



CHAIN REACTION MACHINES

LESSONS 4: My Chain Reaction Machine

LESSON OVERVIEW	GRADE LEVEL	BASE LESSON TIME
In this lesson, students will be given time to build their own chain reaction machine. Using knowledge gained from previous lessons, students will go through the engineering design process. They will design, build, and test and then re-build their machines	K-8	120+ minutes (Lesson should be taught across multiple days)

TEACHER/LEADER TIPS

This lesson focuses on the building of the student's own original chain reaction machine. It may be done in class or outside of class depending on your approach to the Young Inventor's program and the rules of your School Invention Fair. If building is done in class, it is strongly recommended that teachers allow a minimum of two class periods for students to build, test, and rebuild their machines. There should be at least two iterations of a design, so that students can determine what does and does not work and then practice and understand how to identify challenges, evaluate them, and respond with a re-design. If building is completed at home or outside of class, teachers may skip or shorten this lesson.

If preparing students for local school invention fairs and regional invention conventions, it is strongly encouraged that teachers explain the rules and requirements for the Chain Reaction Machine category of competition so that student projects are eligible.

Teachers may choose to show the accompanying Google Slides: YIP Chain Reaction Machine Lesson 4 with the class for the Warm Up Activity. Slides are not used after this point.

GETTING YOURSELF READY

Materials:

- Google Slides: YIP Chain Reaction Machine Lesson 4: My Chain

Your Preparation:

- Set up Google Slides: Lesson 4
- Set up work space and

Agenda:

- Warm Up: Review Simple Machines (5 minutes)
- Activity: Building My

<p>Reaction Machine</p> <ul style="list-style-type: none"> • 1914 Rube Goldberg Cartoon “How to Catch a mouse” (included in Google Slides: Lesson 4) • Materials for chain reaction machine building such as recycled products, materials students bring from home, scissors, glue, string, tape, paper, etc. • Any safety goggles or gloves if appropriate • Changes to My Chain Reaction Machine worksheet (included in YIP CRM Inventor’s Journal) • Chain Reaction Machine Testing Feedback Grid worksheet (included in YIP CRM Inventor’s Journal) • YIP CRM Inventor’s Journals • Pens/pencils 	<p>materials</p>	<p>Chain Reaction Machine (90+ minutes, divided across multiple class sessions)</p> <ul style="list-style-type: none"> • Activity: Testing and Re-designing the Chain Reaction Machine (this takes place throughout the lesson) • Closure: (5 minutes)
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GETTING YOUR STUDENTS READY

Objective:

Students will be able to create a complex machine to complete a simple task using a series of simple machines in a chain reaction. They will then evaluate how to modify their original design and materials based on testing. Students will continue to modify their design and test to develop a most successful invention. Finally, students will be able to explain the importance of testing and re-designing in the invention process.

CONTENT

Warm Up: Review Simple Machines (5 minutes)	Show students a picture of the 1914 Rube Goldberg Machine, “How to Get Rid of a Mouse” (included in Google Slides: Lesson 4). Ask them to identify the simple machines.
Activity: Building My Chain	Tell students that they will now have time begin to build their Chain Reaction Machine based the idea and the design they developed in Lesson 3.

<p>Reaction Machine</p> <p>(90+ minutes, across multiple class sessions)</p>	<p>Remind students of the requirements for the Chain Reaction Machines:</p> <ul style="list-style-type: none"> • projects may be done individually or in groups of no more than 4 students • device must be safe to operate and must not cause damage • device must use at least 4 different simple machines (lever, incline plane, wheel & axel, screw, wedge, and pulley) • device must involve a minimum of 6 steps to complete the task • student may trigger the beginning action <p>Tell students where they can find materials and establish guidelines for safety and safety procedures as appropriate.</p> <p>Allow for independent work time.</p> <p><i>Note to Teacher: At certain points during the building process. Ask students to test their machines. What is working well? What changes and modifications are required to make the machine successfully complete the steps and the entire task? Have students work together for feedback and use the Chain Reaction Machine Testing Feedback Grid (several copies are included in the YIP CRM Inventor Journal) to record their observations. Then, ask them to draw their redesigned machines with the necessary changes on the Changes to My Chain Reaction Machine worksheet (included in the YIP CRM Inventor Journal). Students may add additional pages to their journals if they need more space to draw and re-draw their designs. Encourage students to continue to test and re-design throughout the building process until they are satisfied with the final result.</i></p> <p>When finished, students should “run” their machine several times to ensure that it works consistently. Again, making changes as needed.</p> <p>All design notes, as well as drawings and model descriptions may also be recorded in the YIP CRM Inventor’s Journal.</p>
<p style="text-align: center;">CLOSURE <i>(Check for Understanding)</i></p>	
<p>Closure: (5 minutes)</p> <p>Closure for Work Session 1 (and any others that follow): Have students reflect on what worked and what did not work during their build. Ask them to list 2 modifications they plan to implement in their next build session based on their progress today. Plans may be recorded in their YIP CRM Inventor’s Journals.</p> <p>Closure for Final Work Session: Ask students to list their biggest challenge and their biggest success during their build. Responses may be recorded in their YIP CRM Inventor’s Journals.</p>	

