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Lesson Focus

Students will learn about the Engineering Design Process and design a prototype of a hut able to withstand strong winds on a deserted island.

Lesson Synopsis

Students will hear a story of Sir Charlie who is trying to survive living on a deserted island. His biggest challenge has been the wind at night. Students will follow the constraints and build a hut that will withstand a wind storm (from a hair dryer).



Age Levels

- ◆ 5-8

Objectives

- ◆ Use the Engineering Design Process
- ◆ Work collaborating with peers
- ◆ Design a prototype
- ◆ Plan and sketch a design

Anticipated Learner Outcomes

Students will be able to

- ◆ create a plan
- ◆ design a prototype
- ◆ work as part of a team

Alignment to Curriculum Frameworks

See attached curriculum alignment sheet.

Internet Connections

- ◆ TryEngineering.org

Desert Island Survival

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For Teachers: Teacher Resource

◆ **Anticipated Learner Outcomes**

Students will be able to

- ◆ create a plan.
- ◆ design a prototype.
- ◆ work as part of a team.

◆ **Resources/Materials**

- ◆ Student Rubric
- ◆ Student Engineering Design Process and Challenge Sheet
- ◆ Graph for building
- ◆ Materials:
 - Hair Dryer
- ◆ Student Materials:
 - 4 index cards
 - 2 pieces of construction paper 8x10
 - 4 pieces of newspaper
 - 10 craft sticks
 - graph paper (36 sq inches)
 - ruler
 - 10 pieces of masking tape (3 inches long)
 - 4 straws

◆ **Time Needed**

One hour

◆ **Procedure**

1. To set the stage for the design challenge, read the following passage to the students:

A long time ago a group of adventurous travelers set sail for a week on the seas. However, on the second night, they encountered a horrible storm. The captain tried to get hold of the ship, but it was useless against the violent storm. The captain lost control and the ship slammed into a rocky shore of a deserted island. Sir Charlie was the only one to survive on the island. Now it is your job to help Sir Charlie survive on the island!

On the first night, he slept on the beach with no shelter. Besides the attack of the insects, he had a difficult time sleeping due the extreme winds at night. Your first task it to create a hut that will withstand a wind storm.

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2. Break up the students into groups of 4.
3. Explain the list of supplies and constraints and share materials with each group
4. Describe the design challenge to the students: they have to create a hut that is not bigger than 36 square inches – that is at least 5 inches high – and has a working door. The hut must withstand a windstorm for 8 seconds. The windstorm will be created by using a hair dryer on full speed.
5. Demonstrate the speed for the students. The hair dryer during testing will be held 12 inches away from the hut. The hut will be placed on a table or stool. If the hut does not blow off the table or stool and stays in place for 10 seconds, they have succeeded.
6. Explain that during construction, the hut cannot be taped to the table.
7. Present the rubric (see attached) to the group.
8. Discuss the rubric with the students – so they know exactly what is required. Discuss what factors are needed for success. Some students will realize that the weight of the hut is an important factor.
9. Students will use the Engineering Design Process handout to plan their design. They should be instructed to discuss their ideas and come up with one that they all agree on.
10. Once they have a detailed plan either written or a drawing with labels, they can start to build.
11. Students will have 20-25 minutes to build.
12. Explain that they will be creating and improving as team. During creation, students can test their design with the hair dryer to see where they need to improve.
13. Once time is up, students will then test their design and score their rubric.
14. The teacher will hold the hair dryer and will start the wind on low speed then builds up to the higher speed. The students will count to 10 while high speed is held near the hut.
15. Students will then reflect on the last part of their rubric on the success of their hut. They will discuss what they would change if they can redo the challenge. What did they learn? How did they work together as group?

◆ Tips

- ◆ Extended time will allow for more thoughtful planning
- ◆ Students need to ensure that they use tape sparingly – encourage them to cut the pieces of tape into smaller pieces. A group that is not careful, will run out of tape before their hut is complete.
- ◆ Kids this age love to decorate, so encourage them to know that the way the hut is built is more important than the way it looks.

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Student Resource:

The Engineering Design Process

1. Define

What is the problem you want to solve? What is your challenge?

2. Develop Solutions

Think about all the possible options you can identify to solve the challenge. Brainstorm as many solutions as possible.

3. Optimize

Compare your solutions, test them, and consider which one will do the best job of solving the problem.



And, throughout...Communicate

At each step in the process talk with your team members so everyone can contribute ideas and be a part of the process. Good communication is very important to the engineering design process.

Your Challenge

1. Define

Your challenge is to develop a hut out of provided materials that will withstand a windstorm.

2. Develop Solutions

As a team, look at the materials you have to work with, and consider lots of solutions to the challenge. Be sure to talk about options and consider the materials.

3. Optimize

Agree on which design solutions are most likely to work, sketch them, and then build your design. You may make changes as necessary... and be sure to test how wind impacts the design.



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Student Resource:

Building Graph

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Student Resource:

Rubric for Deserted Island Challenge

Team Members: _____

3 = We exceeded the expectations

2 = We met the expectations

1 = We did not meet expectations

3 2 1 – Our hut was 36 square inches or smaller

3 2 1 – Our hut is 5 inches or higher

3 2 1 – Our hut has a working door

3 2 1 – Our hut withstand the wind for 10 seconds or more

3 2 1 – We worked well together

Total Score: _____

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For Teachers:
Alignment to Curriculum Frameworks

Note: Lesson plans in this series are aligned to one or more of the following sets of standards:

- U.S. Next Generation Science Standards (www.nextgenscience.org)
- U.S. Common Core State Standards for Mathematics (www.corestandards.org/Math)
- International Technology Education Association's Standards for Technological Literacy (<http://www.iteea.org/TAA/PDFs/xstnd.pdf>)
- Computer Science Teachers Association K-12 Computer Science Standards (<http://csta.acm.org/Curriculum/sub/K12Standards.html>)

◆ Next Generation Science Standards - Grades K-2 (Ages 5-8)**K-2-ETS1-1 Engineering Design**

- ◆ Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Engineering Design

- ◆ Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

◆ Standards for Technological Literacy - All Ages
Design

- ◆ Standard 8: Students will develop an understanding of the attributes of design.
- ◆ Standard 9: Students will develop an understanding of engineering design.
- ◆ Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

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