At A Glance

Learning Intentions	Pulleys All Around Us	Pulley Systems	Gearing Up!	Gears In Motion	Wheels In Motion	Levers	What Is Light?	Light Travels	The Colors Of Light	Casting Shadows	Making Sound	Measuring Sound	Sound Travels
Knowledge and Understanding Content													
• identify pulley systems in objects that are designed to lift a load or designed as belt drives to transmit power	•												
• demonstrate how pulley systems work to lift objects and how gear trains work to facilitate motion		•	•										
• demonstrate how gears operate in two planes to facilitate motion; describe how a bicycle works				•									
• demonstrate how wheels work to move objects easily; incorporating simple forces to increase motion					•								
• identify different types of levers and demonstrate how levers work to move or lift heavy things						•							
• identify natural and artificial light sources, identify light sources that give off heat, and emit or reflect light							•						
• determine properties of light (path of light, speed of light, refraction, reflection, absorption, color spectrum)								•	•				
• distinguish transparent materials from opaque materials by examining their shadows										•			
• recognize and demonstrate how sound is made, and create instruments that produce sound											•		
• describe and demonstrate how to measure the volume of sounds using a decibel meter												•	
• demonstrate how sound travels, and recognize that sound can travel through water													•
• identify materials that absorb sound, demonstrate knowledge by creating a soundproofing device													•
Thinking Skills and Investigation Process													
• make predictions, formulate questions, and plan an investigation		•	•		•	•		•	•		•		•
• gather and record observations and findings using drawings, tables, written descriptions	•	•	•	•	•	•	•	•	•	•	•	•	•
• recognize and apply safety procedures in the classroom	•	•	•	•	•	•	•	•	•	•	•	•	•
Communication													
• communicate the procedure and conclusions of investigations using demonstrations, drawings, and oral or written descriptions, with use of science and technology vocabulary	•	•	•	•	•	•	•	•	•	•	•	•	•
Application of Knowledge and Skills to Society and the Environment													
• assess the impact of pulley systems and gear systems on daily life	•	•	•										
• assess the impact of the uses of natural and artificial light to our environment, and ways to conserve it							•						
• recognize the impact of noise pollution on society and the environment, and how to minimize its effects												•	

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Student's Name: _____ Date: _____

Teacher Assessment Rubric

Success Criteria	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding Content				
Demonstrate an understanding of the concepts, ideas, terminology definitions, procedures and the safe use of equipment and materials	Demonstrates limited knowledge and understanding of the content	Demonstrates some knowledge and understanding of the content	Demonstrates considerable knowledge and understanding of the content	Demonstrates thorough knowledge and understanding of the content
Thinking Skills and Investigation Process				
Develop hypothesis, formulate questions, select strategies, plan an investigation	Uses planning and critical thinking skills with limited effectiveness	Uses planning and critical thinking skills with some effectiveness	Uses planning and critical thinking skills with considerable effectiveness	Uses planning and critical thinking skills with a high degree of effectiveness
Gather and record data, and make observations, using safety equipment	Uses investigative processing skills with limited effectiveness	Uses investigative processing skills with some effectiveness	Uses investigative processing skills with considerable effectiveness	Uses investigative processing skills with a high degree of effectiveness
Communication				
Organize and communicate ideas and information in oral, visual, and/or written forms	Organizes and communicates ideas and information with limited effectiveness	Organizes and communicates ideas and information with some effectiveness	Organizes and communicates ideas and information with considerable effectiveness	Organizes and communicates ideas and information with a high degree of effectiveness
Use science and technology vocabulary in the communication of ideas and information	Uses vocabulary and terminology with limited effectiveness	Uses vocabulary and terminology with some effectiveness	Uses vocabulary and terminology with considerable effectiveness	Uses vocabulary and terminology with a high degree of effectiveness
Application of Knowledge and Skills to Society and Environment				
Apply knowledge and skills to make connections between science and technology to society and the environment	Makes connections with limited effectiveness	Makes connections with some effectiveness	Makes connections with considerable effectiveness	Makes connections with a high degree of effectiveness
Propose action plans to address problems relating to science and technology, society, and environment	Proposes action plans with limited effectiveness	Proposes action plans with some effectiveness	Proposes action plans with considerable effectiveness	Proposes action plans with a high degree of effectiveness

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Name: _____ Date: _____

Student Self-Assessment Rubric

Put a check mark (✓) in the box that best describes you:

	Always	Almost Always	Sometimes	Needs Improvement
• I am a good listener.				
• I followed the directions.				
• I stayed on task and finished on time.				
• I remembered safety.				
• My writing is neat.				
• My pictures are neat and colored.				
• I reported the results of my experiment.				
• I discussed the results of my experiment.				
• I know what I am good at.				
• I know what I need to work on.				

1. I liked _____

_____

2. I learned _____

_____

3. I want to learn more about _____

_____

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Introduction

The activities in this book have two intentions: to teach concepts related to physical science and to provide students the opportunity to apply necessary skills needed for mastery of science and technology curriculum objectives.

Throughout the experiments, the scientific method is used. The scientific method is an investigative process which follows five steps to guide students to discover if evidence supports a hypothesis.

1. **Consider a question to investigate.**
   For each experiment, a question is provided for students to consider. For example, "Does light travel?"

2. **Predict what you think will happen.**
   A hypothesis is an educated guess about the answer to the question being investigated. For example, "I believe that light travels in a straight line." A group discussion is ideal at this point.

3. **Create a plan or procedure to investigate the hypothesis.**
   The plan will include a list of materials and a list of steps to follow. It forms the "experiment."

4. **Record all the observations of the investigation.**
   Results may be recorded in written, table, or picture form.

5. **Draw a conclusion.**
   Do the results support the hypothesis? Encourage students to share their conclusions with their classmates, or in a large group discussion format.

The experiments in this book fall under thirteen topics that relate to five aspects of physical science: **Pulleys and Gears; Wheels and Levers; Building Devices and Vehicles that Move; Light and Sound; and Shadows.** In each section you will find teacher notes designed to provide you guidance with the learning intention, the success criteria, materials needed, a lesson outline, as well as provide some insight on what results to expect when the experiments are conducted. Suggestions for differentiation are also included so that all students can be successful in the learning environment.

Assessment and Evaluation:

Students can complete the Student Self-Assessment Rubric in order to determine their own strengths and areas for improvement. Assessment can be determined by observation of student participation in the investigation process. The classroom teacher can refer to the Teacher Assessment Rubric and complete it for each student to determine if the success criteria outlined in the lesson plan has been achieved. Determining an overall level of success for evaluation purposes can be done by viewing each student's rubric to see what level of achievement predominantly appears throughout the rubric.

Pulleys All Around Us

Learning Intention:

Students will learn that some pulley systems are designed to lift a load and some pulley systems are designed to transmit power.

Success Criteria:

- identify everyday objects that use a pulley system to lift a load, or use a pulley system to transmit power
- gather and record information using drawings and written descriptions
- classify pulley systems in objects as either designed to lift a load or as a belt drive that transmits power
- make observations, conclusions, and connections to people and places in the environment

Materials Needed:

- a copy of "Pulleys All Around Us" worksheet 1 and 2 for each student
- a copy of "Pulleys Everywhere" worksheet 3 and 4 for each student
- clipboards (one for each student)
- a few (assorted) pulleys to use as examples for students
- chart paper
- pencils, pencil crayons, markers

Procedure:

1. Using the assorted pulleys as manipulatives, explain to students the purpose of the pulley. Have a brainstorming/discussion session as to what objects use a pulley system, or where students have seen a pulley system being used. Record responses on chart paper. Give students worksheet 1 and 2 to complete, ensuring their understanding of the pulley's ability to lift a load or to act as a belt drive system that transmits power.
2. Explain to students that they are going to take a walk around the school to locate pulleys used in everyday objects. Instruct them to take note of the pulleys' ability to either lift a load or to act as a belt drive system that transmits power. Give each student a clipboard and worksheet 3 to complete as they walk through the school.
3. Next, explain to students that they will take a walk around the neighborhood to look for objects that use a pulley system to operate. Instruct them to take note of the pulleys' ability to lift a load or to act as a belt drive system that transmits power. Give each student a clipboard and worksheet 4 to complete as they go through the neighborhood.
4. Come together as a large group and have a discussion about objects that use pulley systems to operate. (Prompt students to recall what they observed while on their walk through the school and neighborhood.) Make a list of their responses on chart paper. How many had they thought of before their walks? How many did they come up with after? Were any the same?

Differentiation:

Slower learners may benefit by locating and drawing only two everyday objects in the school that use a pulley system, and only two objects in their neighborhood that use a pulley system to operate.

For enrichment, faster learners could plan and carry out a field trip around their homes to look for objects that use a pulley system to operate. They could draw these objects and classify the pulley systems in them as either designed to lift a load or as a belt drive that transmits power.

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Worksheet 1

Name: _____

Pulleys All Around Us

A pulley is a wheel with a groove in it. The groove holds a rope or a belt. Some pulley systems are designed to lift a load. A downward pull on one side of a pulley rope causes the opposite side to go up.

Circle the pulley in each picture, and explain how the pulley is being used.

Worksheet 3

Name: _____

Pulleys Everywhere

Take a walk around your school to look for everyday objects that use a pulley system to operate. **Draw** and **label** four examples that you see.

_____

Check (✓) one:

- ❑ pulley lifts an object
- ❑ pulley is a belt drive that transmits power

_____

Check (✓) one:

- ❑ pulley lifts an object
- ❑ pulley is a belt drive that transmits power

_____

Check (✓) one:

- ❑ pulley lifts an object
- ❑ pulley is a belt drive that transmits power

_____

Check (✓) one:

- ❑ pulley lifts an object
- ❑ pulley is a belt drive that transmits power

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Sound Travels

Learning Intention:

Students will learn that sound can travel through certain materials, and use this knowledge to design and construct a soundproof device.

Success Criteria:

- demonstrate how vibrations move through the air to create sound
- identify materials that transmit or block sound
- design and construct a soundproof device, and test the product using a decibel meter
- gather and record observations using charts, drawings, and written descriptions
- make conclusions about how sound travels and what materials can block sound

Materials Needed:

- a copy of "Does Sound Travel?" worksheet 1, 2, and 3 for each student
- a set of two identical glasses, a shallow dish, a tuning fork, water (for each student, or pair of students)
- a copy of "Sound Absorption" worksheet 4 and 5 for each student
- wood, foam, cardboard, tissue paper, cloth (big enough to cover the radio speaker)
- clipboards (one for each student)
- cardboard boxes, cardboard tubes, newspaper, construction paper, pieces of wood, cloth, popsicle sticks, aluminum foil, Styrofoam trays or plates, foam pieces, plastic containers, egg cartons, wood glue, masking tape, duct tape, string, pipe cleaners, scissors, (or any other materials that you find suitable to include)
- a copy of "Soundproofing!" worksheet 6 and 7 for each student
- a radio, pencils, markers, chart paper

Procedure:

1. Students will investigate how sound travels. Give them worksheets 1, 2, and 3, and the materials to conduct the investigations. Read through the What To Do sections on worksheets 1, 2, and 3 with them. They will conduct the investigations on how sound travels, then record observations and conclusions.
2. As a large group, form a circle around the radio. Give students worksheets 4 and 5, and a clipboard. Read through the question, materials needed, and what to do section with them. Students will record their predictions. Conduct the investigation as a large group. Students will record their observations and make conclusions about the material(s) that transmit sound or block sound from traveling.
3. Students will plan, design, and build a soundproof device. Give students a copy of "Soundproofing!" worksheets 6 and 7, to complete as they build their device. Once their invention is completed, students will test it. Students will evaluate their soundproof device (a star = something done well, a wish = something that needs to be improved). Student-teacher conferences could help guide students on how they would incorporate their wish in order to make adjustments to the design of their soundproof device.

Differentiation:

Slower learners may benefit by working together in a small group, with teacher direction, in order to complete the experiments on worksheet 1, 2, and 3. This would allow for small group instruction on how to accurately observe how vibration travels to create sound.

For enrichment, faster learners could experiment further on the materials that can block sound from traveling by testing five more materials of their choosing.

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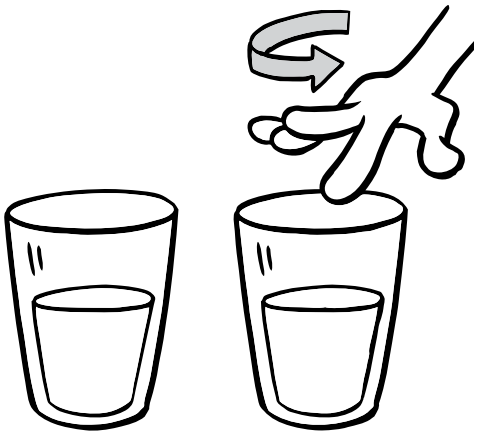
Worksheet 2

Name: _____

Does Sound Travel?

WHAT TO DO



(Part Two)

4. Place the second glass about 4 in. (10 cm) away from the first glass.

5. Fill the second glass halfway (exactly like the first glass).

6. Dip your finger in the water.

7. Rub the rim of the **first** glass with your finger. Go around and around.

8. Record your observations. Discuss your observations with a classmate.

Let's Observe

Does the second glass make a sound?

_____

_____

What do you see in the second glass?

_____

_____

Let's Conclude

What causes the second glass to make a sound?

_____

_____

_____

Worksheet 4

Name: _____

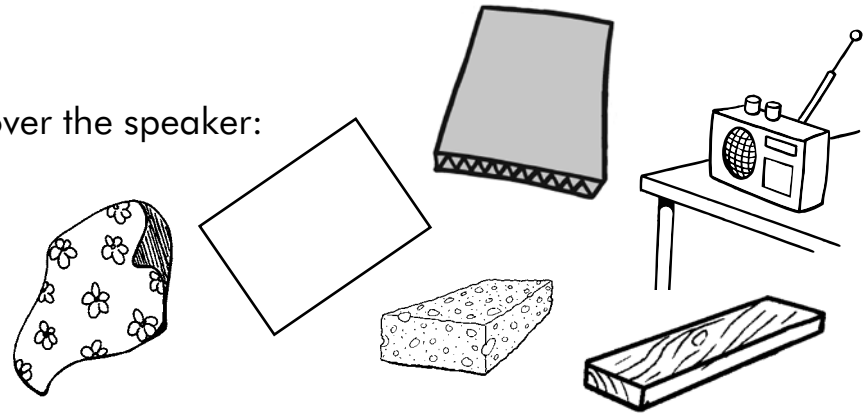
Sound Absorption

QUESTION

What material will block sound the best?

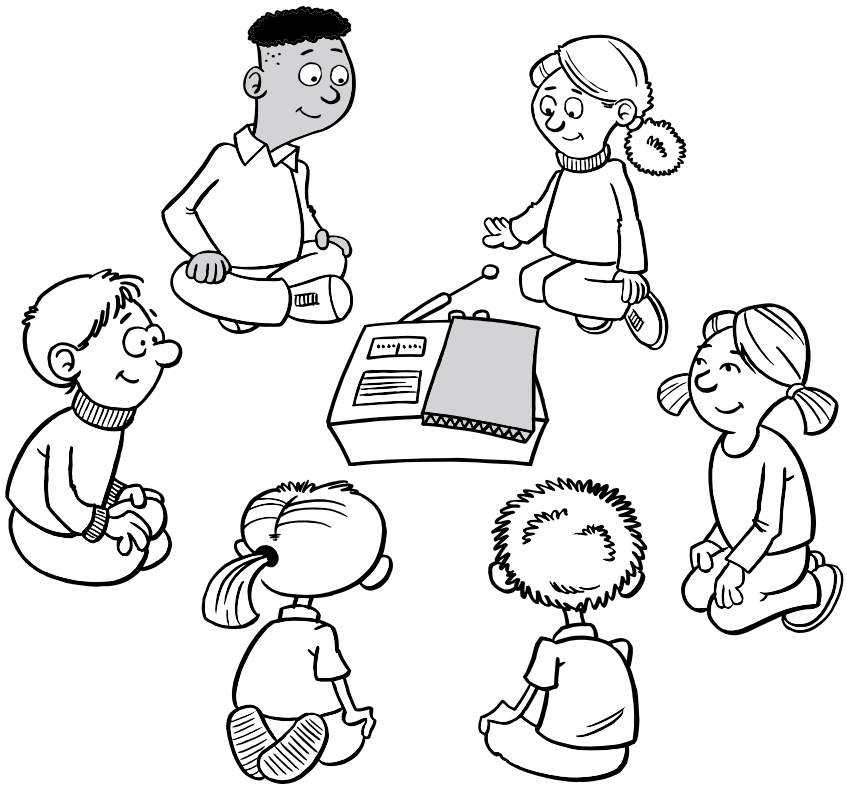
MATERIALS NEEDED

- a radio
- materials big enough to cover the speaker:
  - ❍ wood
  - ❍ foam
  - ❍ cardboard
  - ❍ tissue paper
  - ❍ cloth



WHAT TO DO

1. Place the radio in the middle of the room. The speaker should point up.
2. Sit in a circle around the radio. Turn on the radio.
3. Make a prediction about the answer to the question.
4. Place the wood over the speaker.
5. Record your observations on worksheet 7.
6. Repeat steps 4 and 5, using the other materials.
7. Make a conclusion about what you observed.



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Worksheet 5 Name: _____

Sound Absorption

Let's Predict ???

Which material will block sound the best?

_____

_____

Let's Observe

Put a check mark (✓) in the column that tells what happened.

Material	Did Not Block	Blocked A Bit	Blocked Very Well
wood			
foam			
cardboard			
tissue paper			
cloth			

Let's Conclude

If you had to design a cover for a speaker system, which material would you use? Explain your answer.

_____

_____

_____

If you had to design the walls of a baby's room, which material would you use? Explain your answer.

_____

_____

_____

Worksheet 7 Name: _____

Let's Test It!

Turn on a radio at **medium** volume. Take five big steps from the radio. Hold the decibel meter.

What is the reading on the meter? _____

Place the radio inside your soundproof device and close it. Take five big steps from the soundproof device. Hold the decibel meter.

What is the reading on the meter? _____

Describe what happened.

_____

_____

_____

LET'S EVALUATE!

My thoughts about my soundproof device…

A star:

_____

_____

A wish:

_____

_____