Teaching First Step Nonfiction

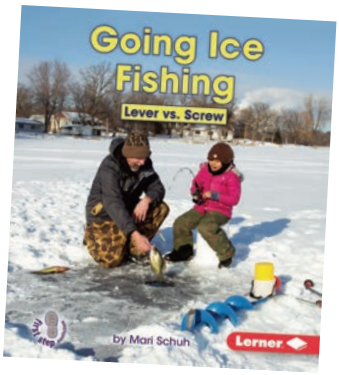
Simple Machines to the Rescue

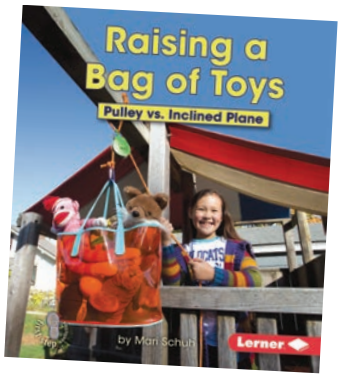
Interest Level: Grades K–2
Reading Level: Grade 1

LERNER SOURCE™

Titles in this series:

Going Ice Fishing:
Lever vs. Screw
Hauling a Pumpkin:
Wheels and Axles vs. Lever
Holding a Door Open:
Wedge vs. Wheels and Axles
Making a Salad:
Wedge vs. Inclined Plane
Playing a Game:
Inclined Plane vs. Lever
Raising a Bag of Toys:
Pulley vs. Inclined Plane





Standards

Next Generation Science Standards

- Asking Questions and Defining Problems (Science and Engineering Practices)
- Developing and Using Models (Science and Engineering Practices)
- K-2-ETS1: Engineering Design (Disciplinary Core Ideas)
- Structure and Function (Crosscutting Concepts)

Common Core State Standards

RI.1.1 Ask and answer questions about key details in a text.

RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.

Multiple Intelligences Utilized

Bodily kinesthetic, interpersonal, intrapersonal, linguistic, logical-mathematical, visual spatial

LernerClassroom™
ISBN 978-1-4677-9443-5

Lesson 1
Simple Machines and Inclined Planes

Purpose
Students will be able to define simple machine and identify examples of inclined planes.

Materials
- *Making a Salad: Wedge vs. Inclined Plane*
- an example of each type of simple machine: a lever, a screw, a wheel and axle, a wedge, an inclined plane, and a pulley
- several examples of inclined planes such as a cutting board, books, cardboard, and folders
- many large cardboard boxes, at least one per student
- old folders
- scrap pieces of paper
- duct tape
- scissors
- a colored marker

Pretest
- What are machines?
- What do machines do?
- What are examples of machines?
- What do you think a simple machine is?
- What do you think might be an example of a simple machine?

Read
- Tell students that in this unit, they will be learning about simple machines.
- Read *Making a Salad: Wedge vs. Inclined Plane*.
- Ask:
  - What is a simple machine?
  - What simple machines did we learn about in this book?

Discuss
- Set up your six simple machines at the front of the room. Name all six machine types for students, and explain that students will learn about each one during the unit.
- Then focus on the inclined plane. Ask students to think of the inclined plane examples from the book.
- If you choose, define *inclined plane* for students. Explain that a plane is a flat surface and that an incline is a tilted surface.
- Then show students real-life examples of inclined planes, such as tilted books, tilted desks, cutting boards, and angled folders and paper.
- Ask students to think about inclined planes and then pair with another student to talk about other examples of inclined planes. When they finish talking, have students share their ideas with the class.

Activity
- Break students into groups of three or four.
- Tell students that they will be using inclined planes to build forts and homes.
- Give each group several cardboard boxes, folders, and pieces of paper. Tell students that they may use any of these materials to build their fort as long as the material forms an inclined plane. Students may not, for example, crumple paper into balls, as it would no longer be forming an inclined plane.
- Cut strips of duct tape for students to use when building.
- As students build, visit each group. Ask the group members to identify each inclined plane that makes up their fort.
- As students identify planes, you may choose to outline or number the planes they point out with a colored marker.
- You may also encourage students to build roofs for their forts. Then discuss how roofs help send things like rain and snow off a building and onto the ground.

Discuss
- What is an inclined plane?
- How did you use inclined planes to build a fort?
- Why is it a good idea to have roofs be inclined planes?
- How did Liz use an inclined plane to solve her problem in the book?
- How else can inclined planes help us?

Evaluate
- Evaluate students' oral responses when identifying inclined planes and when answering questions.

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Lesson 2
What Is a Lever?

Purpose
Students will be able to explain how levers work.

Materials
- *Playing a Game: Inclined Plane vs. Lever*
- rulers
- counting cubes or square blocks
- a broom

Pretest
- What is a simple machine?
- What is an inclined plane?
- What is a lever?

Read
- Read *Playing a Game: Inclined Plane vs. Lever* to the class.
- Review and ask these questions:
  - What is a simple machine?
  - What is an inclined plane?
  - What examples of inclined planes did we see in this book?
  - What is a lever?
  - What examples of a lever did we see in this book?

Activity

Part 1
- Explain to students that a lever is a bar that moves and turns on a fulcrum. Draw a picture of a bar and fulcrum on the board.
- Show students a ruler. Tell students that the ruler can be a bar. Then set a counting cube or block on a flat surface such as a desk. Place the ruler on top of the cube so that the cube acts as a fulcrum. Show students that the ruler/bar can turn up and down on the fulcrum, like a seesaw.
- Pass out rulers and counting cubes or blocks to students. Give them time to practice turning the rulers on the blocks and exploring the role of a fulcrum in how a lever works.

Part 2
- After students have had time to explore, collect the cubes or blocks.
- Show students that a fulcrum can be any point where the lever's bar turns. Show students your ruler turning on the edge of a desk, on the top of a shoe, or on the back of a chair. Give students time to practice finding fulcrums for their rulers.

Part 3
- Finally, explain that a fulcrum doesn't even have to stay in one place.
- Sweep a small area of the classroom with a broom. Show students that the broom turns like a lever. Your hand is the fulcrum!
- Show students this same sweeping motion with the rulers. Give students a few seconds to try this action themselves and then collect the rulers.

Optional
- If you have a seesaw on your playground, take students outside to practice using a lever.

Discuss and Evaluate
- Ask students to turn to partners and think about levers they see in their everyday lives. Visit each pair or group to discuss levers with students. Use students' discussion to assess understanding.

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Lesson 3
What Is a Wheel and Axle?

Purpose
Students will build a wheel and axle.

Materials
- Life Savers mints (2 per student)
- cardboard
- plastic bags
- plastic straws (1 per student)
- tape
- *Hauling a Pumpkin: Wheels and Axles vs. Lever*
- a shovel (optional)
- examples of wheel and axles such as toy cars, a pizza cutter, roller skates, a skateboard, or a rolling pin
- crayons or markers

Prepare
- Cut out rectangles of cardboard about as big as your hand. You should have one piece of cardboard for every two students.
- Place each piece of cardboard in a separate plastic bag. Then add to each bag two plastic straws, four mints, and a roll of tape.

Pretest/Review
- What is a simple machine?
- What is an inclined plane? What are examples of inclined planes?
- What is a lever? What are examples of levers?
- What is a wheel and axle?

Read
- Read aloud *Hauling a Pumpkin: Wheels and Axles vs. Lever*.
- Ask students to name the lever used in the book. Help students identify the fulcrum of the shovel. You may choose to demonstrate lifting with a shovel in the classroom as well so that students can see the lever in action.
- Ask students to find the wheels and axles in the book.
- Then call on students to share other examples of wheels and axles.

Practice
- Show students your examples of wheels and axles.
- Show items one at a time. For each item, call on a student to identify the wheel and then to identify the axle.

Activity
- Tell students that they will be working in pairs to build cardboard cars. Each car should have four wheels and two axles.
- Put students in pairs. Then pass out one plastic bag to each student.
- Ask each student to take two mints and one straw from the bag.
- At the front of the room, demonstrate how to insert the ends of the straw into the holes in the mints to make a wheel and axle. On either side of the two mints, place tabs of tape to keep the mints from sliding around on (or off!) the straws.
- Allow students to test their wheels and axles at their desks.
- Then ask students to take the piece of cardboard out of the bag. Allow students to decorate the cardboard. This will be the body of the car.
- Finally, show students how to attach the axles to the cardboard with tape to make a toy car.

Extension
- Use books and leftover cardboard to make an inclined plane racetrack. Allow students to race their cars down the track.

Evaluate
- Examine each pair's wheels and axles.

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Lesson 4
What Is a Wedge?

Purpose
Students will use a wedge to lift and stop objects.

Materials
- *Holding a Door Open: Wedge vs. Wheels and Axles*
- examples of wedges such as a doorstop, triangular blocks, and plastic knives
- stacks of books

Pretest/Review
- What is a simple machine?
- What simple machines have we already learned about?
- What is a wedge?
- What does a wedge do?

Read
- Read aloud *Holding a Door Open: Wedge vs. Wheels and Axles*.

Discuss
- What problem was Eric trying to solve?
- What simple machine did Eric try to use first?
- Why didn't the wheel and axle work?
- What simple machine did Eric use next?
- Why did the wedge work?
- What other examples of wedges did we see in the book?

Demonstrate
- Explain that wedges can push objects apart and keep objects in place.
- Place a stack of books on a table or desk with the book spines facing up toward the ceiling.
- Use a triangular block or other wedge to push the books apart from one another. Rearrange the books and use the wedge to separate them again.
- Then stack the books so that their covers face the ceiling. Push the wedge between two books to demonstrate that a wedge can also lift objects.

Practice
- If you have enough wedges, distribute them to students or groups of students and allow students to explore the classroom, seeing what effect the wedge has on various objects. What can the wedge separate? What can it lift? What can it stop?
- If you have a limited wedge supply, ask students to choose areas or items in the classroom that they would like to try the wedge on. Then choose a volunteer to test the wedge for the class to observe.

Discuss
- What is a wedge?
- What can a wedge do?
- What are examples of wedges?
- How can a wedge help you solve a problem?

Evaluate
- Evaluate students' oral responses.

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Lesson 5
What Is a Pulley?

Purpose
Students will use and identify a pulley.

Materials
- *Raising a Bag of Toys: Pulley vs. Inclined Plane*
- a pulley and a rope OR a pencil and a spool of ribbon or thread
- a small bucket
- a bag

Prepare
- If possible, set up a pulley in the classroom. Otherwise, you may follow the instructions later in this lesson to set up a pencil and spool pulley.

Pretest/Review
- What is a simple machine?
- What simple machines have we learned about?
- What is something that a simple machine can help you do?
- What is a pulley?

Read
- Read aloud *Raising a Bag of Toys: Pulley vs. Inclined Plane*.
- Ask these questions:
  - What problem were the kids trying to solve?
  - What simple machine did they use first?
  - Why didn't the inclined plane work?
  - What simple machine did they use next?
  - How did the pulley help them?
- Are there any other simple machines that the kids could have tried?

Model
- Call students' attention to the pulley. If you were not able to set up a pulley, follow these directions:
  1. Put a pencil through the hole of a spool of ribbon or thread.
  2. Push the backs of two chairs together. Leave enough space for the width of your hand between the chairs.
  3. Set the pencil ends on the backs of the two chairs so that the pencil is perpendicular to the chair backs.
  4. If necessary, choose students to hold each pencil end in place.
- Explain to students that a pulley is a round object with a groove for a rope or string. Ask students to find the groove on the pulley.
- If you haven't already done so, run rope or string through the pulley. Attach one end of the rope to the handle of a bucket.
- Choose a student volunteer to hold the other side of the rope. Ask them to pull on the rope. What happens to the bucket?

Practice
- Allow students to test the strength of the pulley by placing different objects in the bucket.
- Ask students to compare lifting the bucket full of objects with their hands against lifting the bucket with the pulley. Which one is easier to do?

Discuss
- How much can this pulley lift?
- How could we make this pulley stronger?
- What materials could we use to build a stronger pulley?
- Do you think adding a second pulley would make lifting the bucket easier? Why or why not?

Evaluate
- Evaluate students' oral responses.

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Lesson 6
What Is a Screw?

Purpose
Students will identify ways that screws are used within the classroom.

Materials
- *Going Ice Fishing: Lever vs. Screw*
- a toy or a clock with screws, perhaps holding a battery cover
- a screwdriver
- a few plastic screws
- stickers (one sheet per student)
- Simple Machines Scavenger Hunt p. 8

Pretest/Review
- What is a simple machine?
- What simple machines have we learned about?
- What is something that a simple machine can help you do?
- What is a screw?
- What can a screw do?

Read
- Read aloud *Going Ice Fishing: Lever vs. Screw*.
- Ask these questions:
  - What problem were Sophia and her uncle trying to solve?
  - What simple machine did they use first?
  - Why didn't the lever work?
  - What simple machine did they use next?
  - How did the screw help them?
  - Are there any other simple machines they could have tried?

Model
- Tell students that screws can make holes in objects. They can also hold objects together.
- Show students the toy or clock you have brought. Use a screwdriver to remove the screws from the object. As you remove the screws, walk around so that students can see the screws twisting as they come out of the holes. Then replace the screws, again allowing the students to see the screws go into the holes.
- Explain to students that every screw has a thread that helps it turn and stay in place. Pass around plastic screws for students to examine. Ask students to find the thread wrapping around the screw.
- Share that we use screws all the time to keep toys, furniture, and even parts of buildings together.
- Call students' attention to screws that are in the classroom. For example, students' chairs are likely to be held together with screws.

Practice
- Pass out sheets of stickers to students. Ask students to find screws in the classroom. They're likely to find them on hinges, desks, chairs, toys, and many other objects. Every time students find a screw, they should use one of their stickers to cover the top of the screw.

Discuss
- How many screws did you find in the classroom?
- Where did you find the screws? What were they holding together?
- Where else have you seen screws?

Evaluate
- Pass out Simple Machines Scavenger Hunt p. 8. Ask students to complete it as homework. The following day, ask students to share the examples of simple machines that they found at home. Review students' written and oral responses for understanding.

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Name _____ Date _____

Simple Machines Scavenger Hunt

Find an example of each simple machine at your home or in your neighborhood. Then draw a picture of the simple machine and write the name of the object. For example, in the wedge category, you might draw a picture of a doorstop and write the word *doorstop* next to the drawing.

Inclined Plane

Wedge

Lever

Pulley

Wheel and Axle

Screw

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