

# Project-Based Learning

## Rockets in Space

Sixth Grade

Physical Science



# Rockets in Space

## Sixth Grade

## Physical Science

### Overview

The local space museum has released a Request for Submissions for rocket designs that will be displayed at an annual community event.

While designing their rockets, students will explore the energy and forces that affect motion.

Students must demonstrate understanding by meeting the design requirements and communicating the factors that affect their rocket's motion.

### Guiding Questions

How does potential energy compare to kinetic energy?

How do unbalanced forces affect an object's position, direction, and speed?

How are distance and time used to calculate average speed?

How can you measure and graph changes in motion?

What is the history and future of space exploration?

How does gravity govern the motion of our solar system?

Rockets in Space

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## Rockets in Space

### PBL Project Guide

#### Timeframe

This project will take approximately ten 50-minute class periods.

#### Step-by-Step Overview

- Introduce Launch Video
- Introduce Entry Document
- Facilitate Know/Need to Know activity.
- Students engage in an exploration activity
- Groups brainstorm initial design products and assign roles/responsibilities
- Groups alternate between facilitated content experiences and design time
- During design time, groups integrate new content into design and re-evaluate product(s)
- Groups finalize product(s) and presentation
- Groups present according to project guidelines
- Content Debrief
- Summative Assessment

## Rockets in Space

### PBL Resources

#### Project Resources

- Launch Video Link:  
<https://youtu.be/3WzHXI5HizQ>
- Entry Document Text
- Anticipated Knows/Need to Knows
- Strategies/considerations for implementation

#### Resources to Assemble/Prepare

You will need to prepare the following resources ahead of time:

- Formatted Entry Document
- Sample authentic products similar to project expectations
- Materials for rocket designs

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## Entry Event Guide

### Launch Video

“Interstellar” - Movie Trailer:

<https://youtu.be/3WzHXI5HizQ>

Purpose:

Engages students and introduces the topic of space exploration. Use video to solicit student responses to the following question:

*What is the past and future of space exploration?*

Post student responses.

### Entry Document

Format:

*Request for Submissions* from a local space or history museum. Edit document to include local museum and logistics such as submission dates and presentation requirements.

## Rockets in Space

### Entry Event Guide *continued*

#### Entry Document

##### Request for Submissions

The local space museum provides a focal points to explore the history and progress of aviation as mankind continues to pursue going higher, faster, and farther. The museum hosts an annual community event that includes family-oriented activities, demonstrations, and programs to celebrate space exploration. This year's event will include several exhibits that commemorate the historical efforts of NASA's Space Shuttle Mission. Our "Rockets in Space" exhibit will include many different examples of rockets and communicate how they are designed to optimize space exploration. We are welcoming rocket submissions for review based on the following guidelines.

##### Submission Guidelines:

- Submit a rocket that is designed to maximize flight distance and speed
- Visually represent how the speed of the rocket changed while designing and testing the rocket

##### Presentation Guidelines:

- Describe the history and future of space exploration, including the types of equipment and transportation needed for space travel
- Describe the factors that affect the position, direction, and speed of the rocket

##### Additional Information:

Groups will present their rocket with a 5-minute presentation to staff members of the local museum on the due date. Additional considerations will be given to groups for including creativity and detail.

## Rockets in Space

### What do we KNOW about the project?

#### Content

- Describe the history and future of space exploration
- Describe factors that affect position, direction, and speed of rocket
- Maximize rocket flight distance and speed

#### Product

- Submit rocket designed to maximize flight distance and speed
- Visually represent how the speed changed during design of rocket
- 5-minute presentation that describes history and future of space exploration and the factors that affect position, direction, and speed of the rocket

Additional responses will vary



## Rockets in Space

### What do we NEED to know about the project?

#### Content

- How can you maximize flight distance and speed?
- How can you measure speed?
- What is the history and future of space exploration?
- What types of equipment and transportation are needed for space travel?
- What factors affect position, direction, and speed?

#### Product

- What are the size requirements of the rocket?
- What materials are available?
- How can you visually represent speed?

Additional responses will vary

## Rockets in Space

## Implementation Guide

### Websites

Newton's Laws Tutorial:

<http://www.physicsclassroom.com/Physics-Tutorial/Newton-s-Laws>

Calculating Average Speed:

<http://www.physicsclassroom.com/class/1DKin/Lesson-1/Speed-and-Velocity>

Design Process:

<http://www.sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml>

### Teaching Strategies/Considerations

Consider the guiding questions for the project when selecting content workshops. A combination of research and hands-on activities should be included.

Have students develop an understanding of basic rocket designs before creating their products.

Consider having students use science notebooks or journals to meet the project expectations of recording their design process, design revisions, etc. Have them create rough drafts of their design and record measurements throughout the project.

## Rockets in Space

### Assessment/Presentation

#### Final Group Product

- Rocket design that meets submission requirements
- Visual representation of how speed of rocket changed
- 5-minute presentation that meets presentation guidelines

#### Rubric

- Students will use the entry document as a real world rubric to meet expectations of the project

#### Individual

- Individual assignments as they pertain to each content workshop
- Journal entries documenting speed measurements and design changes
- Summative Assessment

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