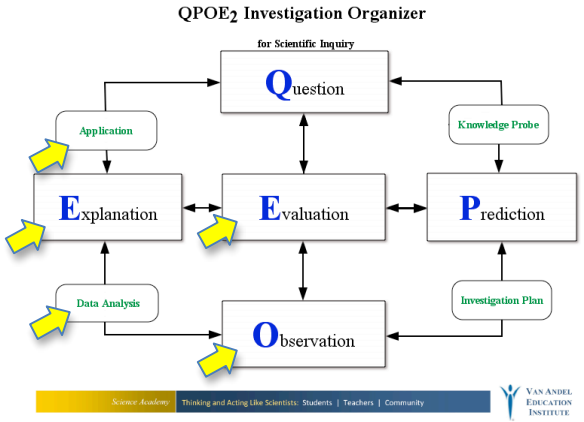
The Rubber Band Instrument Investigation could be used to create something that uses sound to communicate over distances. Again, think about the changes that could be made to the box or container used, and the number, width, or length of rubber bands. A sample Investigation Question could be: ***How can I change the sound I make when using a rubber band instrument so that someone can hear the sound from far away?***

Students can work in teams, pairs, or individually to design and conduct this Application Challenge. Students could conduct this investigation as a whole class, depending on how the teacher wants to accomplish this part of the unit.

The completed Science Investigation Notebooks are models for Application Challenge Investigations (e.g., Investigation Plans, Data Collection Sheets, Explanations). The Anchor Chart #4 Science Word List will assist students with science word choices and spelling.

Teacher Preparation:

- Create Anchor charts:
  - Anchor Chart #1- **Class Science Investigation Notebook for #14 Application Challenge:** Enlarge and display on the wall where students can read it.
  - Anchor Chart #2- **Sound Map of Questions:** Display Driving Question, Application Question, and Application Challenge on sentence strips and post in the classroom.
  - Anchor Chart #3- **Scientific Investigation Process**: Display chart emphasis on **Observation**, **Data Analysis**, **Explanation**, **Evaluation,** and **Application**. Use removable papers or arrows to indicate what parts of the Scientific Investigation Process are emphasized in the lesson.



#14 Sound Application Challenge – Teacher Guide (continued)

- Anchor Chart #4- **Science Word List.** Possible words to have on the Sound Word List will come from The Three Dimensions of the Framework of doing science (e.g., Explanation, Evaluation) and science content (e.g., sound, vibration, loud, quiet, high, low). Have index cards ready to use for students' science word suggestions or write words directly on the Science Word List.

- Prepare copies of the student Data Collection Sheet to gather and record Observations.
- Prepare copies of the Science Investigation Notebook for students.
- Use both the Lesson Packet and Teacher Guide for each lesson.
- Use the Lesson Plan Packet to guide instruction on scientific inquiry and the Teacher Guide to assist with teaching the investigation.
- Prepare copies of previous student Data Collection Sheets for student use or modification.
- Gather supplies and materials based upon student needs.
- Find video clips that show students talking with paper cups and string.
- Find video clips that show students making patterns of sounds.

Sound Application – Teacher Notes

	Investigation Process	Instructional Support
Question	How can I change the sound of a _____ so someone can hear the sound from far away**?**	**Construct the Science Investigation Notebooks together with students who need the support.** Ask students if they are unsure of any words in the Investigation Question. Talk about patterns in sounds. Then show video clips of students making patterns with sounds.
Knowledge Probe	(sound, vibration)	Ask students to share with a partner what they know about the Investigation Question.
Prediction	I think if I change _____ someone will hear the sound because _____.	Encourage students to use information from their Knowledge Probe within their Prediction.
Investigation Plan		Student can use Investigation Plans from previous lessons or use those Investigation Plans as models to write their own plans. The teacher needs to review the plan before students begin the investigation. The teacher also needs to review the Data Collection Sheet for the investigation.
Observation	Students gather Observations using a Data Collection Sheet.	Provide copies of student Data Collection Sheets used in previous investigations or assist students in designing their own Data Collection Sheets.
Data Analysis	My data shows _____.	Ask student groups to reorganize data on paper or whiteboards, look for patterns, and write a summary of the patterns together. Assist student groups as needed.

Sound Application – Teacher Notes (continued)

Explanation	**Claim** *I can change the sound of a _____ by changing _____. After I make this change, someone can hear the sound from far away.* **Evidence** *My evidence is _____.*	**Students Explanations will vary based on the investigations conducted and the data collected by student scientists.**
Evaluation	*I did _____well.* *I could make my investigation better by _____.* *I was surprised by_____.* *Now I wonder: _____?*	Students evaluate their investigations using 1-3 questions provided by the teacher. Sample questions: What did I do well? How could I make my investigation better? What surprised me? What do I wonder now? What do I wonder about now? Explain and elaborate as needed.

Sound Application Anchor Chart #1–Science Investigation Notebook

Question	*How can I change the sound* of a _____ so that someone can hear the sound from far away***?***
Knowledge Probe	• • •
Prediction	*I think if I change* _____ *someone will hear the sound because* _____.
Investigation Plan	1.
Observation	
Data Analysis	My Data Analysis shows _____.

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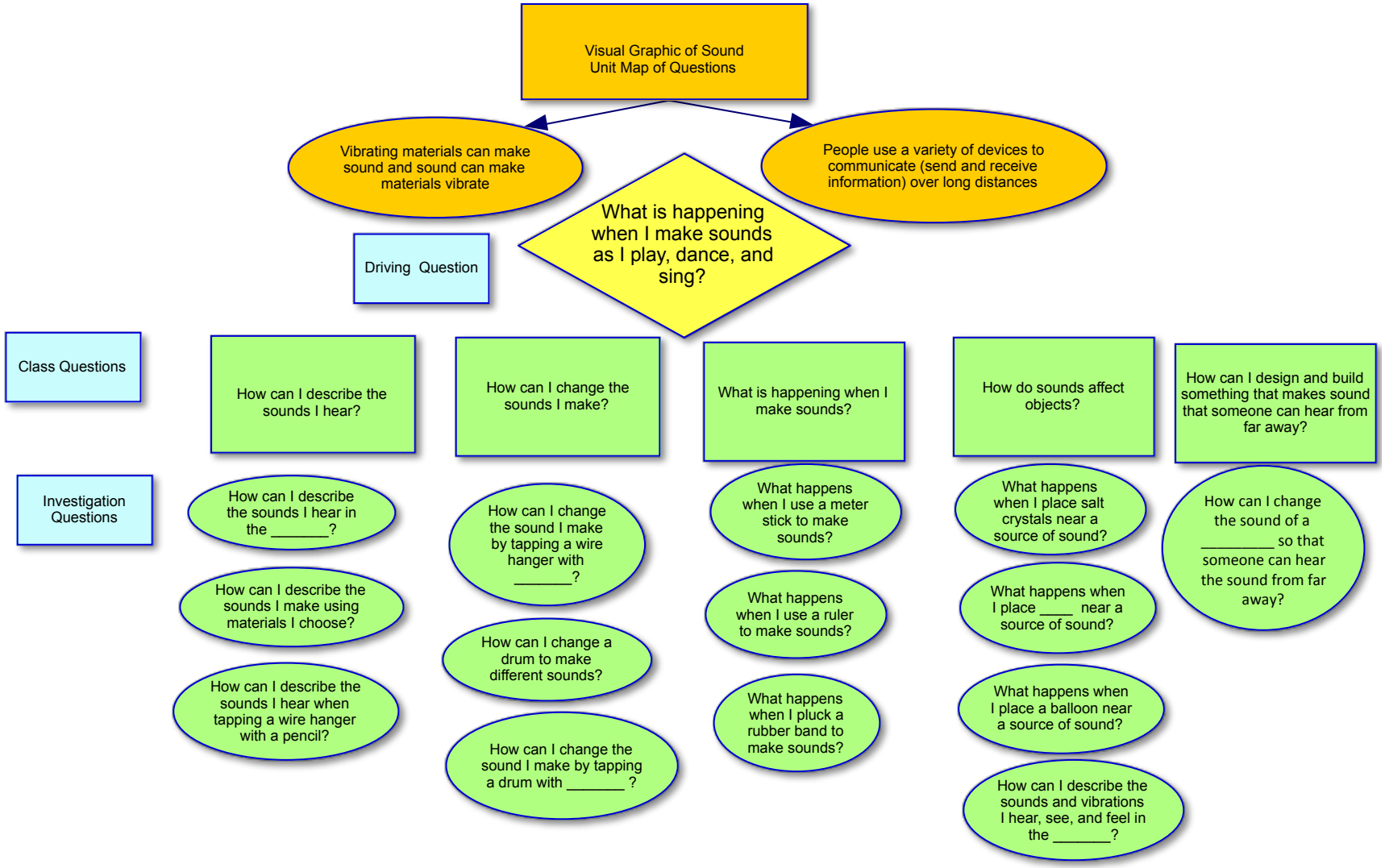
Sound Application Anchor Chart #1- Science Investigation Notebook (continued)

Explanation	**Claim** *I can change the sound of a _____* *by changing _____ .* *After I make this change, someone can hear the sound from far away.* **Evidence** *My evidence is _____.*
Evaluation	*I did _____well.* *I could make my investigation better by _____.* *I was surprised by_____.* *Now I wonder: _____?*

Sound Application


Visual Graphic of Sound
Unit Map of Questions
Vibrating materials can make sound and sound can make materials vibrate
People use a variety of devices to communicate (send and receive information) over long distances
What is happening when I make sounds as I play, dance, and sing?
Driving Question
Class Questions
How can I describe the sounds I hear?
How can I change the sounds I make?
What is happening when I make sounds?
How do sounds affect objects?
How can I design and build something that makes sound that someone can hear from far away?
Investigation Questions
How can I describe the sounds I hear in the _____?
How can I describe the sounds I make using materials I choose?
How can I describe the sounds I hear when tapping a wire hanger with a pencil?
How can I change the sound I make by tapping a wire hanger with _____?
How can I change a drum to make different sounds?
How can I change the sound I make by tapping a drum with _____ ?
What happens when I use a meter stick to make sounds?
What happens when I use a ruler to make sounds?
What happens when I pluck a rubber band to make sounds?
What happens when I place salt crystals near a source of sound?
What happens when I place ____ near a source of sound?
What happens when I place a balloon near a source of sound?
How can I describe the sounds and vibrations I hear, see, and feel in the _____?
How can I change the sound of a _____ so that someone can hear the sound from far away?

Sound Map of Questions:
Driving Question, Class Questions and Investigation Questions

Driving Question: What is happening when I make sounds as I play, dance, and sing?

Class Question #1: How can I describe the sounds I hear?

❒	Investigation #1 Investigation Question:	Sound Hunt (Part 1) How can I describe the sounds I hear in the _____?
❒	Investigation #2 Investigation Question:	Sound Makers How can I describe the sounds I make using materials I choose?
❒	Investigation #3 Investigation Question:	Hanger with Strings (Part 1) How can I describe the sounds I hear when tapping a wire hanger with a pencil?

Class Question #2: How can I change the sounds I make?

❒	Investigation #4 Investigation Question:	Hanger with Strings (Part 2) How can I change the sound I make by tapping a wire hanger with _____?
❒	Investigation #5 Investigation Question:	Drums (Part 1) How can I change a drum to make different sounds?
❒	Investigation #6 Investigation Question: **Optional Investigation**	Drums (Part 2) How can I change the sound I make by tapping a drum with _____?

Class Question #3: What is happening when I make sounds?

❒	Investigation #7 Investigation Question:	Meter Stick Investigation What happens when I use a meter stick to make sounds?
❒	Investigation #8 Investigation Question:	Ruler Investigation What happens when I use a ruler to make sounds?
❒	Investigation #9 Investigation Question:	Rubber Band Instrument What happens when I pluck a rubber band to make sounds?

Class Question #4: How do sounds affect objects?

❒	Investigation #10 Investigation Question:	Salt Crystals (Part 1) What happens when I place salt crystals near a source of sound?
❒	Investigation #11 Investigation Question: **Optional Investigation**	Salt Crystals (Part 2) What happens when I place _____ near a source of sound?
❒	Investigation #12 Investigation Question:	Balloon What happens when I place a balloon near a source of sound?
❒	Investigation #13	Sound Hunt (Part 2) Investigation Question: How can I describe the sounds and vibrations I hear, see, and feel in the _____?

Application: ***How can I design and build something that makes sound that someone can hear from far away?***
Application Challenge: Create an object that can make sound that someone can hear from far away.

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