



# PASTA TOWER CHALLENGE

ENTRIES OPEN MARCH 14, 2019- JULY 11, 2019



## SCIENCE LESSON

### ENGINEERING DESIGN PROCESS

The Engineering Design Process is a series of steps engineers use to solve a problem. Often times, the problem involves designing a product (ex. structure, machine or computer code) that meets specific criteria.

#### FOR THE CLASSROOM

POSSIBLE APPROACH  
FOR THE CLASSROOM



#### LESSON LENGTH

15 MINUTES



#### OBJECTIVE

LEARN ABOUT THE ENGINEERING  
DESIGN PROCESS



#### MATERIALS

POWERPOINT

## VOCABULARY:

- Engineering Design Process
- Ask
- Research
- Brainstorm
- Design
- Build
- Test & Evaluate
- Iterate



### PROCEDURE

1. Download and teach the [ENGINEERING DESIGN PROCESS POWERPOINT](#): We have provided a Future Engineers PPT. Feel free to customize it to suit your teaching needs.



### BACKGROUND INFORMATION

#### ENGINEERING DESIGN PROCESS

The engineering design process is a series of steps engineers use to solve problems. At its core, the process includes defining the problem, developing solutions and optimizing the solutions (See Fig.1) But, traditionally the process is broken up into these 7 steps.

#### 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? What has been 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 (IMAGINE)

During this session, you will 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.



email: [support@futureengineers.org](mailto:support@futureengineers.org)/ web: [www.futureengineers.org](http://www.futureengineers.org)



## LESSON PLAN CONTINUED

# ENGINEERING DESIGN PROCESS



### BACKGROUND INFORMATION

#### ENGINEERING DESIGN PROCESS (CONTINUED)

##### DESIGN (SELECT A PLAN)

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

##### BUILD (CREATE)

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.

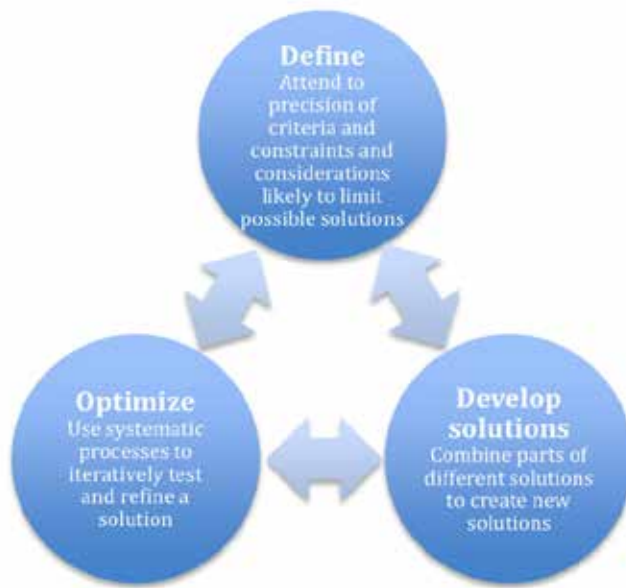


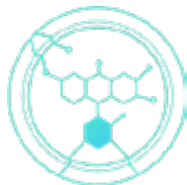
Figure 1. 6th-8th NGSS Standards





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### LESSON PLAN CONTINUED

## ENGINEERING DESIGN PROCESS



#### ADDITIONAL TEACHING RESOURCES:

- What is Structural Engineering? <https://www.youtube.com/watch?v=oqpp8L4J4ek>



#### 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-PS2-2 Motion & Stability:** Plan an investigation to provide evidence that the change of an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.]



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