

# NTTI Media-Rich Lesson

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## NAME

Everyday Machines

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## LESSON TITLE

Third - Sixth

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## GRADE LEVELS

Four -- 45 minute class periods

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## TIME ALLOTMENT

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## OVERVIEW

As an introduction to simple machines, students set up cardboard ramps to explore a variety of rolling (wheel and axle) systems that they create with plastic discs and slim straws. Students manipulate the wheel size, axle length, and axle position to get the rolling systems to perform a variety of tricks. Students then use various internet sites to learn about the different simple machines and how combinations of them are used to create the appliances and complex machines that we use every day.

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## SUBJECT MATTER

Physical Science – Simple Machines

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## LEARNING OBJECTIVES

- Identifies and demonstrates forces, such as push and pull.
- Identifies and compares simple machines and how they work. Compares simple machines (such as inclined planes) based on how well they do a task.
- Explains and illustrates how machines help people. Identifies how simple machines help people to do work (carts, hand trucks, and bicycles).

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## STANDARDS

- Students conduct a simple investigation. (Content Standard A)
- Students employ simple equipment and tools to gather data and extend the senses. (Content Standard A)
- Students use data to construct a reasonable explanation of how simple machines work. (Content Standard A)
- Students communicate investigations and explanations. (Content Standard A)
- Students discover that the position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull. (Content Standard B)
- Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot. (Content Standard E)
- Students learn that people continue inventing new ways of doing things, solving problems, and getting work done. (Content Standard F)

Source: Content standards from the National Research Council of the National Academy of Sciences.

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## MEDIA COMPONENTS

[www.edheads.org/activities/simple-machines/index.htm](http://www.edheads.org/activities/simple-machines/index.htm)

In this interactive website, students are shown examples of simple machines as familiar objects that are found in the garage, bedroom, kitchen and bathroom. Students are asked a series of questions to determine the use of the objects and what type of simple machine they are made from.

<http://www.brainpop.com/tech/simplemachines/>

Students use this engaging website to view two movie clips explaining simple machines and how they help us do work. After each clip students are able to check their understanding by answering questions in a short quiz about simple machines.

<http://www.mos.org/sln/Leonardo/LeoHomePage.html>

In this website, students are given a description and examples of each one of the simple machines. Students are then able to look at complex machines and determine which simple machines are combined to make them.

<http://teacher.scholastic.com/dirtrep/simple/invest.htm>

In this website, students are given an opportunity to investigate and write a science report on a simple machine that is found around their home. Step-by-step instructions are given to create this report. Also, sample student reports are available.

[www.mikids.com/Smachines.htm](http://www.mikids.com/Smachines.htm)

This website gives a description of how each simple machine makes work easier. It also shows examples of the simple machines in everyday appliances and gadgets.

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## **MATERIALS**

### For each student

- 2 large plastic or cardboard discs with three holes in the center and edge grooves (can be found in the FOSS Balance and Motion Kit or use Tinker Toys™)
- 2 small plastic or cardboard discs with a hole in the center and edge grooves (can be found in the FOSS Balance and Motion Kit or use Tinker Toys™)
- 2 - 3 slim straws

### For each group of students

- 1 cardboard ramp (30 x 45 cm)
- 4 clothespins
- small toy car

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## **PREP FOR TEACHERS**

Teachers should preview the websites that will be used and the video clips from Brain Pop and then bookmark the websites to each computer that will be used. The websites suggested in the lesson are very user-friendly and lead to discussion questions that the teacher should anticipate and be prepared for by previewing the interactive websites first. Teachers should also prepare materials to be distributed to each student for the hands-on activity.

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## **INTRODUCTORY ACTIVITY: SETTING THE STAGE (Engage)**

### **Day One**

1. The teacher should distribute large discs to students first and materials for the ramp for each group.
2. The teacher should demonstrate to students how to assemble the ramp (1. Clip two clothespins on the back end of a cardboard rectangle. 2. Clip a second clothespin on each of the first two clothespins to make legs.)
3. The teacher engages the students by asking them to demonstrate what kind of motion the discs can make on the ramp. Most students will try to roll the discs down the ramp like a wheel but will be dissatisfied with the way that the wheels fall over. Teacher – “What does this disc remind you of?” When the students answer, “a wheel”, the teacher should ask where wheels can be found.

4. The teacher should record the students' answers on chart paper and then distribute toy cars to each group of students and have them to roll the cars down the ramp. Teacher – “Why don't the wheels on the car fall over like our plastic ones?” Students should recognize that the axle in the center of the wheels helps to keep the wheels from falling over. Teacher – “An axle is a rod or shaft to which wheels can be attached.”
5. When the students all know about the axle, the teacher should distribute the small straws and ask the students to create a wheel and axle system using the discs and the small straws. Tell the students to demonstrate how their wheel systems roll down the ramp.
6. Students should create various wheel systems using the large and small wheels and the axles. The following are suggestions:
  - Big wheel on one end of the axle; small wheel on the other
  - Axle between two holes that are not center holes, making a wobbly roll
  - Axle stuck into the edge grooves to make a “lawn mower”
  - Big wheel in the middle with little wheels on both ends
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7. Have students to test the wheel systems to determine which design is fastest and which rolls the farthest.
8. The teacher should discuss the results with the students and tell them that the wheel and the ramp that they just used are examples of simple machines.
9. The teacher should **PROVIDE A FOCUS FOR MEDIA INTERACTION** by telling the students that they should listen to this Brain Pop video on inclined planes (<http://www.brainpop.com/tech/simplemachines/>) to determine how simple machines help people do work. The teacher should play this video clip on a large monitor that is attached to a computer with internet capabilities.
10. After the inclined plane video, the teacher should **CHECK FOR UNDERSTANDING** of how simple machines help us do work by having the students answer the questions in the Brain Pop quiz that follows the video.

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## LEARNING ACTIVITIES

### Day Two

In the first day's lesson, the students were introduced to two simple machines (the inclined plane and the wheel) and used Brain Pop to explain what a simple machine is and how it helps people do work. In the lesson for Day Two, the students will become familiar with the other simple machines using the Leonardo da Vinci website (<http://www.mos.org/sln/Leonardo/LeoHomePage.html>).

Students will use the research sheet provided to work in pairs to draw the six simple machines, explain how they help people do work, and give two examples of each type of simple machine.

The teacher should guide students to go to the website (<http://www.mos.org/sln/Leonardo/LeoHomePage.html>) and click on the link that says, “Inventor’s Workshop”. The students should then click on the link that says “Elements of Machines”. Students will use this webpage to help them complete the research activity.

If time allows, students should then go to the “Gadget Anatomy” link to quiz themselves and determine which simple machines are used to make the appliances shown.

After each pair of students has completed the research activity, the teacher should debrief with the entire class by reviewing the names of the simple machines, how they are used to help people do work, and examples of each. The Mi Kids website ([www.mikids.com/Smachines.htm](http://www.mikids.com/Smachines.htm)) will be helpful in reviewing the simple machines and examples of each.

### **Day Three**

On Day Three, allow students to work in groups of four to spend time exploring the EdHeads website ([www.edheads.org/activities/simple-machines/index.htm](http://www.edheads.org/activities/simple-machines/index.htm)) to review what they have learned about simple machines. The teacher should **PROVIDE A FOCUS FOR MEDIA INTERACTION** by telling the students that they will examine everyday machines that can be found in various rooms of the house. In **CHECKING FOR UNDERSTANDING**, the students will interact with the program, be quizzed on the uses of each machine, and asked to classify each item as one of the simple machines.

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### **CULMINATING ACTIVITY**

As a culminating activity, students should bring in a toy or machine that is used at home. The teacher should **PROVIDE A FOCUS FOR MEDIA INTERACTION** by telling the students to follow the directions in the Dirtmeister website (<http://teacher.scholastic.com/dirtrep/simple/invest.htm>) to create a science report on the machine that they brought to class. The students should first go to the Dirtmeister website (<http://teacher.scholastic.com/dirtrep/simple/invest.htm>). Then click on the link, “Observe and Record”. This will give the students guiding questions to think about as they examine their machine. Next, instruct the students to click on the link, “Report Your Findings” to use the questions given to guide their report. The final report should include the following information:

## 1. What object did you find? (For example: Wheelchair ramp)

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*Answer the following questions with complete sentences, and combine them into a paragraph.*

### 2. What type of simple machine is it?

### 3. How can you tell what type of simple machine your object is?

### 4. How does this simple machine make a job easier?

### 5. What are you "trading off" to get the job done more easily with this simple machine?

To affirm the students' performance, the teacher should allow students to share reports with the class when completed.

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## CROSS-CURRICULAR EXTENSIONS

1. Students should sketch diagrams of their machines brought from home. They should draw the machine from their own point of view first. When the diagrams are completed, students should add arrows and written notes to indicate directions of motion for each part, label the elements of machines involved, and explain connections. (Art)
  2. Each group of students should design a machine that would help to solve some school-related problem (i.e. stack books, pass out milk cartons, etc.) and then draw a picture of what the machine looks like. Students should then compose an advertisement for their machine. The advertisements should be as creative as possible including music, art and technology components. (Music, Art, and Technology)
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## COMMUNITY CONNECTIONS

Ask students to get their parents involved in helping them locate examples of machine diagrams from home. The instructions provided by manufacturers with bicycles, kitchen appliances, tools, and lawn mowers often contain explanatory diagrams to help you understand these machines. Auto repair manuals also contain many of these diagrams. Also, construction sets such as Lego® and K'NEX® also have similar kinds of diagrams to help you build particular toy designs.

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## STUDENT MATERIALS

- Research sheet to be used with the Leonardo da Vinci website
- Science notebook to complete the Dirtmeister science report

# Everyday Machines

## Research Sheet

Group Name \_\_\_\_\_

Date \_\_\_\_\_

Use this research sheet provided to work in pairs to sketch a picture of the six simple machines, explain how they help people do work, and give two examples of each type of simple machine.

Simple Machine Drawing	Explanation of How it Helps People do Work	2 Examples
Inclined Plane		
Wheel and Axle		
Pulley		
Screw		
Wedge		
Lever		

