FORTNITE

RUBE GOLDBERG MACHINES

Science & Engineering

Grades 7 to 12, one week lesson

Game Design and Development. This class is designed as a quest—or choice-based learning environment—that provides students with opportunities to take different approaches to meeting the learning outcomes based on their own interests, in terms of content as well as project options.

Classroom has computers available for all students, with flexible seating.

Lesson Overview

Who doesn't love a good Rube Goldberg Machine? Full of humor, wit, and based on simple machines, Rube Goldberg inventions are described as overly complex machines comprised of a number of automated actions to solve a simple problem. I can only imagine how thrilled Rube would have been if Fortnite Creative mode was available in his day. In this lesson, students will learn about simple machines, engineering, and automation. They will design and build a Rube Goldberg Machine in Fortnite Creative mode.

We hope you're not afraid of heights...

Students will create a Rube Goldberg Machine using Fortnite Creative mode. In the process, they will:
- Learn about simple machines,
- Apply the Design Thinking Model to create a complex solution to a simple problem,
- Demonstrate an understanding of automation, physics, and engineering principles as they design and build their functioning machine,
- Develop and test hypotheses while engaging in the iterative design process.

Essential Questions/Big Ideas

- How does the design thinking process support creative problem solving?
- How does hypothesis development and testing inform the design process?
- How do simple machines contribute to automation?

Learning Outcomes/Objectives

The student will be able to:
- Identify simple machines and their purpose,
- Develop and test a hypothesis,
- Create a Rube Goldberg machine comprised of a variety of simple machines that create a complex solution to a simple problem,
- Create a problem in order to develop a solution,
- Understand some of the basic principles of Physics.

Learning Activities

Hook

Show a selection of the following videos (These could be shown at different points throughout the project to maintain excitement about what's possible):

- Baller's Adventure Video: A Rube Goldberg Machine Created in Fortnite Creative mode
- Audri's Monster Trap
- This Too Shall Pass: OK Go Music Video Featuring Rube Goldberg Machine
- 2011 Google Global Online Science Fair: Rube Goldberg Machine
- Getting an Ice Cream: Purdue Society of Professional Engineers Rube Goldberg Team 2016

Instruction: Rube Goldberg, Simple Machines, and The Design Process

1. Rube Goldberg: The Man Behind the Machine: Read and discuss.
2. What are simple machines? Simple Machine Facts: Review the types of simple machines:
   - Lever
   - Wheel and Axle
   - Inclined Plane
   - Wedge
   - Pulley
   - Screw
3. Have students define simple machines in their own words, and identify examples of each from everyday life. (Sample worksheet attached.)
4. Discuss the Engineering Design Process / Iterative Design Process: https://www.teachengineering.org/k12engineering/designprocess

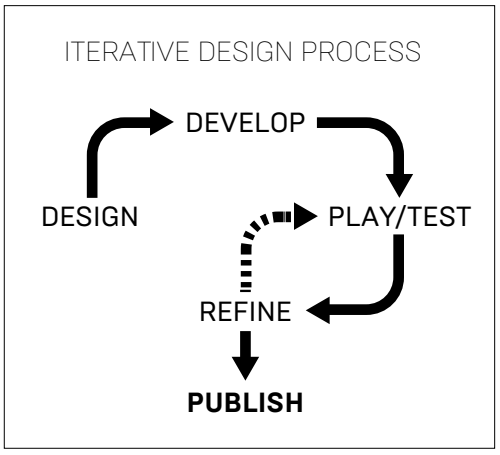
Exploration

Experiment with Fortnite Creative mode to get a sense of the different devices and how they work in order to automate functions in the game.

- Create one automated process using Fortnite Creative. Use the building tools (prefabs, galleries, devices, and so on).

Iterative Design Process:

1. **Design:** Determine a simple problem to solve (such as getting a ball into a basket):
   - This could be a problem provided by the teacher, or students can come up with their own simple problem to solve.
   - Develop an elaborate (complex) plan to solve this simple problem.
   - Develop a storyboard (series of sketches) to brainstorm the problem and its solution.
2. **Develop:** Begin development in Fortnite based on initial design / storyboard.
3. **Peer Testing / Feedback**
4. **Iterate:** Iterate on initial design based on feedback
5. **Peer Testing / Feedback**
6. **Complete Rube Goldberg Machine:** Complete the project based on final feedback.
7. **Create Video Walkthrough:** Optional if unable to show project in Fortnite.



Culminating Activity

Gallery walk or video presentations.

Resources

Compilation of Rube Goldberg Resources
https://wke.lt/w/s/yhwZkD

Assessments

Completed Project

Rube Goldberg Machine Created with Fortnite Creative

Deliverable

Completed Fortnite Island or Video Playthrough of Rube Goldberg Machine

Rubric

	Developing	Competent	Proficient	Distinguished
Project Content / Learning Objectives	Project does not convey the required information or understanding as it pertains to the learning objectives.	Project shows a basic understanding of the subject and demonstration of learning objectives.	Project reflects understanding of the subject and demonstration of desired learning objectives.	Project reflects understanding and synthesis of the subject and mastery of the learning objectives are met or exceeded.
Project Development	Project does not work, or has major flaws that prevent its intended use.	Project demonstrates basic functionality, and has only minor flaws.	Project functions in the way the student intended and provides general guidance for the end user.	Project is functional and refined, with extra features that exceed the requirements.
Project Aesthetics/ Design	Project requires more attention to the look and feel of the experience as well as the general design.	Project shows some attention to aesthetics and thoughtful design but is incomplete or lacking in some aspects of layout and design.	Project is well-organized and pleasing to the eye; easy to navigate and understand. Demonstrates thoughtful design.	Project is well-organized, makes good use of space; Great use available and user created assets; world is inviting and thoughtful and intentional design is apparent.
Reflection	Student demonstrates difficulty describing the intent of their project.	Student can mostly describe / reflect upon the basics of the project and intended learning objectives.	Students provides a thoughtful reflection / explanation of the project and how it relates to the desired learning outcomes.	Student can describe how their code works and how they wrote it, and help others debug their code.

Standards Mapping

ISTE Standards

3 Knowledge Constructor
Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

4 Innovative Designer
4a Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
4c Students develop, test and refine prototypes as part of a cyclical design process.
4d Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

5 Computational Thinker
5c Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
5d Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

6 Creative Communicator
6c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Next Gen Science Standards

Motion and Stability: Forces and Interactions

MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

Energy

HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Engineering Design

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Interdisciplinary and 21st Century Connections

This lesson covers areas related to engineering, science, and multimedia design. This lesson integrates all areas of STEM / STEAM.

21st Century Connections:

1. Critical thinking
2. Creativity
3. Collaboration
4. Communication
5. Technology literacy
6. Flexibility
7. Leadership
8. Initiative
9. Social skills

Modifications and Accommodations

Provide students with the option to use a different tool to create a Rube Goldberg Machine:
- Use a different digital tool to create a Rube Goldberg Machine
- Create a physical Rube Goldberg Machine

Incorporate adaptive controller / game controller if necessary.

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Additional Teaching Material

Simple Machines All Around Us

Provide real life examples of simple machines in the real world. Include a name for the machine, a description of its function, and an image or sketch.

Simple Machine (provide a definition of each)	Name of Real World Machine	Description (Explain how the machine works and it's intended function)	Image (provide credit if you are using an online image)
Lever			
Wheel and Axle			
Inclined Plane			
Wedge			
Pulley			
Screw			