EGG DROP CHALLENGE

ENTRIES OPEN APRIL 15, 2019 - JULY 10, 2019

LESSON PLAN

BUILD & ITERATE

It's build time! Students will build, evaluate and refine their egg drop invention. Students will experience the iterative nature of the Engineering Design Process. During the drop they will see how kinetic/potential energy and Newton's laws apply to an egg drop.

FOR THE CLASSROOM

POSSIBLE APPROACH FOR THE CLASSROOM

LESSON LENGTH

1-2, 30-50 MINUTES

OBJECTIVE

BUILD, ITERATE, AND DROP TEST THE STUDENTS' EGG DROP INVENTIONS

MATERIALS

SEE BELOW

VOCABULARY:

- Engineering design process
- Iterate

MATERIALS

BUILD & DROP TEST

- Paper Plates
- Straws
- Balloons
- Rubber Bands
- Tape

DOCUMENTATION & SUBMISSION

- Video Camera Device (ipad, mobile, video camera, etc.)
- Computer
- Internet
- Access to CONTEST RULES and DESIGN GUIDELINES

PROCEDURE

1. DOWNLOAD AND TEACH THE BUILD & ITERATE POWERPOINT: We have provided a Future Engineers PPT. Feel free to customize it to suit your teaching needs.

2. REVIEW RULES & GUIDELINES: Have students review the CONTEST RULES and DESIGN GUIDELINES if they haven't already.

3. BUILD

- Select a location for the 8ft drop test.
- Review the Engineering Design Process.
- Give students time to work on their egg drop payload prototype.

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PROCEDURE

4. PEER REVIEW

- Students pair up to share their designs and answer the following questions about each other's submission materials:
  - What do you think works well with their design?
  - What do you think could improve?

5. ITERATE

- Students should make iterative changes to improve their design.

6. TEST

- It's time for the big test! Assist your students with a media setup, reminding them to not include faces in their video. Have students take a picture of their design prior to the drop. With your teacher assistance - drop your students' egg drop inventions from a height of 8 feet, while your students document the drop via video.

7. PREPARE SUBMISSION MATERIALS and PEER REVIEW

- Students prepare their video (muting sound if needed), thumbnail image, title, and text description.
- Students pair up to share their designs andr review their prepared materials before submission:
  - Does it follow the Contest Rules?
  - Does it meet the Design Guidelines?

8. SUBMIT

- Students should login to Future Engineers and submit their 'EGG DROP' challenge entry.

BACKGROUND INFORMATION

ENGINEERING DESIGN PROCESS

The engineering design process is a series of steps used to solve problems, and innovate/engineering new creations. Some define it with more steps than others, but at the core a process where students ask the right questions, use creativity to brainstorm ideas, use design skills to create the plan/design, get hands-on to build a solution, and then iterate, test and refine. Your students are already mid-journey, but here are some steps to explain the steps to your students.

ASK: Engineers must ask questions about the problem they want to solve. What is the goal? What are we trying to solve? What have others done in the past?

RESEARCH: Research includes looking up information that will help you solve your problem or reach your goal. You also examine what materials and resources are available to use. You can also look at what has been done and the mistakes that have been made. Notes are taken on all these things so new possibilities can be imagined.

BRAINSTORM: Work with a team to come up with as many possible ideas and solutions as possible. All ideas are good ones and creativity is highly encouraged.

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BACKGROUND INFORMATION

DESIGN: Take your research and brainstorming ideas and come up with a plan or design. Be sure to consider the design constraints.

BUILD: Build out your design. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

TEST & EVALUATE: Test out your design and see if your build worked. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

IMPROVE (Iterate): Use what you learned in your testing to make a better version of your solution. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

NEXT GENERATION SCIENCE STANDARDS

MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed, object, tool or process such that an optimal design can be achieved.

MS-PS2-1 Motion & Stability: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
PS2.A: Forces and Motion

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction.

MS-PS2-2 Motion & Stability: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
PS2.A: Forces and Motion

- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.

NEXT GENERATION SCIENCE STANDARDS

MS-PS3-2 Energy: Develop a model to describe that when the arrangement of object interacting at a distance changes, different amounts of potential energy are stored in the system.

PS3.A Definitions of Energy

- A system of objects may also contain stored (potential) energy, depending on their relative positions.

PS3.C Relationships Between Energy and Forces

- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.

MS-PS3-5 Energy: Construct, use and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.