

Preparation Guide

Level 1 Module 3

Sound with Spotlight Lessons on Earth

Materials: This section lists the quantity of each material necessary for the lesson. Lesson materials may be from a *PhD Science® TEKS Edition* materials kit or they may be school supplied. In addition to the listed materials, teachers should have access to the following common classroom items: sticky notes, chart paper, pencils, a whiteboard, and markers. This section also lists items in the current lesson that are reused in future lessons. Note that items found in a typical elementary classroom (e.g., glue, tape, scissors) are not listed for reuse.

Resources: This section lists module resources (from Appendix A in the Teacher Edition) and core texts used in the lesson. Classrooms also need daily access to the module’s Teacher Edition, Science Logbooks, and, if applicable, PhD Projected. A symbol (🖥️) identifies resources that appear in PhD Projected.

Preparation: This section identifies preparation teachers should complete before the lesson, including media teachers must cue before the lesson and activities that require setup. This section also describes advance preparation for upcoming lessons. For example, if teachers need to prepare 1 day in advance for an activity in Lesson 11, an advance preparation note appears in the Preparation section for Lesson 10. A symbol (📅) identifies lessons with advance preparation notes.

Advance Materials Preparation

An activity in this module requires advance preparation. A version of this list appears in the Module Overview of the Teacher Edition. The expanded version in this guide identifies all lessons for which preparation may take longer than a planning period. A symbol (†) identifies preparation that can be done earlier than the suggested time.




Lesson	Time in Advance	Investigation	Description
12	2 days†	Sound Outside a Door Investigation	Arrange for an adult to help monitor the class during Lesson 12.

Spotlight Lessons on Earth Materials

Lesson	Time in Advance	Investigation	Description
2	2-3 days before†	Observe Soil Samples	Spread 5 cups of topsoil in a plastic bin to dry.
5	1 day before	Make Paint	Obtain 12 small rocks of a size that students can firmly hold.




Lesson Preparation

Lesson 1

Materials	Kit Items <input type="checkbox"/> Knowledge Deck™ poster, Recycled Orchestra (1)	School Supplied Items <input type="checkbox"/> Common objects (e.g., can, plastic container, sheet of paper, plastic utensil) (1 set) <input type="checkbox"/> World map (1, optional)
	Item Reuse <input type="checkbox"/> Lesson 2 requires the prepared class musical instruments chart.	
Resources	<input type="checkbox"/> Lesson 1 Resource A: Strategies for Supporting Students Who Are Deaf or Hard of Hearing <input type="checkbox"/> Lesson 1 Resource B: Sound Cards <input type="checkbox"/> Lesson 1 Resource C: Sound Card Sorting Charts <input type="checkbox"/> Lesson 1 Resource D: Cateura Photographs 	
Preparation	<input type="checkbox"/> Cue “Friends for Life” audio, “Fiesta en Sevilla” audio, and “Pakkala-Kriti” audio: http://phdsci.link/1647 , http://phdsci.link/1661 , and http://phdsci.link/1662 .  <input type="checkbox"/> Prepare sound cards. (See Lesson 1 Resource B.) <input type="checkbox"/> Prepare to distribute a copy of Lesson 1 Resource C to each group. Each group needs a copy of both charts in the resource. <input type="checkbox"/> Cue pencil audio, guitar audio, broom audio, violin audio, fork audio, saxophone audio, metal cans audio, drums audio, and cello audio: http://phdsci.link/1654 , http://phdsci.link/1653 , http://phdsci.link/1648 , http://phdsci.link/1656 , http://phdsci.link/1652 , http://phdsci.link/1655 , http://phdsci.link/1649 , http://phdsci.link/1651 , and http://phdsci.link/1650 . 	



Lesson 2

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Knowledge Deck cards, Recycled Orchestra (24) <input type="checkbox"/> Sticky note arrows (180) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Magnifiers, handheld, plastic (12) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Tape (partial roll)
	<p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Class musical instruments chart from Lesson 1 (1) 	
	<p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 3 requires the prepared class musical instruments chart. <input type="checkbox"/> Lesson 5 requires 6 of the handheld magnifiers. <input type="checkbox"/> Lesson 9 requires the prepared recycled drum card. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 2 Resource A: Recycled Instrument Cards <input type="checkbox"/> Lesson 2 Resource B: Ordinary Instrument Cards <input type="checkbox"/> Lesson 2 Resource C: Recycled Trumpet Photograph  <input type="checkbox"/> Lesson 2 Resource D: Ordinary Trumpet Photograph  	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare recycled instrument cards. (See Lesson 2 Resource A.) <input type="checkbox"/> Prepare ordinary instrument cards. (See Lesson 2 Resource B.) <input type="checkbox"/> Cue <i>Eine kleine Nachtmusik</i> audio and Recycled Orchestra video (Allgood, Penaranda-Loftus, and Townsley 2015a): http://phdsci.link/1663 and http://phdsci.link/1742.  	

Lesson 3

Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Glue sticks (24)
	Module 2 Kit <input type="checkbox"/> Acetate sheet, transparent, 8.5" × 11" (1, optional)	
	Prepared Items from Previous Lessons <input type="checkbox"/> Class musical instruments chart from Lesson 2 (1)	
	Item Reuse <input type="checkbox"/> Lesson 4 requires the prepared class musical instruments chart. <input type="checkbox"/> Lesson 9 requires the prepared x-ray film card.	
Resources	<input type="checkbox"/> Lesson 3 Resource A: X-ray Film Card <input type="checkbox"/> Lesson 3 Resource B: Initial Model Photographs	
Preparation	<input type="checkbox"/> Prepare x-ray film card. (See Lesson 3 Resource A.) <input type="checkbox"/> Prepare initial model photographs. (See Lesson 3 Resource B.)	


Lesson 4

Materials	Kit Items <input type="checkbox"/> Classroom instruments <ul style="list-style-type: none"> ○ Drum with drumsticks (1) ○ Guiro with scraper (1) ○ Kalimba (1) ○ Lap harp with pick (1) ○ Triangle with wand (1) ○ Ukulele (1) 	School Supplied Items <input type="checkbox"/> Tape (partial roll)
	Prepared Items from Previous Lessons <input type="checkbox"/> Class musical instruments chart from Lesson 2 (1)	
	Item Reuse <input type="checkbox"/> Lesson 5 requires the classroom instruments and prepared classroom instrument illustrations. <input type="checkbox"/> Lesson 21 requires the class musical instruments chart and instrument instructions chart.	
Resources	<input type="checkbox"/> Lesson 4 Resource A: Classroom Instrument Photographs <input type="checkbox"/> Lesson 4 Resource B: Classroom Instrument Illustrations	
Preparation	<input type="checkbox"/> If the class is not using the Module 3 materials kit, test each classroom instrument to ensure that students will see or feel evidence of vibration. <input type="checkbox"/> Prepare classroom instrument photographs. (See Lesson 4 Resource A.) <input type="checkbox"/> Prepare classroom instrument illustrations. (See Lesson 4 Resource B.)	

Lesson 5

Materials	Kit Items <input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) Module 1 Kit <input type="checkbox"/> Magnifiers, handheld, plastic (6)	School Supplied Items <input type="checkbox"/> Cups, plastic (12) <input type="checkbox"/> Glue sticks (12)
	Prepared Items from Previous Lessons <input type="checkbox"/> Classroom instrument illustrations from Lesson 4 (1 set)	
	Item Reuse <input type="checkbox"/> Lesson 6 requires the plastic cups, classroom instruments, handheld magnifiers, and prepared class claims chart.	
Resources	<input type="checkbox"/> Lesson 5 Resource A: Instrument Stations Setup Instructions <input type="checkbox"/> Lesson 5 Resource B: Visible Evidence of Vibration Symbols	
Preparation	<input type="checkbox"/> Set up instrument stations. (See Lesson 5 Resource A.)	


Lesson 6

Materials	Kit Items <input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) Module 1 Kit <input type="checkbox"/> Magnifiers, handheld, plastic (6)	School Supplied Items <input type="checkbox"/> Cups, plastic (12) <input type="checkbox"/> Glue sticks (12) <input type="checkbox"/> Salt, table ($\frac{1}{2}$ tsp) <input type="checkbox"/> Tape (partial roll)
	Prepared Items from Previous Lessons <input type="checkbox"/> Class claims chart from Lesson 5 (1)	
	Item Reuse <input type="checkbox"/> Lesson 7 requires the classroom instruments and the prepared class causes of sound chart. <input type="checkbox"/> Lesson 9 requires 6 of the cups. Save remaining 6 cups for Lesson 14.	
Resources	<input type="checkbox"/> Lesson 5 Resource A: Instrument Stations Setup Instructions <input type="checkbox"/> Lesson 6 Resource A: Tactile Evidence of Vibration Symbols <input type="checkbox"/> Lesson 6 Resource B: Causes of Sound Instrument Illustrations	
Preparation	<input type="checkbox"/> Set up instrument stations. (See Lesson 5 Resource A.) <input type="checkbox"/> Cue slow-motion drum video: http://phdsci.link/1684 .  <input type="checkbox"/> Prepare causes of sound instrument illustrations. (See Lesson 6 Resource B.)	


Lesson 7

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sentence strips (2) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bins or baskets (6) <input type="checkbox"/> Clipboards with metal clips (12) <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Manila folders (12) <input type="checkbox"/> Pocket chart (1) <input type="checkbox"/> Rubber bands (12) <input type="checkbox"/> Rulers, plastic (25, optional) <input type="checkbox"/> Table salt (3 tsp) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Straws (25) <input type="checkbox"/> Tape (partial roll, optional)
	<p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Class causes of sound chart from Lesson 6 (1) 	
	<p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 8 requires the classroom instruments and prepared class causes of sound chart. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 7 Resource A: Straw Demonstration and Activity Setup Instructions <input type="checkbox"/> Lesson 7 Resource B: Causes of Sound Object Illustrations 	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare plastic drinking straws for straw demonstration and activity. (See Lesson 7 Resource A.) <input type="checkbox"/> Prepare causes of sound object illustrations. (See Lesson 7 Resource B.) <input type="checkbox"/> Prepare the materials for the common object activity by placing the rubber bands, manila folders, and clipboards for each group in a bin or basket. 	






Lesson 8

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Chenille stems (4) <input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) <input type="checkbox"/> Containers, plastic, 4" × 4" × 2" (6) <input type="checkbox"/> Ribbon, $\frac{1}{4}$" wide (40") Module 2 Kit <ul style="list-style-type: none"> <input type="checkbox"/> Craft sticks, wax (8) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Common objects from Lesson 7 (i.e., clipboard with metal clip, manila folder, and rubber band) (1 of each) <input type="checkbox"/> Rubber bands (8) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape (partial roll)
	Prepared Items from Previous Lessons <ul style="list-style-type: none"> <input type="checkbox"/> Class causes of sound chart from Lesson 6 (1) 	
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 9 requires the classroom instruments, 1 of the plastic containers, and the prepared class ukulele parts diagram. Save remaining plastic containers for Lesson 14. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 8 Resource A: Recycled Violin, Guitar, and Saxophone Photographs  <input type="checkbox"/> Lesson 8 Resource B: Recycled Ukulele Setup Instructions 	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare recycled ukuleles. (See Lesson 8 Resource B.) 	




Lesson 9

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Beads, plastic (90) <input type="checkbox"/> Beads, wooden (90) <input type="checkbox"/> Jewelry boxes with lids, cardboard (6) <input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) <input type="checkbox"/> Container, plastic, 4" × 4" × 2" (1) <input type="checkbox"/> Pom-poms (30) <input type="checkbox"/> Shakers, clear plastic (2) <p>Module 2 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Acetate sheets, transparent, 8.5" x 11" (3) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum foil (partial roll) <input type="checkbox"/> Bags, resealable plastic (6) <input type="checkbox"/> Beans, dried (12 tbsp) <input type="checkbox"/> Bottles with caps, plastic (6) <input type="checkbox"/> Cotton balls (30) <input type="checkbox"/> Cups, plastic (6) <input type="checkbox"/> Felt or cloth (1 sheet) <input type="checkbox"/> Metal soup cans (6) <input type="checkbox"/> Rice, uncooked (12 tbsp) <input type="checkbox"/> Rubber bands (4) <input type="checkbox"/> Sticky notes (12) <input type="checkbox"/> Tape, clear (partial roll)
	<p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Class ukulele parts diagram from Lesson 8 (1) <input type="checkbox"/> Recycled drum card from Lesson 2 (1) <input type="checkbox"/> X-ray film card from Lesson 3 (1) 	
	<p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 11 requires the classroom drum, triangle, and ukulele. Save all other classroom instruments for Lesson 18. <input type="checkbox"/> The Engineering Challenge (Lessons 21–25) requires 64 of the wooden beads, 1 of the plastic shakers, the plastic bottles, the cardboard jewelry boxes, the soup cans, and the pom-poms. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 9 Resource: Workshop Photograph  	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Disassemble a recycled ukulele with rubber band strings by removing the rubber bands from the plastic container. <input type="checkbox"/> Prepare aluminum foil squares for recycled shaker materials by cutting out one 5" square for each group. <input type="checkbox"/> Prepare stack of acetate sheets. Stack three acetate sheets, and fix them in place with clear tape so the stack is similar in thickness to a sheet of x-ray film. 	


Lesson 10

Materials	Kit Items <input type="checkbox"/> Music boxes in cardboard boxes (3)	School Supplied Items None
Resources	<input type="checkbox"/> Lesson 10 Resource A: Music Box Photograph  <input type="checkbox"/> Lesson 10 Resource B: Wooden Music Box Photograph  <input type="checkbox"/> Lesson 10 Resource C: Conceptual Checkpoint 	
Preparation 	<input type="checkbox"/> Cue music box video and slow-motion music box video: http://phdsci.link/1701 and http://phdsci.link/1702 .  <input type="checkbox"/> Prepare to distribute a copy of Lesson 10 Resource C to each student.	
	Advance Preparation for Lesson 12 2 Days Before: Arrange for an adult to help monitor the class during Lesson 12.	



Lesson 11

Materials	Kit Items <input type="checkbox"/> Classroom instruments from Lesson 4 <ul style="list-style-type: none"> ○ Drum with drumsticks (1) ○ Triangle with wand (1) ○ Ukulele (1) 	School Supplied Items <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (1)
	Item Reuse <input type="checkbox"/> Lesson 12 requires the classroom drum, triangle, and ukulele.	
Resources	<input type="checkbox"/> Lesson 11 Resource A: Recycled Orchestra Concert Photographs  <input type="checkbox"/> Lesson 11 Resource B: Concert Hall Photograph  <input type="checkbox"/> Lesson 11 Resource C: Class Concert Hall Model Setup Instructions	
Preparation	<input type="checkbox"/> With assistance from volunteers, test the classroom to confirm that it is suitable for a model orchestra. While volunteers play the classroom instruments, move outside of the classroom to a position approximately 12 inches from the open classroom door. Open and close the door, listening to ensure that the instruments are noticeably quieter but still audible when the door is closed. If necessary, adjust the location of the model orchestra or find an alternative location to achieve this result. <input type="checkbox"/> Prepare class concert hall model. (See Lesson 11 Resource C.) <input type="checkbox"/> Cue Recycled Orchestra video from Lesson 2 (Allgood, Penaranda-Loftus, and Townsley 2015a): http://phdsci.link/1742 . 	


Lesson 12

Materials	Kit Items <input type="checkbox"/> Classroom instruments from Lesson 4 <ul style="list-style-type: none"> ○ Drum with drumsticks (1) ○ Triangle with wand (1) ○ Ukulele (1) 	School Supplied Items <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape, masking (12 ft)
	Module 1 Kit <input type="checkbox"/> Sentence strips (2)	
	Item Reuse <input type="checkbox"/> Lesson 13 requires the classroom drum, triangle, and ukulele.	
Resources	<input type="checkbox"/> Lesson 12 Resource: Concert Hall Entrance Photograph 	
Preparation	<input type="checkbox"/> Prepare a tape line to indicate where students should stand as they listen to the model orchestra. Place a 12-foot piece of tape on the floor outside the classroom. The tape should be parallel to and about 12 inches away from the classroom door.	


Lesson 13

Materials	Kit Items <input type="checkbox"/> Classroom instruments from Lesson 4 <ul style="list-style-type: none"> ○ Drum with drumsticks (1) ○ Triangle with wand (1) ○ Ukulele (1) 	School Supplied Items <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (1)
	Module 1 Kit <input type="checkbox"/> Sentence strip (1)	
	Item Reuse <input type="checkbox"/> Lesson 18 requires the classroom drum, triangle, and ukulele.	
Resources	<input type="checkbox"/> Lesson 11 Resource B: Concert Hall Photograph  <input type="checkbox"/> Lesson 13 Resource A: Outdoor Concert Photograph  <input type="checkbox"/> Lesson 13 Resource B: Class Outdoor Concert Model Setup Instructions	
Preparation	<input type="checkbox"/> With assistance from volunteers, test an available outdoor space to confirm that it is large enough for the outdoor sound investigation. While volunteers play the classroom instruments on one end of the outdoor space, walk in the opposite direction until the sound becomes much quieter. Note both the location of the model orchestra and the endpoint. If a quiet outdoor space is not available, use a large, open indoor space such as a cafeteria, gymnasium, or long hallway. <input type="checkbox"/> Prepare class outdoor concert model. (See Lesson 13 Resource B.)	


Lesson 14

Materials	Kit Items <input type="checkbox"/> Containers, plastic, 4" × 4" × 2" (6) <input type="checkbox"/> Knowledge Deck cards, Eardrum (24) <input type="checkbox"/> Knowledge Deck poster, Eardrum (1) <input type="checkbox"/> Pie tins, aluminum (6)	School Supplied Items <input type="checkbox"/> Cups, plastic (6) <input type="checkbox"/> Plastic wrap (partial roll) <input type="checkbox"/> Rubber bands (6) <input type="checkbox"/> Salt, table (7 tsp) <input type="checkbox"/> Scissors (1)
	Module 1 Kit <input type="checkbox"/> Sentence strip (1)	
	Item Reuse <input type="checkbox"/> Lesson 15 requires the pie tins.	
Resources	<input type="checkbox"/> Lesson 14 Resource A: Listening to Music Photographs  <input type="checkbox"/> Lesson 14 Resource B: Eardrum Model Setup Instructions	
Preparation	<input type="checkbox"/> Prepare eardrum models. (See Lesson 14 Resource B.) <input type="checkbox"/> Prepare cups with salt by adding about 1 tsp of table salt to each group's small cup.	





Lesson 15

Materials	Kit Items <input type="checkbox"/> Balloon pump, handheld (1) <input type="checkbox"/> Pie tins, aluminum (12)	School Supplied Items <input type="checkbox"/> Balloons (12) <input type="checkbox"/> Tape (partial roll)
	Module 1 Kit <input type="checkbox"/> Sentence strip (1)	
	Item Reuse <input type="checkbox"/> Lesson 16 requires the balloon pump and pie tins.	
Resources	<input type="checkbox"/> Lesson 15 Resource: Balloon Illustrations <input type="checkbox"/> <i>Moses Goes to a Concert</i> (Millman 1998)	
Preparation	<input type="checkbox"/> Cue Recycled Orchestra video from Lesson 2 (Allgood, Penaranda-Loftus, and Townsley 2015a): http://phdsci.link/1742 .  <input type="checkbox"/> Identify four corners or areas of the classroom to use for a Question Corners routine. Prepare a copy of each balloon illustration in Lesson 15 Resource. Before the lesson, post one balloon illustration in each corner. <input type="checkbox"/> Use a balloon pump to inflate one balloon for each student pair. If it is not possible to reuse balloons from Lesson 15, inflate new balloons before Lesson 16.	




Lesson 16

Materials	Kit Items	School Supplied Items
	<input type="checkbox"/> Balloon pump, handheld (1) <input type="checkbox"/> Pie tins, aluminum (12)	<input type="checkbox"/> Balloons (12) <input type="checkbox"/> Glue stick (1)
	Item Reuse	
	<input type="checkbox"/> The Engineering Challenge (Lessons 21–25) requires the pie tins.	
Resources	<input type="checkbox"/> Lesson 16 Resource: Vibrating Balloon Illustration  <input type="checkbox"/> <i>Moses Goes to a Concert</i> (Millman 1998)	
Preparation	<input type="checkbox"/> If it is not possible to reuse balloons from Lesson 15, use a balloon pump to inflate new balloons before Lesson 16. <input type="checkbox"/> Prepare vibrating balloon illustration. (See Lesson 16 Resource.)	

Lesson 17

Materials	Kit Items	School Supplied Items
	None	None
Resources	<input type="checkbox"/> Lesson 17 Resource A: London Neighborhood Photograph  <input type="checkbox"/> Lesson 17 Resource B: Neighborhood Model  <input type="checkbox"/> Lesson 17 Resource C: Conceptual Checkpoint 	
Preparation	<input type="checkbox"/> Cue London neighborhood video: http://phdsci.link/1703 .  <input type="checkbox"/> Prepare to distribute a copy of Lesson 17 Resource C to each student.	





Lesson 18

Materials	Kit Items	School Supplied Items
	<input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) <input type="checkbox"/> Knowledge Deck cards, Talking Drum (24) <input type="checkbox"/> Knowledge Deck poster, Talking Drum (1) <input type="checkbox"/> Sticky note arrows (48)	<input type="checkbox"/> World map (1, optional)
	Item Reuse	
	<input type="checkbox"/> Lesson 19 requires the classroom instruments and Talking Drum Knowledge Deck poster.	
Resources	<input type="checkbox"/> Lesson 18 Resource: Talking Drum Photographs 	
Preparation	<input type="checkbox"/> Cue “Charleston” (Johnson 1923) audio and doorbell audio: http://phdsci.link/1712 and http://phdsci.link/1713 .  <input type="checkbox"/> Cue talking drum video: http://phdsci.link/1714 . 	






Lesson 19

Materials	Kit Items	School Supplied Items
	<input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) <input type="checkbox"/> Knowledge Deck poster, Talking Drum (1)	<input type="checkbox"/> Tape, masking (partial roll)
	Item Reuse	
	<input type="checkbox"/> Lesson 21 requires the classroom instruments and Talking Drum Knowledge Deck poster.	
Resources	<input type="checkbox"/> Lesson 19 Resource A: Message Stations Setup Instructions and Classroom Procedure <input type="checkbox"/> Lesson 19 Resource B: Instrument Message Sheets	
Preparation	<input type="checkbox"/> Set up message stations. (See Lesson 19 Resource A.)	


Lesson 20

Materials	Kit Items	School Supplied Items
	None	<input type="checkbox"/> Computers or tablets with internet access (6)
Resources	<input type="checkbox"/> Lesson 20 Resource A: Sound Device Photographs  <input type="checkbox"/> Lesson 20 Resource B: Communication Device Photographs <input type="checkbox"/> Lesson 20 Resource C: Communication Scenario Photographs  <input type="checkbox"/> <i>Moses Goes to a Concert</i> (Millman 1998)	
Preparation	<input type="checkbox"/> Set up the communication device stations. Prepare a copy of each photograph in Lesson 20 Resource B, and place each photograph at a station. Cue the marshaling wands video, smoke alarm video, traffic signals video, ambulance video, crosswalk signals video, and flags video at the corresponding stations: http://phdsci.link/1718 , http://phdsci.link/1706 , http://phdsci.link/1707 , http://phdsci.link/1708 , http://phdsci.link/1719 , and http://phdsci.link/1709 .  <input type="checkbox"/> Cue marshaling wands video: http://phdsci.link/1718 . 	


Lesson 21

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Beads, wooden (3) <input type="checkbox"/> Jewelry box with lid, cardboard (1) <input type="checkbox"/> Chenille stem (1) <input type="checkbox"/> Classroom instruments from Lesson 4 (1 of each) <input type="checkbox"/> Knowledge Deck poster, Talking Drum (1) <input type="checkbox"/> Pie tin, aluminum (1) <input type="checkbox"/> Pom-poms (3) <input type="checkbox"/> Shaker, clear plastic (1) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum foil (partial roll) <input type="checkbox"/> Bottle with cap, plastic (1) <input type="checkbox"/> Craft stick, jumbo (1) <input type="checkbox"/> Magnet (1, optional) <input type="checkbox"/> Metal soup can (1) <input type="checkbox"/> Paper clips, large (3) <input type="checkbox"/> Plastic wrap (partial roll) <input type="checkbox"/> Rubber bands (3)
	Prepared Items from Previous Lessons <ul style="list-style-type: none"> <input type="checkbox"/> Class musical instruments chart from Lesson 4 (1) <input type="checkbox"/> Class instrument instructions chart from Lesson 4 (1) 	
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 22 requires the prepared sample Engineering Challenge materials, prepared class problem and solution chart, and prepared class list of ways to make sound. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 9 Resource: Workshop Photograph  <input type="checkbox"/> Lesson 20 Resource A: Sound Device Photographs  <input type="checkbox"/> Lesson 21 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 21 Resource B: Engineering Design Process Visual  <input type="checkbox"/> Lesson 21 Resource C: Accessibility Guidelines <input type="checkbox"/> Lesson 21 Resource D: Megaphone Photograph  	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Cue recess video: http://phdsci.link/1739.  	


Lesson 22

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Beads, wooden (64) <input type="checkbox"/> Chenille stems (24) <input type="checkbox"/> Jewelry boxes with lids, cardboard (2) <input type="checkbox"/> Pie tins, aluminum (2) <input type="checkbox"/> Pom-poms (64) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum foil (partial roll) <input type="checkbox"/> Bottles with caps, plastic (2) <input type="checkbox"/> Craft sticks, jumbo (24) <input type="checkbox"/> Magnet (1, optional) <input type="checkbox"/> Metal soup cans (2) <input type="checkbox"/> Paper clips, large (64) <input type="checkbox"/> Plastic wrap (partial roll) <input type="checkbox"/> Rubber bands (64) <input type="checkbox"/> Scissors (1)
	Prepared Items from Previous Lessons <ul style="list-style-type: none"> <input type="checkbox"/> Sample Engineering Challenge materials from Lesson 21 (1 set) <input type="checkbox"/> Class problem and solution chart from Lesson 21 (1) <input type="checkbox"/> Class list of ways to make sound from Lesson 21 (1) 	
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 23 requires the materials from the material testing stations. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 21 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 21 Resource B: Engineering Design Process Visual  	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare the aluminum foil and plastic wrap squares for the material testing stations by cutting out a 5" square of each material for each station. <input type="checkbox"/> Prepare each material testing station by placing station materials at a designated location. If possible, save the materials to reuse in Lessons 23 and 24. 	


Lesson 23

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Beads, wooden (64) <input type="checkbox"/> Chenille stems (24) <input type="checkbox"/> Jewelry boxes with lids, cardboard (8) <input type="checkbox"/> Pie tins, aluminum (16) <input type="checkbox"/> Pom-poms (64) <input type="checkbox"/> String (40 ft) Safety Kit <ul style="list-style-type: none"> <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Safety goggles, teacher (1) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum foil (partial roll) <input type="checkbox"/> Bottles with caps, plastic (8) <input type="checkbox"/> Craft sticks, jumbo (24) <input type="checkbox"/> Glue sticks (8) <input type="checkbox"/> Magnet (1, optional) <input type="checkbox"/> Measuring tape (1) <input type="checkbox"/> Metal soup cans (8) <input type="checkbox"/> Paper clips, large (64) <input type="checkbox"/> Plastic wrap (partial roll) <input type="checkbox"/> Rubber bands (64) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Scissors, blunt tip (8) <input type="checkbox"/> Tape (partial roll)
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 24 requires the prepared Engineering Challenge materials, prepared sending and receiving lines, and prepared message cards. 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 21 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 21 Resource B: Engineering Design Process Visual  <input type="checkbox"/> Lesson 23 Resource: Message Card 	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Identify and prepare a large outdoor space for groups to test their devices. In this space, use string or tape to create two 20-foot lines that are 80 feet from each other. These are the sending and receiving lines. If an outdoor space is not available, use a large, open indoor space such as a cafeteria, gymnasium, or long hallway. <input type="checkbox"/> Prepare the Engineering Challenge materials and Engineering Challenge building tools. If necessary, prepare new 5" squares of aluminum foil and plastic wrap for each group. Determine how students will retrieve materials. Either line up all materials by item on a counter or table for students to access when needed or gather each group's set of materials in a box or bag beforehand for ease of distribution and cleanup. As necessary, replenish materials before Lesson 24. <input type="checkbox"/> Prepare message cards. (See Lesson 23 Resource.) 	


Lesson 24

Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Glue sticks (8) <input type="checkbox"/> Magnet (1, optional) <input type="checkbox"/> Measuring tape (1) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Scissors, blunt tip (8) <input type="checkbox"/> Tape (partial roll)
	Safety Kit <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Safety goggles, teacher (1)	
	Prepared Items from Previous Lessons <input type="checkbox"/> Engineering Challenge materials from Lesson 23 (8 sets) <input type="checkbox"/> Sending and receiving lines from Lesson 23 (1 each) <input type="checkbox"/> Message cards from Lesson 23 (1 or 2 per group)	
Resources	<input type="checkbox"/> Lesson 21 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 21 Resource B: Engineering Design Process Visual 	
Preparation	<input type="checkbox"/> As necessary, replenish Engineering Challenge materials and re-create sending and receiving lines. <input type="checkbox"/> As necessary, prepare additional message cards. (See Lesson 23 Resource.)	



Lesson 25

Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Magnet (1, optional)
Resources	<input type="checkbox"/> Lesson 21 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 21 Resource B: Engineering Design Process Visual 	
Preparation	None	

Lesson 26

Materials	Kit Items None	School Supplied Items None
Resources	<input type="checkbox"/> Lesson 26 Resource: Key Term Cards	
Preparation	<input type="checkbox"/> Prepare key term cards. (See Lesson 26 Resource.) <input type="checkbox"/> Cue Recycled Orchestra video from Lesson 2 (Allgood, Penaranda-Loftus, and Townsley 2015a): http://phdsci.link/1742 . 	

Lesson 27

Materials	Kit Items	School Supplied Items
	<input type="checkbox"/> Cups, insulated, disposable, 9 oz (27) <input type="checkbox"/> String (108 ft)	<input type="checkbox"/> Paper clips, large (26) <input type="checkbox"/> Pencil, sharp (1) <input type="checkbox"/> Scissors (1)
	Item Reuse	
	<input type="checkbox"/> Lesson 28 requires the prepared demonstration cup telephone and student cups with string.	
Resources	<input type="checkbox"/> Lesson 27 Resource A: Cups with String Setup Instructions and Classroom Procedure <input type="checkbox"/> Lesson 27 Resource B: Cup Telephone Diagram 	
Preparation 	<input type="checkbox"/> Cut a 4' piece of 2 mm cotton string to display in the Launch. <input type="checkbox"/> Prepare cups with string. (See Lesson 27 Resource A.) <input type="checkbox"/> Prepare cup telephone diagram. (See Lesson 27 Resource B.)	
	Advance Preparation for Lesson 2 2-3 Days Before: Spread 5 cups of topsoil in a plastic bin to dry.	

Lesson 28




Materials	Kit Items	School Supplied Items
	None	None
	Prepared Items from Previous Lessons	
	<input type="checkbox"/> Demonstration cup telephone from Lesson 27 (1) <input type="checkbox"/> Student cups with string from Lesson 27 (24)	
	Item Reuse	
	<input type="checkbox"/> Lesson 29 requires the prepared demonstration cup telephone.	
Resources	<input type="checkbox"/> Lesson 28 Resource: Cup Telephone Setup Instructions	
Preparation	<input type="checkbox"/> Prepare cup telephones using cups with string. (See Lesson 28 Resource.)	

Lesson 29


Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Scissors (1)
	Prepared Items from Previous Lessons <input type="checkbox"/> Demonstration cup telephone from Lesson 27 (1)	
Resources	<input type="checkbox"/> Lesson 29 Resource: System Card	
Preparation	<input type="checkbox"/> Score End-of-Module Assessment and write individual feedback. <input type="checkbox"/> Select at least one End-of-Module Assessment item for the class to debrief, and prepare a sample response for that item to share with students. <input type="checkbox"/> Prepare Systems card. (See Lesson 29 Resource.) <input type="checkbox"/> Select student work products showing that objects are made of parts, and display them in different areas of the classroom. Student work products may include the anchor model, other class charts, selected Science Logbook pages, and Engineering Challenge designs.	

Earth Materials Lesson Materials and Preparation

Lesson 1

Materials	Kit Items <input type="checkbox"/> Clay pots, painted (6) <input type="checkbox"/> Clay pots, unpainted (6)	School Supplied Items None
	Module 1 Kit <input type="checkbox"/> Safety goggles, student (24) <input type="checkbox"/> Safety goggles, teacher (1)	
Resources	<input type="checkbox"/> Lesson 1 Resource A: Casas Grandes Photograph  <input type="checkbox"/> Lesson 1 Resource B: Casas Grandes Pottery Photographs  <input type="checkbox"/> Lesson 1 Resource C: Mata Ortiz Pottery Photographs  <input type="checkbox"/> <i>The Pot that Juan Built</i> (Andrews-Goebel and Diaz 2002)	
Preparation	<input type="checkbox"/> Add a sticky note to page 24 of <i>The Pot that Juan Built</i> next to the photograph of Juan Quezada.	

Lesson 2


Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Clay, natural, powdered (6 tbsp) <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (24) <input type="checkbox"/> Moss (1 $\frac{1}{2}$ cups) <input type="checkbox"/> Sand (1 $\frac{1}{2}$ cups) <input type="checkbox"/> Sifting screens, plastic (6) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Magnifiers, handheld, plastic (12) <input type="checkbox"/> Safety goggles, student (24) <input type="checkbox"/> Safety goggles, teacher (1) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bowls, paper, 12 oz (7) <input type="checkbox"/> Container, 3 qt or larger (1) <input type="checkbox"/> Marker, permanent (1) <input type="checkbox"/> Plates, paper, 10" (12) <input type="checkbox"/> Spoons, plastic (6) <input type="checkbox"/> Tape (partial roll) <input type="checkbox"/> Top soil (5 cups)
	<p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 2 Resource A: Clay Photographs  <input type="checkbox"/> Lesson 2 Resource B: Soil Sample Setup Instructions <input type="checkbox"/> Lesson 2 Resource C: Soil Sample Parts Setup Instructions <input type="checkbox"/> <i>The Pot that Juan Built</i> (Andrews-Goebel and Diaz 2002) 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 29 Resource: Crosscutting Concept Cards 	
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare materials for soil sample observations. (See Lesson 2 Resource B.) <input type="checkbox"/> Prepare materials for soil sample parts comparison. (See Lesson 2 Resource C.) 	

Lesson 3

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Clay, modeling, air dry (2 lb) <input type="checkbox"/> Clay, natural, powdered (1 tbsp) <input type="checkbox"/> Clay pot, unpainted (1) <input type="checkbox"/> Moss (1 tbsp) <input type="checkbox"/> Pipette, disposable (1) <input type="checkbox"/> Sand (1 tbsp) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Safety goggles, teacher (1) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bag, sandwich, resealable plastic (1) <input type="checkbox"/> Bowls, paper, 12 oz (3) <input type="checkbox"/> Cup, clear plastic, 9 oz (1) <input type="checkbox"/> Plates, paper, 10" (24) <input type="checkbox"/> Spoon, plastic <input type="checkbox"/> Water (access)
	<p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sifted soil mixture from Lesson 2 (1) 	
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 3 Resource: Clay Demonstration Setup Instructions <input type="checkbox"/> <i>The Pot that Juan Built</i> (Andrews-Goebel and Diaz 2002) 	

Preparation	<input type="checkbox"/> Prepare materials for clay demonstration. (See Lesson 3 Resource.) <input type="checkbox"/> Prepare materials for pottery making activity. Shape air-drying modeling clay into 1" balls. Make enough for each student to receive 1 modeling clay ball. Place each of the student modeling clay balls on a separate paper plate. Prepare the clay balls on the day of the lesson to allow students to work with the clay before it dries.
--------------------	--

Lesson 4




Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape (partial roll)
Resources	<input type="checkbox"/> Lesson 4 Resource: Natural Sources of Water Posters Setup Instructions	
Preparation 	<input type="checkbox"/> Cue water source videos: http://phdsci.link/2089 , http://phdsci.link/2090 , and http://phdsci.link/2091 . <input type="checkbox"/> Prepare natural sources of water posters. (See Lesson 4 Resource.) <input type="checkbox"/> Access Google Earth™ mapping service and navigate to Mata Ortiz: http://phdsci.link/2086 . Ensure that the Palanganas River is in view.	
Advance Preparation for Lesson 5 1 Day Before: Obtain 12 small rocks of a size that students can firmly hold while students scrape sidewalk chalk.		

Lesson 5

Materials	Kit Items <input type="checkbox"/> Hematite rock sample (1) <input type="checkbox"/> Paintbrushes (24) <input type="checkbox"/> Pipettes, disposable (12) <input type="checkbox"/> Sidewalk chalk, 2 colors (6 each color) Module 1 Kit <input type="checkbox"/> Safety goggles, student (24) <input type="checkbox"/> Safety goggles, teacher (1)	School Supplied Items <input type="checkbox"/> Bowls, paper, 12 oz (12) <input type="checkbox"/> Cups, clear plastic, 9 oz (6) <input type="checkbox"/> Paper towels (12 sheets) <input type="checkbox"/> Rocks, small (12)
Prepared Items from Previous Lessons <input type="checkbox"/> Prepared student pots from Lesson 3 (24)		
Resources	<input type="checkbox"/> Lesson 1 Resource C: Mata Ortiz Pottery Photographs <input type="checkbox"/> Lesson 5 Resource A: Painting Mata Ortiz Pottery Photograph <input type="checkbox"/> Lesson 5 Resource B: Making Paint Setup Instructions <input type="checkbox"/> Lesson 5 Resource C: Metate Photograph <input type="checkbox"/> <i>The Pot that Juan Built</i> (Andrews-Goebel and Diaz 2002)	

Preparation	<input type="checkbox"/> Prepare materials for making paint activity. (See Lesson 5 Resource B.) <input type="checkbox"/> Add a sticky note to page 26 of <i>The Pot that Juan Built</i> next to the photograph of the metate.
--------------------	---

Lesson 6

Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape (partial roll)
Resources	<input type="checkbox"/> Lesson 6 Resource A: Casas Grandes Valley and Hawaiian Island Photographs  <input type="checkbox"/> Lesson 6 Resource B: Human-Made Resources Cards <input type="checkbox"/> Lesson 6 Resource C: Natural Resources Cards <input type="checkbox"/> Lesson 6 Resource D: Locations of Human-Made Resources Photographs  <input type="checkbox"/> Lesson 6 Resource E: Human-Made Resources Photographs  <input type="checkbox"/> <i>The Pot that Juan Built</i> (Andrews-Goebel and Diaz 2002)	
Preparation	<input type="checkbox"/> Prepare to distribute color copies of human-made resources cards. (See Lesson 6 Resource B.) <input type="checkbox"/> Prepare color copies of natural resources cards. (See Lesson 6 Resource C.) <input type="checkbox"/> Identify three corners or areas of the classroom to use for a Question Corners routine. Prepare a color copy of each photograph in Lesson 6 Resource D. Before the lesson, post one photograph in each corner.	

Works Cited

Allgood, Brad, Juliana Penaranda-Loftus, and Graham Townsley, dirs. 2015a. *Landfill Harmonic*. DVD, 60:24. Los Angeles: The Film Collaborative.

Johnson, James P., composer. 1923. "Charleston." Lyrics by Cecil Mack. Golden Gate Orchestra. Recorded 1925. <https://adp.library.ucsb.edu/index.php/matrix/detail/2000157151/10292-Charleston>.

Millman, Isaac. 1998. *Moses Goes to a Concert*. New York: Farrar, Straus and Giroux. [All references to *Moses Goes to a Concert* are from this source.]

Credits

Page 2, "Friends for Life" by Yan Perchuk/Shutterstock.com, "Fiesta en Sevilla" by Diego Gallego/StockMusicSite.com, "Pakkala-Kriti" by Suchitra Lata/StockMusicSite.com, pencil, guitar, broom, violin, fork, saxophone, metals cans, drums, and cell audio licensed through Audio Jungle/EnvatoMarket; page 3, *Eine kleine Nachtmusik* audio by Wilfred Symphony Orchestra/Shutterstock.com; Page 3, 10, 12, 18, Recycled Orchestra footage by Landfill Harmonic; Page 6, Drum in slow motion video by Engin Sezer/Shutterstock.com; Page 13, London neighborhood video by Peter John Phipp/Oxford Scientific Video/Getty Images, "Charleston" audio clip courtesy DAHR/UC Santa Barbara, Doorbell audio licensed through Audio Jungle/EnvatoMarket; Page 14, Marshaling wands video by Jose Gullen, Smoke alarm video by guy113/Creatas Video/Getty Images, Traffic signals video by Chuck and Sarah Fishbein/Iconica Video/Getty Images, Ambulance video by videomask/Shutterstock.com, Crosswalk signals video by Edwin Lee/Moment Video RR/Getty Images, Flags video by Ivan Marc/Shutterstock.com and Marrom/Shutterstock.com; Page 15, Recess video by Zhang Peng/Getty Images Editorial Footage/Getty Images.