

Engineering Design

Teacher Slides

Editable template to guide your students through Engineering Design Challenges!

THANK YOU!

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ABOUT VIVIFY

Vivify is a team comprised of two Aerospace Engineer friends, Natasha and Claire, who live in Texas. We met as college classmates and roommates at Texas A&M University and later left engineering careers in the Department of Defense and Air Tractor to pursue our passion for STEM education. Learn more of our story [here](#).

Our goal is to bring engineering to life—to vivify learning—for kids of all ages. Please connect with us so we can learn how to better serve your students!

- Natasha & Claire, The Vivify Team



Connect with us for free STEM resources!

Subscribe to our newsletter and receive access to a library of free STEM resources through www.vivifsystem.com. Follow us on social media or listen to “The STEM Space” podcast for more resources and ideas. We also welcome you to join [“The STEM Space”](#) Facebook group to connect with other educators across the world.



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ABOUT STEM Challenges

STEM is a great way to incorporate the engineering design process into your classroom or afterschool program! Students will:

- Learn about an engineering problem they need to solve.
- Connect the problem to STEM careers and a real-world event.
- Gather materials and brainstorm ideas.
- Draw a design idea.
- Build and test their device. Students will keep making changes and improving their design.
- Share their a final design.

Leading STEM Challenges

The following pages provide an overview of the [engineering design process](#) as well as notes on how to facilitate a STEM challenge. Keep these in mind as you access the editable Teacher Slides for Engineering Design Challenges. These slides are meant as template to be modified for use with Vivify's STEM activities. The slides are created for [Vivify's Space Lander Engineering Challenge](#) to provide an example of how to utilize the template.

Engineering Design Process

1
 Identify the Problem

2
Brainstorm 

3
 Design

4
Build
Test & Evaluate
Redesign

5
Share Solution 

HOW TO FACILITATE A STEM CHALLENGE

STEM challenges usually require at least 90 minutes of class instruction to fully utilize the engineering design process. Educators with shorter class periods can stretch the sessions over 2 - 3 classes. Recommendations for sessions are below. Keep in mind that educators often focus the most on building and testing. However, reflection is equally important and should not be skipped. Additionally, during a class discussion, teachers can use the building and testing experience to connect with important science concepts during reflection.

One 90 minute Session

Engage: 15 minutes

- Play video related to mission
- Discuss STEM career connection
- Introduce mission
- Provide science background

Activity: 60 minutes

- Provide activity instructions
- Divide into teams
- Brainstorm ideas
- Gather materials
- Build and test
- Improve and re-test

Reflection: 15 minutes

- Answer reflection questions
- Share solutions with class

Session 1

- Play video related to mission
- Discuss STEM career connection
- Introduce mission
- Provide science background
- Divide into teams
- Brainstorm ideas

Session 2

- Play a video related to the mission
- Refresher on mission
- Gather materials
- Build and test
- Reflect

Session 3

- Play a video related to the mission
- Refresher on mission
- Improve designs and re-test
- Share solutions
- Reflect

Editable Teacher Slides

Use our editable Google Slide template to guide your students through an engineering design challenge! Read below on how to use the slides.



Teacher Classroom Slides

[Click here to access the editable companion slides.](#)

Warm Up

Do you think aliens exist? Why or why not?

1. Warm-up

As students walk in the door, turn on their brains with a fun warm-up challenge as a teaser to the activity! Examples: what would you bring on a trip to Mars? Why is teamwork difficult?

Your Mission

An alien spacecraft has been spotted orbiting Earth! They are a peaceful species and wish to share their advanced technology with the human race. They also promise to bring a special dessert more delicious than chocolate!

The aliens need our help! They do not have a way to land on Earth. They have asked Earth to design a lander using only the supplies available on their ship.

2. Identify the Problem

Introduce students to the engineering design challenge with a storyline (Your Mission slide). Next, show a real-world video connected to the challenge, and then dive into the specific engineering constraints.

Identify the Problem

Design and build a lander to protect two aliens trying to reach Earth.

What is needed for a lander to be successful?

Identify the Problem

Design and build a lander to protect two aliens trying to reach Earth.

Constraints:

1. Only build underneath the lander.
2. Do not cover the cup.
3. Do not place anything inside the cup.
4. Cup must keep "aliens" inside after dropping.
5. Only use provided supplies.

Background

Design and build a lander to protect two aliens trying to reach Earth.

As the lander falls, it will experience these forces:

3. Background: What information do students need to be successful? What are the key science concepts? Take some time before brainstorming to point these out through a class discussion, videos, or demonstrations. Keep referring back to the concepts throughout the process.

Background

Design and build a lander to protect two aliens trying to reach Earth.

Shock Absorption
It is important that the lander make a soft landing upon the surface of Mars. Something is needed in the design that will absorb the shock of landing.

What is an example of a shock absorbing system?

Stabilisation
The design must have a way to keep the lander upright when falling and landing.

Brainstorm & Design



Design and build a lander to protect two aliens trying to reach Earth.

1. How might you use the materials to solve the problem?
2. How might you slow down the lander and absorb the shock of impact?
3. How might you keep the lander upright when it hits the ground?

Constraints:

1. Only build underneath the lander.
2. Do not cover the cup.
3. Do not place anything inside the cup.
4. Cup must keep "aliens" inside after dropping.
5. Only use provided supplies.

Supplies:

- Tape
- Plastic cup
- Platform: Paper square
- 10 Cotton balls
- 6 straws
- 6 Index cards

Build & Test



Design and build a lander to protect two aliens trying to reach Earth.

After building, test your lander at knee height.

Did you succeed? Go higher!

Did you fail? Improve and re-build!



Constraints:

1. Only build underneath the lander.
2. Do not cover the cup.
3. Do not place anything inside the cup.
4. Cup must keep "aliens" inside after dropping.
5. Only use provided supplies.

Supplies:

- Tape
- Plastic cup
- Platform: Paper square
- 10 Cotton balls
- 6 straws
- 6 Index cards

Reflect



Design and build a lander to protect two aliens trying to reach Earth.

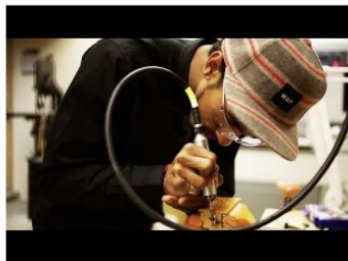
Compare your design with the other teams. What are some similarities? Differences?

How did you use the concept of drag in your device? Shock absorption?

What challenge did you face in this mission? How did you overcome failure?

STEM Career Spotlight

Today's Focus: Mechanical Engineer



STEM Skill Spotlight

Today's Focus: Teamwork

Think of a time that you worked in a team.

What went well?
What was difficult?



4. Brainstorm & Design

Go back to the constraints and now introduce the materials for the challenge. Ask students to brainstorm ideas - you may want to start individually and then move to team brainstorming. Provide students with materials to come up with a final design to test.

5. Build & Test

Time to build their design! Keep this slide up as they build, test, re-build, and continue to improve. Add any testing instructions here.

6. Reflect

Take a moment to reflect on the challenge. Bring back science connections to emphasize concepts.

7. Bonus Slides:

Consider adding in a STEM Career Spotlight to focus on a different career each session or a STEM skill that might be useful to cover prior to the challenge.

WANT MORE STEM?

For a complete list of all of Vivify STEM resources broken down by standards, topics, and grade levels, go here: <http://bit.ly/VivifyResourceGuide>



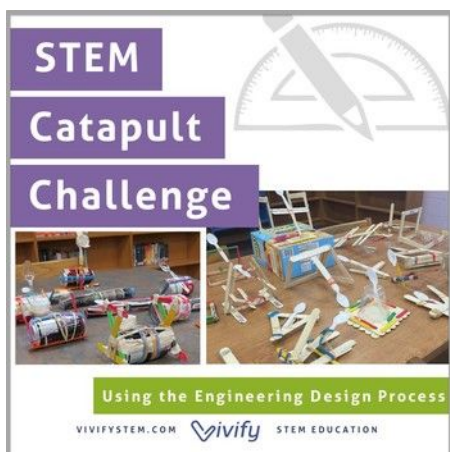
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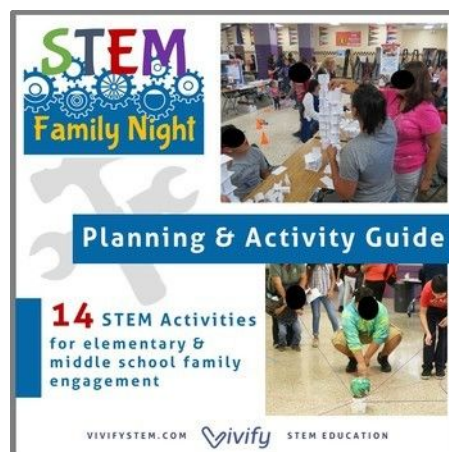
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Vivify's Overview of STEM Education

Successful STEM education is an empowering interdisciplinary approach that brings math and science concepts to life through problems that mimic the complexities and excitement of the real world. STEM revolves around the Engineering Design Process that embraces failure, relies on teamwork, and requires critical thinking and creativity. While exciting, educators often become intimidated as a search for curriculum leads to an overwhelming range of activities from index towers to robotics competitions. At Vivify, we believe that not all STEM is created equal. Educators should adopt a [3 Stages of STEM](#) approach by progressively building towards more complex projects.

To learn more about the 3 Stages of STEM, go here: <http://bit.ly/stemstages>