**Title** Lesson 5: Design and Construct a Glider (2 Days)

**Project title** If You Build It, Will It Fly??????

**Grade Band Team:** Grades 6-8 ,Team C

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**Key Terms:**

Math terms Science terms

angles, aerodynamics, angle of attack,

measurement, airfoil, center of gravity, drag,

reflection, fuselage, gravity, high pressure,

 scale (drawing), lift, low pressure, rudder,

 symmetry vertical stabilizer(fin), wing, thrust

**Learning Objectives:**

Student will be able to…

1. Identify the four forces affecting flight (weight, lift, drag, thrust).
2. Explain why engineers build models, collect and analyze data from the models to form conclusions and make design decision base on evidence.
3. Give examples of how aircraft models can be modified to improve flight based on evidence.

**Common Core Standards in Math**

**Draw construct, and describe geometrical figures and describe the relationships between them.**

* 7.G.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

**Wisconsin** **Model Academic Standards in Science**

*POSITION AND MOTION OF OBJECTS*

D.4.6 Observe and describe physical events in objects at rest or in motion

D.4.7 Observe and describe physical events involving objects and develop record-keeping systems to follow these events by measuring and describing changes in their properties, including:

* position relative to another object
* motion over time
* and position due to forces

 D.8.6 While conducting investigations, explain the motion of objects using concepts of speed, velocity, acceleration, friction, momentum, and changes over time, among others, and apply these concepts and explanations to real-life situations outside the classroom

**Wisconsin Model Academic Standards in Information and Technology Literacy**

* C.8.2 Explain and demonstrate several solutions to a problem or opportunity using technological design, tools, careful planning, experimentation, and testing.

**Career Cluster Pathways in Manufacturing**

* Production
* Manufacturing production process development
* Installation and repair

**Materials**

Materials and tools for constructing styrofoam glider;

Various types of styrofoam containers, food trays,



Paper clips

poster putty or other weighted and attachable materials

adhesive tapes

**Tools**

Razor Knife

Cutting Board

Cardboard or backer material

 rulers/straight edge

 pencil

**Procedure**

1. Have students refer to the notes in their lab notebooks and the NASA handout “X-Gliders: Exploring Flight Research with Experimental Gliders” to come up with design ideas for their own personal glider. <http://er.jsc.nasa.gov/seh/X_Gliders.pdf>

Students will:

1. Draw their glider design on graph paper
2. Cut out the paper wing, fuselage, and stabilizer fin.
3. Trace the above parts onto foam tray.
4. Cut out the foam glider parts.
5. Carefully piece together the glider. Remind them to consider the angle of attack of the wings.
6. Write name on small stickers (2), and place them on the plane in symmetrical locations.
7. Experiment with wing “angle of attack,” adding additional weight to plane nose…

**Assessment**

 **Pre-assessment**

In lab notebooks, students will list 3-5 things they know about gliders/planes and how they are able to fly. Pictures may be used to help with explanations.

**Formative Assessment** Discussion questions and observation of students in class

1. What are the three most important things to remember when designing and building your glider?
2. What changes would you make in your glider design for the following situations?
	1. Your glider tends to “nose dive.”
	2. Your glider doesn’t fly in a straight line.
	3. Your glider flies only a short distance.

 **Summative Assessment**

In your lab book, draw and label a picture/ diagram of a glider in flight. Include the words high pressure, low pressure, lift, angle of attack, thrust, drag, fuselage, wing and stabilizer fin. Also have them explain one problem they had with their glider’s design, construction and/or flight, and how they corrected the problem.

**REACT Model of Contextual Teaching**

**Relating** – Students will be able to relate their new/increased understanding of flight to their experiences of traveling to vacation locations via airplanes.

**Experiencing** – Students will be experiencing firsthand the forces of flight. They will have the opportunity to experiment with the variables of their glider to try to increase flight distance and accuracy.

**Applying** – Students will apply what they have learned by adjusting their glider to increase flight distance and accuracy. Results of these changes will be tested in a team based classroom flight competition.

**Cooperating** – Students will have the opportunity to work with others on their team to solve their “engineering problems” before the flight competition.

**Transferring** – Students will transfer their new knowledge of forces and motion to many every day experience: from pushing someone on the swings or pushing a wheel barrow to working on fixing heating and cooling systems when they are grown. The options are endless!