BLOOMING

Inclusion and Diversity in STEAM

Lesson Plan: Exploring Aeronautics

Grade Level: Middle School (8th Grade)

Subject Areas: Science, Technology, Engineering, Mathematics (STEM)

Duration: 3 Class Periods (45 minutes each)

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Objectives:

- Students will understand the basic principles of aerodynamics and flight.
- Students will apply engineering design processes to create a functional glider.
- Students will learn about the role of women in STEAM through the life and career of Eleni Valavani.
- Students will develop problem-solving, teamwork, and critical thinking skills.

Materials:

- Interview excerpt with Eleni Valavani
- Paper or foam sheets for glider construction
- Scissors, rulers, tape, and glue

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- Small weights (e.g., paperclips)
- Protractors and measuring tapes
- Graph paper for design sketches
- Computer and projector for presentation
- Whiteboard and markers

Total Time: 3 Class Periods (135 Minutes)

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Period 1 (45 Minutes): Introduction to Aeronautics

Warm-up (10 minutes):

- Begin with a discussion on flight and the role of aeronautical engineers.
- Introduce key aerodynamics concepts: lift, thrust, drag, and weight.

Activity 1 (20 minutes):

- Present Eleni Valavani's interview and discuss her journey in aeronautics and astronautics(Interview (1)).
- Highlight key moments in her career and discuss how aerodynamics has influenced aircraft design.

Activity 2 (15 minutes):

- Engage students in a group discussion about the forces acting on an aircraft during flight.
- Ask students to give real-life examples of aerodynamics, like airplanes, birds, or paper planes.

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Period 2 (45 Minutes): Designing and Building a Glider

Warm-up (5 minutes):

- Recap the key concepts discussed in the previous period (lift, drag, weight, and thrust).
- Explain the engineering design process: ask, imagine, plan, create, test, and improve.

Activity 1 (20 minutes):

- In small groups, students sketch their own glider designs on graph paper.
- Discuss how changing the design of wings, tail, and body can affect the flight performance.

Activity 2 (20 minutes):

- Students use materials (paper or foam sheets, rulers, scissors, tape) to build their gliders based on their design sketches.

- Encourage creativity while making sure the designs consider the four forces of flight.

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Period 3 (45 Minutes): Testing and Reflection

Warm-up (5 minutes):

- Review the designs students created and predict how each glider will perform based on its shape and weight distribution.

Activity 1 (25 minutes):

- Testing: Students take their gliders outside or into a large space to test their flight.
    - Use measuring tapes and protractors to measure how far and how long the gliders stay in the air.
    - Students may make small adjustments to improve their gliders after initial tests (iterative process).

Activity 2 (10 minutes):

- Group Discussion: Ask students to reflect on their designs.
    - Which designs flew the furthest and why?
    - How did changing certain design elements affect the flight?

Closure (5 minutes):

- Summarize the main takeaways about aerodynamics, design, and problem-solving.
- Discuss the importance of perseverance, as reflected in Eleni Valavani's career, when working through engineering challenges.

Assessment:

- Participation in group activities and discussions.
- Quality and creativity of the glider design.
- Ability to explain the relationship between design choices and flight performance.
- Accuracy in measuring and recording flight distances.

Extension Activities:

- Encourage students to research more about careers in aeronautics and astronautics.
- Have students participate in a class-wide glider competition, awarding prizes for longest flight, best design, and most improved.

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