

# Simple Machines, Complex Inventions

**Grade Level: 4-8**

## Lesson Overview

Let students' creativity shine while learning about simple and complex machines. In the style of Rube Goldberg, students will make the simple task of shelling an ear of corn overly complicated in cartoon style.

## Student Objectives

1. Apply the principles of Rube Goldberg to create a cartoon depicting 10 steps to accomplish a given task.
2. Illustrate cartoon, using focus, organization and coherence.
3. Explain orally how the task will be accomplished.

## Materials

- ✓ Paper, writing and drawing materials for each student or group of students. *11" X 17" paper is suggested.*
- ✓ Simple Machines Information Sheet
- ✓ 6 ears of corn in plastic bag (the cobs can be used in Tinkering Outside the Box lesson)

## Vocabulary

- **Rube Goldberg** - Pulitzer Prize winning cartoonist and engineer who drew contraptions that satirized the new technology and gadgets of the day.

## Procedure

1. Exhibit an ear of corn and discuss how corn can be shelled manually. Allow groups of students to shell an ear of corn. Reserve the kernels for the extension activity in this lesson. The cob may be used in Tinkering Outside the Box lesson.
2. Share the following Rube Goldberg background information with the students:

Source: <http://www.rubegoldberg.com> (Samples of illustrated machines, additional background information and hints for a successful project can be found on this site.)

"The Rube Goldberg Machine Contest brings the ideas of Pulitzer Prize-winning artist Rube Goldberg's "Invention" cartoons to life. Named after, and inspired by the cartoonist Reuben Lucius Goldberg, this Olympics of Complexity is designed

to pull students away from conventional problem-solving and push them into the endless chaos of imagination and intuitive thought. To be specific, groups are given an elementary challenge: something as simple as peeling an apple, sharpening a pencil, or putting toothpaste on a toothbrush. But instead of just “solving” the problem, students have to make the solution as complicated and as convoluted as possible. In fact, the more steps – there’s a minimum of twenty – the better the Rube Goldberg Machine. And what a machine! An assemblage of ordinary objects, mechanical gadgets, and the oddest odd and ends are linked together and somehow get to the desired goal.

Rube Goldberg drew his “Inventions” as contraptions that satirized the new technology and gadgets of the day. His drawings, using simple machines and household items already in use, were incredibly complex and wacky, but somehow (perhaps it was because Rube was a graduate engineer) the “Inventions” always had an ingenious, logical progression as they worked to finish their task.”

3. Tell students that they will be given a simple task to illustrate and explain, but their goal is to make steps of the completed task as tedious as possible. They may work in groups.
4. Students must use: a minimum of 3 simple machines (and be able to identify them) in their solution, and 10 separate, different steps to complete the task.
5. The task to complete: “Shell (take all of the kernels off) one ear of corn and put kernels into a container.” (Any type of container will suffice.)
6. Students devise the machine that will shell the corn, then illustrate the machine (with all steps included) and write the description of each step of the solution.
7. Each group will orally present their concept drawing and explain how their invention works.
8. Students’ illustrations and descriptions can be displayed in class.

## **Extension Activities**

1. Pose the question: “What can we do with the shelled kernels of corn?” Allow students to determine what will be done with the kernels. Some suggestions might be putting it into a school bird feeder, take it home to feed birds, use it for math calculations (weight, measurement, etc.) or grinding it to make corn meal (using either a coffee grinder or a mortar and pestle).

## Standards

### ***Illinois Science Standard***

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

### ***Illinois English Language Arts Standard***

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions

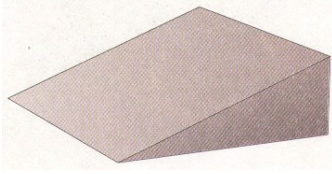
The **M**ultidisciplinary **A**gricultural Integrated **C**urriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in September 2021.



These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

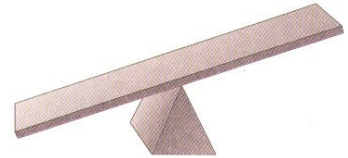
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## Simple Machines Information Sheet



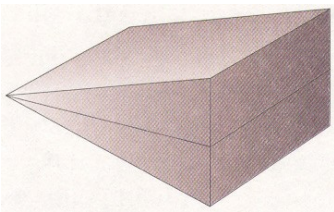
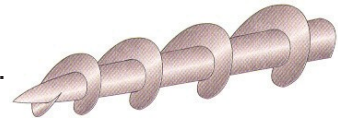
An **inclined plane** is a sloping surface that can be used to help move items over a certain distance. By spreading the amount of work needed over a larger distance, less force is needed at any particular moment. It can help move things up and down.

A **lever** is a device such as a bar or board that pivots on a fulcrum. It allows weight to be moved a short distance with a concentrated amount of force. The fulcrum can be moved depending on the weight of the object being lifted. For instance, when you push down on one end the other end lifts up.



A **pulley** is a wheel with a grooved rim over which a rope, cable or chain passes. It changes the direction of the force applied which makes the work easier. For instance, when you pull down on the rope, you can lift an object attached to the other end of the rope.

A **screw** is an inclined plane wrapped around a shaft or cylinder. It allows a force to be concentrated. It may be used to fasten or move things. It may move itself, an object, or material surrounding the object.



A **wedge** is two inclined planes attached back to back. When you use the pointed and often sharp edge of an inclined plane, you can separate or split things when force is applied.

A **wheel** is a circular object or disk which revolves on a central point such as an **axle**, such as a bar or cylinder. These two parts work together. As the wheel turns the axle also turns. When the axle turns, the wheel turns a greater distance than the axle, but less force is needed to move it. The axle moves a shorter distance but requires a greater force to move it. They are used to move things and change power, speed or direction. It reduces the amount of friction an object creates during its motion.

