

THE INVENTOR'S SECRET: WHAT THOMAS EDISON TOLD

HENRY FORD By Suzanne Slade/2015/ISBN 978-1-58089-667-2

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LESSON DESCRIPTION:

In this lesson, students will listen to the story of Thomas Edison and Henry Ford, two American innovators who became lifelong friends. Students will learn about the products created by the two men, and how their consumers affected their production and price setting. Students also will learn how curiosity and determination led to innovation of ideas, goods and services that improve human quality of life. Students then will demonstrate innovation by helping solve a problem in their community.

Other: The book includes details about inventions featured in the text (electric pen, phonograph, electric light and the early car), details about sources used to compile the information in this text, a timeline of events, notes from the author and illustrator, and a selected bibliography of websites and books.

GRADE LEVEL: 3-5

CONCEPTS: producers, consumers, costs and benefits, inquiry, curiosity, determination, invention, problem solving, goods/services

TIME REQUIRED: 60 minutes (read story and look at inventions); additional time will be required to solve a problem in your local school, home, or community. The total amount of time is determined by the teacher.

CONTENT STANDARDS

C3 FRAMEWORK:

- D2.Eco.1.3-5. Compare the benefits and costs of individual choices.
- D2.Eco.8.3-5. Identify examples of external benefits and costs

NATIONAL STANDARDS IN PERSONAL FINANCE: II

- Buying Goods and Services. Grade 4, No. 5. Informed decision making requires comparing the costs and benefits of spending alternatives. Costs are things that a decision maker gives up; benefits are things that a decision maker gains.
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OBJECTIVES

- Students will identify and define consumers, producers, and price.
- Students will conduct an investigation that leads to innovation or an invention.
- Students will understand the inquiry/problem-solving process.
- Students will predict where inventions/innovation may lead.



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MATERIALS

- Book
- Visuals of inventions—print double-sided with picture on the front and description on the back.
- Handout: It's Your Turn! Be an Innovator!

PROCEDURES

- Silently show students a picture or video of an invention or innovation they likely never have seen (<http://bit.ly/16QK9y> is an example). Ask students the following questions about what they just saw:
 - What questions or comments do you have about this invention?
 - If people who use resources to make goods and services are **producers**, who do you think produced the invention and why?
 - What problem(s) might this invention have solved/will solve?
 - The people who will buy and/or use this good to satisfy a want are called consumers. Who do you think would be the **consumers** of this product and why?
 - **Price** is the amount that people pay when buying a good or service. What do you think is an appropriate price for this item?
 - What else had to be invented before this item could be?
 - What problems might have the inventors faced in inventing this item?
- Tell students that today, they will look at a story about two inventors in the United States who made things we still use. Ask students to think about what was produced in the story and why, who the consumers/users of the products were and why, what the price of those goods were and why they varied, and what problem(s) the inventions solved. Ask students to think about what problems the inventors faced and how they overcame them.
- The teacher will then read the book to the class.
- Have students provide a brief summary of the book. Ask them to recall the inventions, the inventors, and the moral to the story. Ask them who the producers in the story were, who the consumers in the story were, and the effect the producer and consumers had on the goods.

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- Tell students they will examine those inventions a little more closely. Using Visual 1, show the class a picture of the invention. Ask students the following questions:
 - What is this product/invention? Who produced/invented it?
 - What problem do you think it solved?
 - Who might have been the consumers of the product?
 - How do you think this invention improved life?
 - What do you think had to be invented before this was?
 - What inventions have come about because of this one?

Then read the description on the back of the picture out loud to the class. Repeat this process with each invention on visuals 1-5.

- Tell students now that they have examined the inventions a little more closely, they will turn their focus to the inventors themselves. Ask students to answer the following questions:
 - What were these inventors like?
 - How did they demonstrate curiosity?
 - How did they demonstrate determination?
 - How did they demonstrate strong problem-solving skills?
 - How did these characteristics enable them to become inventors and improve the lives of others?
 - How do your friends in this class demonstrate these characteristics? How do you?
 - What does that say about them? What does it say about you?
- Review the answers students provided to the questions above. Tell students that not all inventions are physical products; some are **services**, which are activities that can satisfy people's wants. Ask students to provide examples of services. (*Student answers will vary: lawn mowing, dog walking, babysitting*) Reaffirm with students that, yes, all of those are activities that satisfy people's wants. Tell students that today they are going to become innovators by coming up with ideas for goods or services to help their community.
- Give students a copy of "Handout 1: It's Your Turn! Be an Innovator!" Read the directions together. Remind students that just like Edison and Ford, they have to identify a "problem" that can be fixed or improved.

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- Tell students you are going to model the process for completing this worksheet by providing an example of a problem in your community that recently has been addressed, or one that exists.
 - o Here is an example:
 1. *Problem: A lot of kids are getting hurt during recess.*
 2. *Turn that into a question: Why are kids getting hurt during recess, and how can we minimize injuries?*
 3. *Who are the producers of the solution? the students in this class with help from teachers and administrators.*
 4. *Who are the consumers? the students on the playground.*
 5. *Data sources: 1) talk to kids about what injuries they have, 2) ask how they were injured, 3) watch kids play and see if they witness anyone getting hurt, 4) walk around the playground and look for hazards.*
 6. *Data findings: 1) kids are getting hurt on the playground, 2) all were hurt on the pavement on the playground, 3) we saw a kid fall and skin his knee when he was running on the pavement, and 4) we saw a hole in the pavement.*
 7. *Inferences: 1) the hole likely is the culprit 2) it needs to be fixed, 3) kids will get hurt if it goes unfixed and, 4) the problem will get worse over time.*
 8. *Solutions: We can either: 1) ask the school to fill the hole, 2) have kids play kickball in the grass instead of the pavement, 3) have recess indoors until it is safe to play outside, or 4) fill the hole ourselves with smaller rocks, and grass.*
 9. *Costs/Benefits of each choice: 1) expensive, but effective, 2) free, not as fast/fun, but safer ... unless there is a hole in the ground, 3) free, not as fun, can't run around, but it is safe, 4) free, but might not be any safer, although could be a temporary fix.*
- Have students complete Handout 1: "It's Your Turn! Be an Innovator!" Let them share their ideas with the class about problems that need to be solved in their school, home, favorite place to play, and elsewhere. Write their ideas on the board. Ask students to pick the top three ideas they would like to investigate. Have them find classmates who have similar interests.
- Give students a copy of Handout 2. Read the directions together. Remind them that these were the same steps Edison and Ford used to make their products, but these steps can be applied to solving problems or offering new services.
- Explain each category on the worksheet.
 - o Let students brainstorm the "data sources" section before gathering the data.
 - o Give students time to gather the data and record their findings in the "data findings" boxes.
 - o In their groups, students should be able to make inferences about their findings.

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- Have students continue the investigation until complete. (This step may be divided over time). They will gather data, prepare to present their data through charts/graphs/pictures, present their data, and propose solutions based on the data.

CLOSURE

- At the end of each day, ask students:
 - What is a producer? When do I act as a producer?
 - What is a consumer? When do I act as a consumer?
 - How do producers and consumers affect the price of a good or service?
 - What roles do producers, consumers, and price play in my investigation?
- After all groups have completed their investigations, have them report their findings to the class. Let other students ask questions of other groups as needed. Stop each presentation after each group shares the costs and benefits of each solution; have other students guess the group's recommended solution based on what they just learned. Then, have the group reveal its choice and justification.
- After each group presentation, ask all students who the producers and consumers were/are for each group. Ask all students if they have ideas for other potential solutions to the problem they heard.
- Remind students that just like Edison and Ford, they too, are thinking of producers and consumers when they tackle these problems. They are exercising the same innovation and determination to find solutions to problems.

ASSESSMENT

- It's Your Turn! Be an Innovator!—Students will conduct their own investigations and write a proposal for addressing a problem in their community.
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[Extended Learning] This lesson helps set the groundwork for an interdisciplinary unit on inventions/innovation. Here are some quick ideas for how to do that.

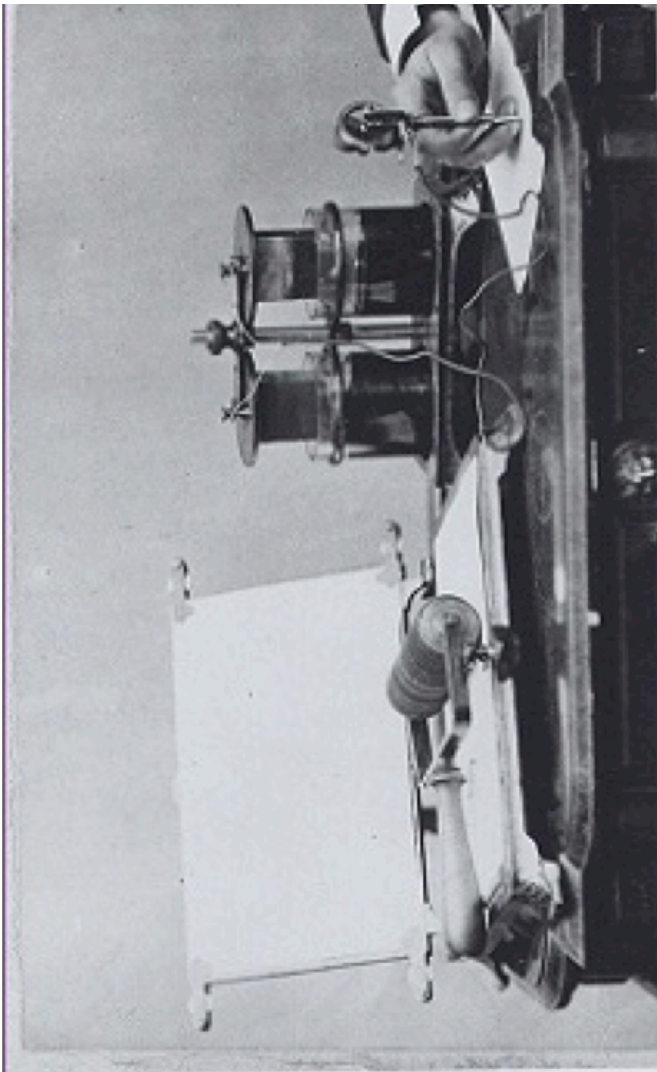
Choose a problem for the class to take on that either: a) no one had investigated previously or b) is something all students would like to investigate further. Then, have the class repeat the process in greater depth by applying discipline-specific skills to the investigation.

- Social Studies—research and gather data using primary and secondary sources
- Science—use the scientific method to test their solutions to their problems.
- Math/Economics—consider the cost of their project (human, capital, natural resources as well as opportunity cost), and ways to finance the project.
- ELA—students then will write a proposal for the appropriate audience with the suggestion for how to fix the problem. They may give a presentation to the audience, if appropriate.

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VISUAL 1: THOMAS EDISON'S ELECTRIC PEN



Edison's Electric Pen. National Park Service. <https://www.nps.gov/edis/blogs/year-of-innovation-octobers-featured-exhibit-is-edisons-electric-pen.htm>

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Edison invented the electric pen in 1875 with the assistance of Charles Batchelor. The penlike shaft had a reciprocating needle that was driven by a small motor powered by a wet-cell battery.

As the user wrote or drew on a wax stencil, the needle made thousands of perforations per minute. The stencil was then placed in a press, and a roller forced ink through the holes, creating multiple copies (up to 15,000 according to Edison's advertisements).

The battery was a drawback, however; clerks complained that it was messy, heavy and expensive. Despite that, sales proved strong across the United States, Europe and Latin America. By the 1880s, typewriters became more widespread, and mechanical pens that did not require batteries appeared on the market. The electric pen later evolved into the mimeograph and the tattoo needle.



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VISUAL 2: THOMAS EDISON'S PHONOGRAPH



Original Edison Tin Foil Phonograph. Photo courtesy of U.S. Department of the Interior, National Park Service, Edison National Historic Site. <https://www.loc.gov/collections/edison-company-motion-pictures-and-sound-recordings/articles-and-essays/history-of-edison-sound-recordings/history-of-the-cylinder-phonograph/>

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In 1877, Edison turned the crank on his tinfoil phonograph and said, "Mary had a little lamb." The sound waves of his voice vibrated a flexible diaphragm inside, which caused a needle to vibrate. The vibrating needle scratched small dents in a piece of tinfoil wrapped around a cylinder. After adjusting the machine to play back sounds, Edison turned the crank again. The scratches on the tinfoil made the needle vibrate, causing the diaphragm to vibrate and reproduce his voice.

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VISUAL 3: THOMAS EDISON'S ELECTRIC LIGHT



Edison's Electric Light Bulb. Rutgers. "Thomas A Edison Papers. <http://edison.rutgers.edu/lamp.htm>

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The electric light, or light bulb as we call it today, is Edison's most famous invention. A metal socket on a glass bulb held a thin filament inside. Electricity heated the filament until it glowed. Edison's biggest challenge was finding a filament that would glow a long time and not burn up or melt. After testing boxwood, hickory, cedar, and thousands of other materials, he finally chose a carbonized bamboo filament for his commercial light.

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VISUAL 4: HENRY FORD'S EARLY CAR



Henry Ford's Quadricycle. <https://corporate.ford.com/company/history.html>

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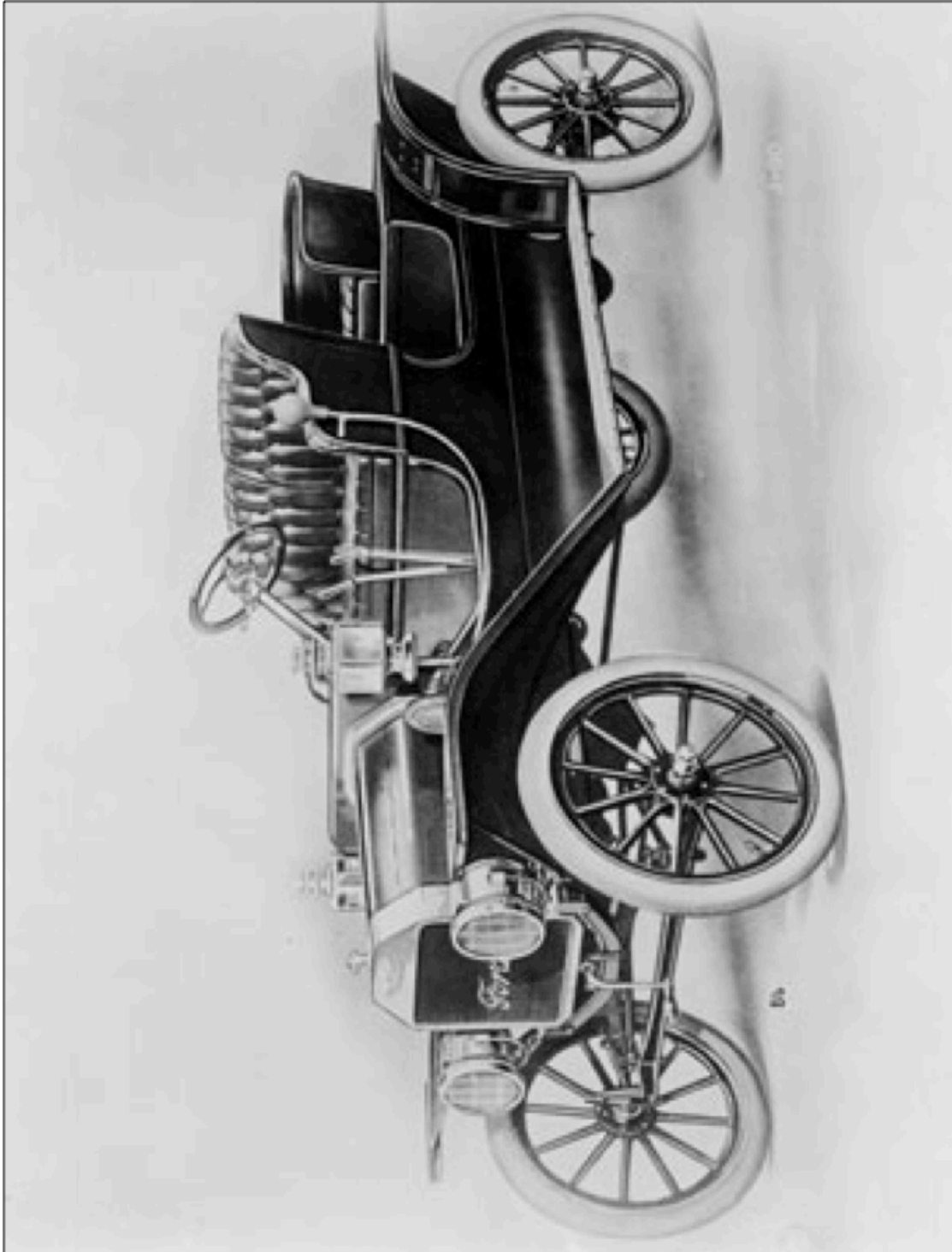
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Henry Ford's first vehicle rode on four bicycle wheels and was powered by a four-horsepower engine. Instead of a steering wheel, the Quadricycle had a tiller. The gearbox had only two forward gears with no reverse.



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VISUAL 5: HENRY FORD'S MODEL T



Henry Ford's Model T. <https://corporate.ford.com/company/history.html>

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Henry Ford's Model T put the world on wheels with a simple, affordable, durable automobile. Ford sold 15 million Model Ts before ceasing production in May 1927, making it one of the best-selling vehicles of all time, and arguably the most famous car in the world. In 1908, there were only about 18,000 miles of paved roads in the United States. To deal with the primitive roads, Ford used light and strong vanadium steel alloy for critical parts. At the time, most automobiles were luxurious novelties rather than affordable transport. But to appeal to the mass market, Ford's vehicle also had to be reliable and easy to maintain.

<https://corporate.ford.com/company/history.html>



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HANDOUT 1: IT'S YOUR TURN! BE AN INNOVATOR!

Directions: The inventors you read about created products that improved our quality of life. However, inventions do not have to be products. They also can be a way to solve a problem. Using the chart below, brainstorm ways to fix problems or improve the situation at your school, home, favorite place to play, or other place you would like to add. Next, gather in small groups and share your ideas. Then share those ideas with the class.

It's Your Turn! Be an innovator! (Part 1)		
Inquiry Process	Problem	Question to investigate
	What is a problem that needs to be addressed here, or how can these areas be improved?	Turn your problem into a question
School		
Home		
Favorite place to play		

HANDOUT 2: IT'S YOUR TURN! BE AN INNOVATOR! (PART 2)

Directions: After you have shared your ideas, identify the top three problems you would like to solve. See if you can find classmates who share the same interests. As a small group, decide which of the four problems you would like to tackle. Then, fill out the chart below.

It's Your Turn! Be an innovator! (Part 2)				
My question to investigate:				
1	2	3	4	
Data Sources What information is needed to identify solutions to this problem? Where will you get that information?				
1	2	3	4	
Data Findings What did the data say? What did you learn from the data?				
1	2	3	4	
Inferences What did the data suggest about the problem and potential solutions?				
1	2	3	4	
Solutions Based on your investigation, what are four ways your solutions address the problem?				

It's Your Turn! Be an innovator! (Part 2)

Benefits

Costs

Write your solution options in the boxes below

Solution 1:

Solution 2:

Solution 3:

Solution 4:

Based on your costs and benefits analysis, which solution do you recommend and why?

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