GEORGIA PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

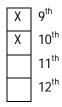
PATHWAY:	Engineering
COURSE:	Foundations of Engineering and Technology
UNIT:	STEM Mini-Golf Course



Annotation: Briefly describe the unit topics, tasks, methods, etc.

More than just problem solving! Integration of Science, Technology, Engineering and Math to develop a mini-golf course that incorporates all six simple machines and a Rube Goldberg device into each hole of the course. Students learn how to calculate the mechanical advantage of each simple machine and how energy is transferred to keep the ball moving in the Rube Goldberg device.

Grade(s):



Time:

20 Hours

Author:

Susan Millican (Dade County High School)

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

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Unit Plan Resource

Unit 16-FET • Page 1 of 7



GPS Focus Standards: Please list the standard and elements covered.

- ENGR-FET-4 Students will apply mathematics and science to the solution of a technological problem.
 ENGR-FET-5 Students will describe the essential systems and processes involved with invention, innovation, and entrepreneurship.
- ENGR-STEM-1 Students will recognize the systems, components, and processes of a technological system.
- ENGR-STEM-3 Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation, invention, and fabrication while considering economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.
- ENGR-STEM-4 Students will apply principles of science, technology, engineering, mathematics, interpersonal communication, and teamwork to the solution of technological problems.
- ENGR-STEM-5 Students will select and demonstrate techniques, skills, tools, and understanding related to energy and power, bio-related, communication, transportation, manufacturing, and construction technologies.

GPS Academic Standards:

- MA1G1. Students will investigate properties of geometric figures in the coordinate plane.
- MA1P1. Students will solve problems (using appropriate technology).
- MA1P3. Students will communicate mathematically.
- MA1P4. Students will make connections among mathematical ideas and to other disciplines.
- MC2P2. Students will reason and evaluate mathematical arguments.
- MM3P3. Students will communicate mathematically.
- MM3P4. Students will make connections among mathematical ideas and to other disciplines.
- MM3P5. Students will represent mathematics in multiple ways.
- SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.
- SCSh3. Students will identify and investigate problems scientifically.
- SP3. Students will evaluate the forms and transformations of energy.
- SPS8. Students will determine relationships among force, mass, and motion.

National / Local Standards / Industry / ISTE:

UNDERSTANDINGS & GOALS

Enduring Understandings:

Students will gain an understanding of problem solving, engineering design techniques, 6 simple machines,

mechanical advantage, and work ethics.

Essential Questions:

How are simple machines used to transfer energy?

Knowledge from this Unit: Factual information.

Skills from this Unit: Performance.



Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

Pre-test Objective assessment - multiple-choice, true- false, etc. ___ Quizzes/Tests Unit test X Group project Individual project Self-assessment - May include practice quizzes, games, simulations, checklists, etc. ___ Self-check rubrics ____ Self-check during writing/planning process ____ Journal reflections on concepts, personal experiences and impact on one's life ____ Reflect on evaluations of work from teachers, business partners, and competition judges ___ Academic prompts Practice guizzes/tests Subjective assessment/Informal observations ___ Essay tests ___ Observe students working with partners ___ Observe students role playing Peer-assessment ___ Peer editing & commentary of products/projects/presentations using rubrics __ Peer editing and/or critiquing **Dialogue and Discussion** ___ Student/teacher conferences ___ Partner and small group discussions _____ Whole group discussions _ Interaction with/feedback from community members/speakers and business partners Constructed Responses ___ Chart good reading/writing/listening/speaking habits ___ Application of skills to real-life situations/scenarios Post-test

Assessment(s) Title:

- Rube Goldberg Mini Golf
- Rube Goldberg Simple Machine Assessment
- Rube Goldberg Reading Assessment
- Mechanical Advantage Assessment

Assessment(s) Description/Directions:

See attached rubric and design brief.

Attachments for Assessment(s): Please list.

- Rube Goldberg Mini Golf Rubric Design brief and rubric for Rube Goldberg Mini Golf
- Rube Goldberg Simple Machine Assessment
- Rube Goldberg Reading Assessment
- Mechanical Advantage Assessment
- Simple Machines PowerPoint
- Rube Goldberg Mini Golf Sequence
- NAEP Simple Machines Learning Module
- NAEP Simple Machines Teacher Guide
- NAEP Simple Machines Worksheet
- NAEP Simple Machines Newsletter



Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

- ENGR-FET-4 Students will apply mathematics and science to the solution of a technological problem.
 ENGR-FET-5 Students will describe the essential systems and processes involved with invention, innovation, and entrepreneurship.
- ENGR-STEM-1 Students will recognize the systems, components, and processes of a technological system.
- ENGR-STEM-3 Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation, invention, and fabrication while considering economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.
- ENGR-STEM-4 Students will apply principles of science, technology, engineering, mathematics, interpersonal communication, and teamwork to the solution of technological problems.
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- MA1G1. Students will investigate properties of geometric figures in the coordinate plane.
- MA1P1. Students will solve problems (using appropriate technology).
- MA1P3. Students will communicate mathematically.
- MA1P4. Students will make connections among mathematical ideas and to other disciplines.
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- MM3P3. Students will communicate mathematically.
- MM3P4. Students will make connections among mathematical ideas and to other disciplines.
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- SP3. Students will evaluate the forms and transformations of energy.
- SPS8. Students will determine relationships among force, mass, and motion.

- 2. Review Essential Questions.
 - How are simple machines used to transfer energy?
 - **3.** Identify and review the unit vocabulary.
 - 4. Assessment Activity.
 - FLUBBER 1
 - RUBE GOLDBURG READING FACTS AND LIES .5
 - SIMPLE MACHINES 1
 - WEB SITES IDENTIFY SIMPLE MACHINES IN RUBE GOLDBURG AND COMPLETE RUBE GOLDBURG "GAME"
 1
 - RUBE GOLDBURG MINI GOLF 5-7
 - CALCULATE MACANICAL ADVANTAGE OF COURSE 1
 - REPORT ON RUBE GOLDBURG DEVICES (HOMEWORK) 1

Attachments for Learning Experiences: Please list.

- Rube Goldberg Mini Golf Rubric Design brief and rubric for Rube Goldberg Mini Golf
- Rube Goldberg Simple Machine Assessment
- Rube Goldberg Reading Assessment
- Mechanical Advantage Assessment
- Simple Machines PowerPoint
- Rube Goldberg Mini Golf Sequence
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- NAEP Simple Machines Teacher Guide
- NAEP Simple Machines Worksheet
- NAEP Simple Machines Newsletter

Notes & Reflections: May include notes to the teacher, pre-requisite knowledge & skills, suggestions, etc.



Culminating Unit Performance Task Title:

Rube Goldberg Mini Golf Course

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Build one par three hole of a mini golf course that includes all six simple machines and a Rube Goldberg device.

Attachments for Culminating Performance Task: Please list.

Rube Goldberg Mini Golf Sequence

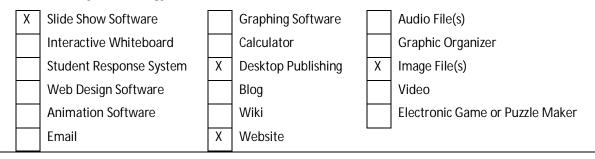


Web Resources:

- Rube Goldberg Videos and Game:
 - o Game: http://pbskids.org/zoom/games/goldburgertogo/game.html
 - o Honda cog: http://www.ebaumsworld.com/2006/06/honda-ad.html
 - o Dorm room alarm clock: http://www.break.com/index/rubegold6.html
 - o Rube Goldberg web site: http://www.rgmc.com/
 - o http://www.mousetrapcontraptions.com/links-10.html
 - o High school videos: http://eoh.ec.uiuc.edu/corporate/movies.php
 - Rube Goldberg hints: http://www.pen.k12.va.us/Pav/Science/Physics/Contests/RUBE%20CONTEST/rube.html
 - o Tea cup: http://video.google.com/videoplay?docid=-2367646121273499414
 - o 4 videos: http://www.minezone.org/blog/2006/04/10/four-great-rube-goldberg-videos/
 - o High school videos: http://www.anl.gov/Careers/Education/rube/rubevideos.htm
 - o http://www.donpixel.com/play/en/060302124616/

Attachment(s): Supplemental files not listed in assessment, learning experiences, and performance task.

What 21st Century Technology was used in this unit:



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Unit Plan Resource

Unit 16-FET • Page 7 of 7