



Invention Exhibit Resources Overview

Standards Covered

Science

2010 Standards

- 4.4.3 Investigate how changes in speed or direction are caused by forces: the greater the force exerted on an object, the greater the change.
- 4.4.4 Define a problem in the context of motion and transportation. Propose a solution to this problem by evaluating, reevaluating, and testing the design. Gather evidence about how well the design meets the needs of the problem. Document the design so that it can be easily replicated.

2016 Standards

- 4.PS.2 Investigate the relationship of the speed of an object to the energy of that object.
- 4.PS.3 Investigate how multiple simple machines work together to perform everyday tasks.
- 7.PS.5 Investigate Newton's second law of motion to show the relationship among force, mass, and acceleration.
- 3-5.E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Social Studies

- 4.1.11 Identify and describe important events and movements that changed life in Indiana in the early twentieth century.

ELA

- 4.RN.1 Read and comprehend a variety of nonfiction within a range of complexity appropriate for grades 4-5. By the end of grade 4, students interact with texts proficiently and independently at the low end of the range and with scaffolding as needed at the high end.
- 4.RN.4.2 Combine information from two texts on the same topic in order to demonstrate knowledge about the subject.
- 4.SL.4.2 Create oral presentations that maintain a clear focus, using multimedia to enhance the development of main ideas and themes that engage the audience.
- 4.RV.1 Build and use accurately general academic and content-specific words and phrases.

Objectives

- *Students will be able to use and apply content specific vocabulary.
- *Students will be able to explain what a chain reaction machine is and how it works.
- *Students will be able to discuss ways to improve a chain reaction machine.
- *Students will design and create their own chain reaction machine.
- *Students will be able to research an inventor, and be able to explain their invention(s) as well as their connection to Indiana.
- *Students will analyze information from both a video and a text to understand chain reaction machines.
- *Students will construct their own chain reaction machine using found objects.
- *Students will enhance or improve their chain reaction design to make it more efficient.

In-Class Activities

Activity #1

Invention Vocabulary Development

Standards

ELA

4.RV.1 Build and use accurately general academic and content-specific words and phrases.

Objectives

*Students will be able to use and apply content specific vocabulary.

Lesson Ideas

Review with students the vocabulary words related to the Rural Electrification Exhibit. Students should copy down these words in their science notebooks while the teacher reviews the definitions.

Enrichment

Students could look up the words themselves to find the definitions and write them in their science notebooks.

Differentiation/Accommodation

Students could be given a copy of the Vocabulary List for Teachers to glue into their science notebooks while the teacher reviews over the definitions.

Practice/Assessment

Students are given the Vocabulary Activities handout. This can be used as an assessment to gauge student understanding of the words or just as a practice to help students learn the definitions.

Resource for activity #1

Inventions Exhibit

Vocabulary List for Teachers:

<u>Word</u>	<u>Definition</u>
applied force	A force applied to an object by a person or another object (ex. pushing or pulling)
chain reaction machine	Performs a task through a series of reactions, for example one domino knocks down another, then that one knocks down the next domino
chute	A passage through which things move, may be level but often goes down
mechanical lift	Used to move things by picking them up
patent	Right granted to an inventor for the exclusive use, production, or sale of the invention

Resource for activity #1

Vocabulary Activities

Match the following vocabulary words with their definition.

<p>_____ applied force</p> <p>_____ chain reaction machine</p> <p>_____ chute</p> <p>_____ mechanical lift</p> <p>_____ patent</p>	<p>A.) A passage through which things move, may be level but often goes down</p> <p>B.) A force applied to an object by a person or another object (ex. pushing or pulling)</p> <p>C.) Right granted to an inventor for the exclusive use, production, or sale of the invention</p> <p>D.) Performs a task through a series of reactions, for example one domino knocks down another, then that one knocks down the next domino</p> <p>E.) Used to move things by picking them up</p>
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Activity #2

Invention Informational video and Text Standards

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2016 Standards

- 4.PS.3 Investigate how multiple simple machines work together to perform everyday tasks.
- 3-5.E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

ELA

- 4.RN.1 Read and comprehend a variety of nonfiction within a range of complexity appropriate for grades 4-5. By the end of grade 4, students interact with texts proficiently and independently at the low end of the range and with scaffolding as needed at the high end.
- 4.RN.4.2 Combine information from two texts on the same topic in order to demonstrate knowledge about the subject.

Social Studies

- 4.1.11 Identify and describe important events and movements that changed life in Indiana in the early twentieth century.

Objectives

- *Students will analyze information from both a video and a text to understand chain reaction machines.
- *Students will construct their own chain reaction machine using found objects.
- *Students will enhance or improve their chain reaction design to make it more efficient.

Lesson Ideas

Explain to students they will be watching a video about chain reaction machines. Take a few minutes to answer questions and explain what chain reaction machines are. Watch the YouTube video: <https://www.youtube.com/watch?v=6FzUx2EFk8s> . Have students observe what is happening in the video. Explain that this is a very large chain reaction machine. See if they can find the different applied forces. Next pass out the paragraph on Rube Goldberg. Have students read through the paragraph. They can then answer the questions about chain reaction machines and Rube Goldberg.

Enrichment

Have students do much research into Rube Goldberg and the contest that is held for students every year in his honor. <https://www.rubegoldberg.com/>

Differentiation/Accommodations

You may have a small chain reaction machine already set up in the classroom for students to see and use before viewing the video. Students could also read the paragraph and answer the questions with a partner.

Assessment

You could use Activity #3 as an assessment.

Resource for activity #2

Rube Goldberg

One objective of engineering is to design machines to help people accomplish tasks. Rube Goldberg originally went to school for engineering so he could do this. However, he became an artist instead. His interest in engineering showed in his art. He drew cartoons of inventions that did simple things in very complicated ways. Most of his inventions were chain reaction machines which perform a task through a series of reactions. These reactions are caused by **applied forces**. A force is applied to the object from another object. For example, one domino knocks down another and then that one knocks down the next domino.

Answer the following questions based off the video and what you read in the text.

1.) What are some of the applied forces you saw in the video?

2.) What did you like about the machine you saw in the video? What would you have done differently?

Activity #3

Design your own Chain Reaction Machine

Standards

Science

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3-5.E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Objectives

*Students will be able to explain what a chain reaction machine is and how it works.

*Students will be able to discuss ways to improve a chain reaction machine.

*Students will design and create their own chain reaction machine.

Lesson Ideas

Review with students what a chain reaction machine is. Remind them what an applied force is. Review what they saw in the YouTube video. Challenge students to create their own chain reaction machine with found objects. After running their machine, they should make changes and re-design the machine to make it even more efficient.

Enrichment

Have students create 2 different chain reaction machines, a more simple and quick machine and a more complex machine. They could also be challenged to have their machine perform a particular task such as roll a ball into a cup.

Differentiation/Accommodations

Students may work in pairs for this project. They also may be given a chain reaction machine that is started and just needs to be completed.

Assessment

Students can be assessed not only on their machine, but also on the design changes they made to their machine and their reasoning's for those changes.

Activity #4

Inventors with Indiana Connections

Standards

Social Studies

4.1.11 Identify and describe important events and movements that changed life in Indiana in the early twentieth century.

ELA

4.SL.4.2 Create oral presentations that maintain a clear focus, using multimedia to enhance the development of main ideas and themes that engage the audience.

Objectives

*Students will be able to research an inventor, and be able to explain their invention(s) as well as their connection to Indiana.

Lesson Ideas

Give students the list of Inventors with Indiana Connections. Let them choose 3 of the inventors to research. They should fill out an Inventor Investigation Worksheet about each inventor. They then need to choose their favorite inventor of their 3 to do more in-depth research on. This should include their connection to Indiana along with any other items they may have invented, as well as any other interesting information about the inventor.

Enrichment

Have students create presentations on their inventor. This could include a Prezi, poster, PowerPoint, etc.

Differentiation/ Accommodations

Students could work with partners on the research project. Students could be given pre-printed information about their chosen inventors for them to look through. Students could be supplied with a Symbaloo of websites for them to go to for more information about their inventors.

Assessment

Completed Inventor Investigation Worksheets and presentations can be used as an assessment.

Resources for activity #4

Inventors with Indiana Connections

Philo Farnsworth - As a teen in 1921, Farnsworth figured out how to send pictures through an all-electronic television system that didn't need complex moving parts. His **image dissector** – made in Fort Wayne - helped spread TVs around the world.

Marion Donovan - Tired of cleaning up spills from leaky diapers, Fort Wayne native Marion Donovan used a shower curtain to sew a leak-proof diaper cover in 1946. Later she added a special absorbent paper to create the first **disposable diaper**.

Elwood Haynes - In 1894, Elwood Haynes created and tested one of the first **gasoline-powered cars**, the Pioneer. Then he started a factory in Kokomo to mass-produce cars. Later he invented stainless steel in the company's laboratory.

Ralph Baer - By day, Baer made Army defense systems. At night, he created the first TV **video games**. His invention led to the Magnavox Odyssey game system, made in Fort Wayne in 1972. Later, he invented other electronic toys, like Simon.

Robert Borkenstein - Upset by drunk-driving wrecks, Borkenstein invented the **breathalyzer** in 1954 so police could quickly prove a driver was drunk. Later, the Fort Wayne native taught forensic science at Indiana University.

Andrew Moyer - Penicillin mold has long been recognized as a powerful antibacterial medicine. Early on, it could only be grown in small batches, slowing its production. Indiana native Andrew Moyer developed a method to grow mold faster, enabling **industrial production of penicillin**. In other words, Moyer's discovery meant a lot more penicillin could be produced. His 1944 breakthrough saved countless lives.

Madame Walker - in the 1890s, Walker's own hair loss inspired her to create a **healing shampoo** for African Americans. Walker created an entire line of products made in Indianapolis beginning in 1910.

Ralph Teetor - Hagerstown native Ralph Teetor, a blind engineer, invented **cruise control** after a rocky ride with his lawyer. Cruise control kept cars moving smoothly at a constant speed. Cruise control was first offered in some cars in 1958.

Gebisa Ejeta - Purdue professor Gebisa Ejeta developed a special **grain sorghum** variety that grows without much water. His research has helped feed people living in dry conditions worldwide.

Ball Brothers - In 1900, Frank C. Ball and his cousin Alvah created the world's first **automatic glass machine** at the Ball Corporation in Muncie. Soon, the Ball Corporation was making 90 million jars a year for people around the world.

James Oliver - James Oliver learned that cooling a plow blade right out of the hot iron furnace made it stronger. Farmers rejoiced in 1858 with the new **Oliver Chilled Plow** which was produced in South Bend.

Revra DePuy - Early on, doctors tried to protect broken bones with scraps of wood. These wooden splints didn't work very well. In 1895, Revra DePuy invented a better way with **fiber splints** that he made in his Warsaw company. Unlike a wooden splint, a fiber splint could be shaped to fit the person needing it.

Inventor Investigation Worksheet

Name of Inventor:

What did they invent?

Why did they invent it? What was the goal of the invention? What inspired them to invent it?

How did it improve life for the people in Indiana and other places?