## Lesson Overview

### Overview

Lesson Author:
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Date:
4/3/19

Grade Level:
4th

Subject Area:
Science: Bernoulli's Principle

Time Allotment: 45 minutes

Short Description:

*In this lesson students will learn Bernoulli's Principle and how air pressure affects how objects move and flow. Students will be divided into pairs and asked to build the Jetfire. Students will go through the engineering design process to make their JetFire and we will test each groups Jetfire to see who's can fly the farthest. We will compare results for distance between groups and discover what caused the Jetfire to fly the farthest. By the end of the lesson students should understand how Bernoulli's Principle affects how objects fly.*

### Standards

State Curriculum Standards met in this lesson:

<u>Science</u>

Science: Force, Motion and Energy
4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

a) distinctions are made among observations, conclusions, inferences, and predictions;

h) hypotheses are developed as cause and effect relationships;

l) models are constructed to clarify explanations, demonstrate relationships, and solve needs

4.2 The student will investigate and understand characteristics and interactions of moving objects. Key concepts include

a) motion is described by an object's direction and speed;

b) changes in motion are related to force and mass

<u>Health</u>
4.1 The student will explain how nutrition and other health-enhancing behaviors affect personal health

p) Describe steps to resolve a conflict.

4.3 The student will describe the importance of identifying and accessing health resources for personal and community health

k) Practice communication skills to overcome common communication difficulties.
l) Describe the relationship of positive self-concept, meeting academic goals, and participation in co-curricular and extracurricular activities.

## Instructional Outcomes:

*differentiate among simple observations, conclusions, inferences, and predictions, and correctly apply the terminology in oral and written work.*

*create a plausible hypothesis, stated in terms of cause (if) and effect (then), from a set of basic observations that can be tested.*

*identify the forces that cause an object's motion*

## Focus: "Big Ideas" & "Essential Questions"

*In order to conduct an experiment, one must recognize all of the potential variables or changes that can affect its outcome.*

*In science, it is important that experiments and the observations recorded are repeatable*

*Conclusions are drawn by making judgments after considering all the information you have gathered. Conclusions are based on details and facts.*

*An experiment is a fair test driven by a hypothesis. A fair test is one in which only one variable is compared.*

***Essential questions***

*Why does an airplane fly? What causes it to stay in the air?*

*How might we investigate how air pressure affects objects when the pressure increases or decreases.?*

*To what extent does testing an experiment or design help improve it?*

## Procedures

*Generate specific learning activities facilitating the principles and components of the Learning Cycle model.*

### Lesson Set/Launch

To start the lesson:

- Teachers will introduce themselves to the students and then give the students the opportunity to introduce themselves to the teachers

**Engage**

- Teachers will Demonstrate the Magic Ping Pong Ball activity

### Rationale:

Students will understand that engineering is an important job. Majority of everything we use was created by an engineer and went through the engineering design process process. Students will understand that Bernoulli's Principle helps airplanes fly. The increase and decrease of air pressure has a direct relationship with how an object moves.
Understanding air pressure can help students make smart choices outside of the classroom and help students live a healthier and safer life.

### Techniques and Activities:

**Engage:**

- Teachers will place two cups on a desk and place a ping pong ball in one.
- Teachers will ask for volunteers to see if a students can get the ping ball from one cup to the other without touching the ball or picking up the cups.
- Once the volunteer has tried to move the ball the teachers will demonstrate how to move the ball by blowing over the top of the cup with the ball to make it bounce into the empty cup.
- Students will be asked what they think happened and why the ball moved. After receiving a few answers the teachers will explain to the students that it is because of air pressure and Bernoulli's Principle.
- After the Magic Ping Pong Ball activity teachers will provide a brief lesson on engineering and Bernoulli's Principle

**Explore:**

- Once the lesson is over students will be asked to divide themselves into pairs
- Once the students are in pairs, the teachers will pass out the Jetfires and markers.
- Students will be instructed to build the Jetfire with their partner and prepare to fly them. Students should put their names on the Jetfire to identify their plane.
- Students will line up at one end of the classroom and be asked to fly their Jetfire to the other end of the classroom. When students fly their planes the teachers will use tape to mark where they land and write the students' name on the tape. The tape will be a marker to see whose Jetfire went the furthest.

**Explain:**

- After flying the Jetfires students will be asked to explain what happened
- Teachers will explain Bernoulli's Principle with air pressure and how it affected how their Jetfire flew.
- Students will discuss why they think their classmates' Jetfire went the furthest

**Elaborate:**

- After the discussion students will have the opportunity to alter the wings of their Jetfire to try and make it fly further
- We will then test how far students' Jetfires can fly with the changes they have made

**Evaluate**:

- After flying the Jetfires students will take a short quiz to evaluate their learning.

Lesson Closure:

*To close the lesson we will have an open discussion with students and asked for volunteers to tell the teachers what they have learned and enjoyed about the lesson*

Assessment/Evaluation:

*Give students a 5 question quiz that they will complete about Bernoulli's Principle and engineering. We will go over the answers as a class.*

Student Products:

Students will have built a Jetfire.

Supplemental Activities:

***Extensions***

*Connect what we learned about the Jetfire to airplanes, rockets, and even boat sails.*

Adaptations for Special Learners:

Special needs learners

Teachers will provide hands on assistance to build the Jetfire for special needs learners .
Teachers will provide a powerpoint for visually impaired students

Gifted Students

Challenge students to compare what we learned about air pressure and Bernoulli's Principle to Airplanes. Students can compare how airplanes and hang gliders stay in the air. Students can use Bernoulli's Principle to take about how tents and umbrellas flip over.

## Differentiated Instruction & Cross-Curricula Integration:

Flexible grouping

Students are required to solve a problem collaboratively

Students will use their critical thinking skills to help solve a problem

## Resources

*Materials and resources needed for this lesson.*
Jetfire activity pack
Paper
Pencil
Markers
2 Cups
Ping pong ball
Tape

*Technology resources needed for this lesson*
*Projector*
*Computer*
*Powerpoint made with google docs*