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Lesson Plan by Sonya Williams, 4<sup>th</sup> Grade Teacher  
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<b>Activity Title:</b>	Take Flight
<b>NGSS</b>	3-5 ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
<b>Topic/nature of the Investigation:</b>	Students will compare and contrasts various types of gliders.
<b>Knowledge Learning Objectives:</b>	To identify key vocabulary related to flight. To construct gliders by following the directions of the designer. To design and test gliders for flying capability.
<b>Skill and Reasoning Learning Objectives</b>	To identify reasons why certain gliders may go farther than others. To determine ways to increase the likelihood of a glider flying a certain distance. To analyze what type of designs produce the best flying results. To analyze how the shape of a glider impacts the speed.

### Engage

Key Vocabulary:

Drag, Lift, Thrust, Gravity

Nose, Propeller, fuselage, wing, elevator, ailerons, rudder

**Key Question:**

**What causes an object to fly?**

**Opening activity to surface student thinking:**

**Students will observe model airplanes, posters, and books related to aviation followed by a discussion about why they think planes are able to fly.**

**Questions for whole group discussion:**

**What are some objects that you know can fly?**

**What does an object need to fly?**

**What causes an object not to fly?**

**How can you increase the speed and distance that an object flies?**

### Explore

#### Activities (list)

- Construct a pre-designed glider following directions on how to assemble the individual parts.
- Test out the gliders.
- Design paper airplanes.
- Test out paper airplanes.
- Compare and contrast the differences between the gliders and paper airplanes.
- Make another paper airplane using the same design, but using different paper.
- Test out the new paper airplane.
- Evaluate differences between the two paper airplanes.

#### Driving Question

What are the needed parts of a glider?  
How well did your glider fly?  
What could you have done differently?  
How well did your paper airplane fly?  
What could you have done differently?

**Student Communication Product:** Prepare an oral explanation that details your successes and challenges of flying your glider and paper airplane. Prepare to take questions from the audience.

### Explain

**Content Media:** Teacher will show a short video of gliders and airplanes followed by a lecture on the basic principles of flight.

**Clarifying Questions for Whole/Small Group Discourse: What are the differences between gliders, paper airplanes, and jets?**

**Student Communication Product (assessment):** Students will write a short summary of their experiences which includes a diagram of their designs. They will be encouraged to incorporate the key vocabulary from the lesson.

**Elaborate**

**Activities:**

**Discover how to make an airplane climb, descend, roll, and turn in the air.  
Try and fly your gliders and plane from different positions (crouching, from the second floor of the school, while jumping). Note differences in the outcome.  
Read and conduct research on jets.**

**Extending/Application Questions for Whole/Small Group Discourse:**

**How have planes changed over time?  
What would you do to increase the efficiency of planes?**

**Evaluate**

<b>Skill/Reasoning Learning Objectives</b>	<b>Assessment Instrument</b>
<p>To identify reasons why certain gliders may go farther than others. To determine ways to increase the likelihood of a glider flying a certain distance. To analyze what type of designs produce the best flying results. To analyze how the shape of a glider impacts the speed.</p>	<p><b>Write an instruction manual on how to design and build gliders/paper airplanes.</b></p>
<b>Knowledge Learning Objectives</b>	<b>Assessment Instrument</b>
<p>To identify key vocabulary related to flight. To construct gliders by following the directions of the designer. To design and test gliders for flying capability.</p>	<p><b>Short Teacher Created Quiz Demonstration of a glider flying specific distances.</b></p>

AVIATION PROJECT REPORT  
From: 107<sup>th</sup> Street STEM Magnet School  
Los Angeles Unified School District

The aviation project that I conducted with my 22 fourth graders was a huge success and truly one of their most memorable learning experiences of the year. When the pilot “Mossy” came to visit our class to deliver the grant award my students were immediately excited to learn more about aviation. My students were able to research, design, and build gliders thanks to the generous award from SAFE. Building the gliders enabled them to work collaboratively while learning more about how things fly.

A secondary benefit of this aviation project was realizing the significance of perseverance and tenacity. A few of my students struggled with building the gliders, but they worked with determination and dedication. After we flew the gliders one of those students said, “I’m so glad I didn’t give up on this.” This opened the door for a conversation about the rewards of striving to reach goals even when the task is difficult.

After we built the gliders together I had students who chose to continue creating more gliders on their own using alternative materials to compare and contrast the success of the gliders we built in class with the ones they built at home. It was amazing to see students go the extra mile to continue researching flight and aviation outside of school. My students are still working to improve their designs and several have dreams of one day becoming a pilot. In fact one of my female students said she didn’t know women were allowed to fly. Without this project there is no telling how long she would have continued to live with that misconception.

In sum, I believe this project will have a lasting impression on my students. It was a meaningful and engaging learning experience for them. Their horizons were broadened and this tremendously helped to support my teaching principle that the sky’s the limit.

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