




Automating Tasks with Simple Machines

OVERVIEW

Students will learn the concept of automation, understand how simple machines can be used for automation, and design and build a simple automated device using basic materials.

<p>AUTHOR DaChelle Gupton</p>	<p>GRADE LEVEL 6-8</p>	<p>CONTENT AREA STEM/Science</p>
		
<p>ESSENTIAL QUESTIONS</p> <p>How do simple machines, such as levers, pulleys, and inclined planes, contribute to the automation of tasks in everyday life?</p> <p>What are the benefits and limitations of using simple machines to automate tasks, and how do engineers apply these principles in designing efficient systems?</p>	<p>TIME NEEDED</p> <p>Learning Activities (20 minutes) Hands-on Activity (40 minutes)</p>	<p>STANDARDS</p> <p>7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency</p> <p>This lesson can be altered to support multiple grade-levels</p>



Making Connections

Prior to delving into the lesson on automating tasks with simple machines, it is beneficial for students to have a foundational understanding of basic physics concepts such as force, motion, and energy. They should also be familiar with the fundamental principles of engineering design, including problem-solving strategies and the iterative process of prototyping and testing. Additionally, having prior knowledge of the six types of simple

machines—levers, pulleys, wheels and axles, inclined planes, wedges, and screws—will provide students with a solid framework for comprehending how these devices can be utilized in automated systems. Furthermore, an awareness of the significance of automation in modern society, including its impact on efficiency, productivity, and job sectors, can help students contextualize the relevance and importance of the lesson. By connecting prior knowledge to the upcoming lesson, students will be better equipped to engage with the material and apply their understanding to the hands-on activities and discussions ahead.

Background

In today's rapidly advancing world, automation plays a pivotal role in revolutionizing industries, enhancing efficiency, and shaping the future of work. This lesson aims to introduce students to the fundamental concepts of automation and simple machines, empowering them to explore how basic mechanical devices can be utilized to automate tasks and solve real-world problems.

Materials

- Cardboard or foam board
- Popsicle sticks, straws, or other craft sticks
- Rubber bands
- Tape
- Markers
- Small objects like marbles or paper clips (optional)

The Activity

Part 1: Warm-up

- Show students a [video](#) or pictures of examples of automation in everyday life, such as automatic dishwashers, traffic lights, or self-driving cars. Ask them what they notice about these systems and how they function.

Part 2: Discussion on Simple Machines and Brainstorming

- Introduce the concept of automation as the use of machines and systems to perform tasks without human intervention. Discuss the benefits of automation, such as increased efficiency, accuracy, and safety.
- Explain how simple machines such as levers, pulleys, ramps, and wheels can be used in automated systems to change forces and directions. Use demonstrations or diagrams to illustrate how these machines work.
- Divide students into pairs or small groups. Ask them to think of a daily task or chore that automation could make easier. Brainstorm ideas for devices that could use simple machines to automate that task.

Part 3: Hands-on Activity Instructions

- Give each group the materials and instruct them to design and build a simple automated device based on their chosen task. Encourage them to use the principles of simple machines in their designs.
- Students can sketch their design first, and then build their device.

- Allow time for testing and troubleshooting. Provide assistance and guidance as needed.
- Have students present their inventions to the class, explaining their chosen task, the simple machines used, and how their device works.

WRAP-UP AND ACTION

- Observe students' participation in discussions and activities.
- Evaluate the functionality and creativity of their automated devices.
- Ask students to reflect on the challenges and benefits of automation in their final presentations.

Extensions

- Have students research the history of automation and its impact on society.
- Discuss the ethical considerations of automation, such as job displacement and safety concerns.
- Explore the future of automation and its potential impact on different aspects of life.

Resources

[PBS Learning Media - Simple Machines](#)

[Generation Genius - Simple Machines](#)

[Khan Academy - Simple Machines](#)

[Ted Talk - The Power of Automation and How to Control it](#)

[Harvard Business Review Articles on Automation](#)

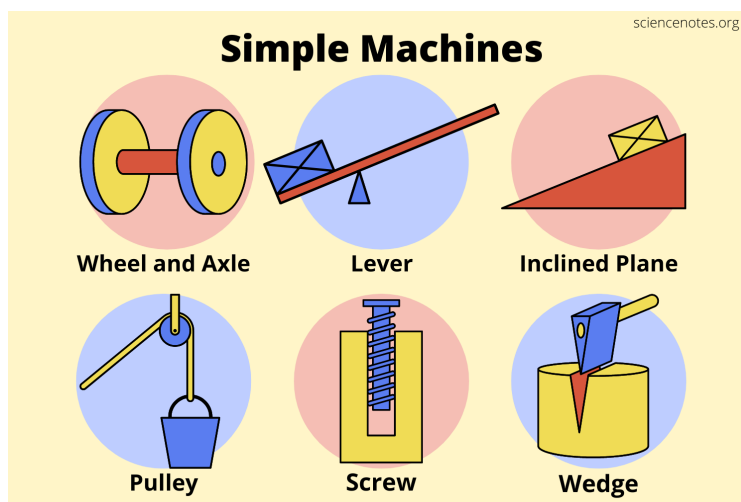
About the Author

DaChelle Gupton is a 23-24 Kenan Fellow. She is currently a STEM Coordinator in Pitt County Schools. She has been in education for almost 8 years and before becoming a STEM Coordinator, she taught middle school science.

About the Fellowship

DaChelle completed her fellowship at Hitachi Astemo, located in Tarboro, North Carolina. During her fellowship, she learned about the car parts that the company manufactured for their only customer at the time which was Honda. She learned the ins and outs of Hitachi Astemo from different leaders within the company and she got to get a firsthand look at how automation works within their company.

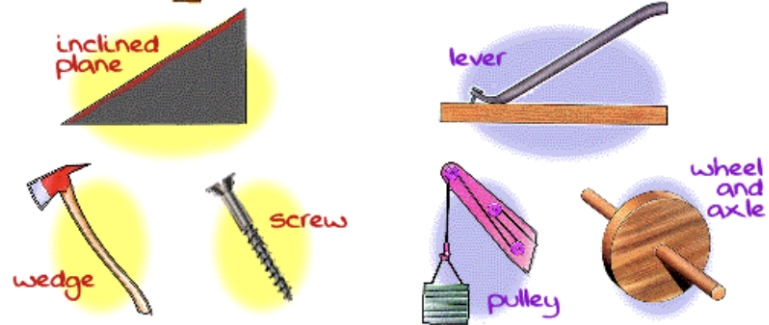
Student Pages



Simple Machines Scavenger Hunt!

Look around and find as many simple machines as you can. Look closely; they are everywhere! Use the pictures below as a guide.

Simple Machines



When you find a simple machine, write it down in the correct category in the table below. If you find a compound machine (one that combines more than one simple machine), record it in the compound machine row.

Simple Machine Type	Examples
Inclined plane	
Pulley	
Wedge	
Lever	
Screw	
Wheel and axle	
Compound machine	

Appendix

Criteria	3 points	2 points	1 point
Design & Creativity	The device demonstrates originality and creativity	The device shows some creativity in design	The device lacks creativity
Functionality & Efficiency	The device effectively automates the chosen task	The device mostly automates the task but may have minor flaws	The device does not effectively automate the chosen task
Use of Simple Machines	The device incorporated a variety of simple machines effectively to achieve its function	The device utilizes some simple machines to achieve its function	The device fails to utilize simple machines to achieve its function
Collaboration & Participation	All group members actively contribute to the design and construction of the device, demonstrating effective teamwork	Most group members contribute to the design and construction, but participation may be uneven or incomplete	Few group members contribute to the design and construction leading to an uneven distribution of effort

Each criterion is evaluated on a scale of 1 to 3 points, with 3 being the highest score indicating excellent performance, 2 indicating satisfactory performance, and 1 indicating below expectations.