LESSON PLAN CODE: S-11/12

SUBJECT: Biology/Anatomy

GRADE LEVEL/COURSE: 11-12


TEACHER(S) NAME(S): Alicia Lowe

ALIGNMENTS:

- **PA Academic and Common Core Standards**
  - 1.2 - *Reading Informational Text* - Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

- **Big Ideas, Concepts, and Competencies [PDE-SAS Curriculum Framework]**
  - Biology Big Idea: Evolution is the result of many random processes selecting for the survival and reproduction of a population.

VOCABULARY:

1. *avian* - (birds) feathered, winged, bipedal, endothermic, egg-laying, vertebrates
2. *pneumatized* - air-filled, hollow
3. *pygostyle* – fused vertebrae forming a single bone that support tail feathers and musculature
4. *keel* – extension of the sternum that sits perpendicular to the ribs to anchor the wing muscles, provides leverage for flight
5. *furcula* – fused clavicles that strengthen the thoracic portion of the skeleton during flight

LEARNING OBJECTIVES:

1. TSWBAT list six categories of adaptations that contribute to avian flight.

2. TSWBAT briefly explain how birds’ bodies are capable of flight and how the Wrights’ glider attempts to mimic them.
ESSENTIAL QUESTIONS [including guiding historical/investigative question]:

In his letter to Octave Chanute, Wilbur Wright compares manned flight to the flight of birds. How does the Wrights’ machine compare to avian anatomy?

DURATION:

Two (2) 40-minute class periods

MATERIALS:

Internet access, SmartBoard, “The Inventive Wright Brothers” Teachers Guide from LOC, class set of laptops/tablets, small poster paper, markers, tape/glue

SUGGESTED INSTRUCTIONAL STRATEGIES [WHERE TO]:

W – Humans are always trying to re-create nature, from building fires, to making shelter, etc. One particular fascination has always been flight. In this activity, we will discover some early pioneers of flight and gain some insight about their feelings towards their work. By the end of the activity, you will be able to explain to your classmates how an early “flying machine” mimicked birds’ bodies.

H – We will read an excerpt from a letter sent from an American inventor named Wilbur Wright to a French inventor named Octave Chanute. Both men were experimenting with flying machines that were operated by people. In the letter, Wilbur Wright describes his preoccupation with flight as a “disease.”

E – As a group, we will travel outside to observe birds in flight. Once back inside, we will spend time researching bird anatomy and the adaptations that allow for flight. Then, we will examine photographs of the Wright Brothers’ glider. After this research, we will compare a bird’s body to the components of the glider.

R – During the research, we will continually come back to our primary sources (glider photos) and secondary sources (informational texts).

E – Once you have gained enough information to answer the question, you will express your newfound knowledge of birds and the glider by presenting a poster. On the poster, you will make three statements comparing natural flight (components of bird anatomy) to man-made flight (components of the Wrights’ glider). Each comparison must be made up of one “natural” component and one “man-made” component.

T – This is a student-centered project, therefore the students will tailor their learning and methods on their own. Students may choose to research via books, videos, Internet, etc. They may also choose the way in which they depict and explain their comparison statements.
O – In each step of instruction, students gain more independence from the teacher. The activities are quite abstract, so the teacher will be available to the students so they may ask for clarification or a step in the right direction.

INSTRUCTIONAL PROCEDURES [INQUIRY-DRIVEN]:

(Before the lesson, students will be assigned the Teacher’s Guide to the Inventive Wright Brothers from the LOC. They will read the guide and complete a worksheet that goes along with it.)

1. Display the “Wilbur Wright to Octave Chanute” letter from the LOC website on the Smart Board. Also display a typed version of the excerpt on the Smart Board so that students may follow along if they cannot read the hand-written letter. SEE END OF LESSON PLAN FOR EXCERPT.

   - Read the first two paragraphs of the letter as a class; students may take turns reading sentences.
   - “Why do you think Wilbur says he has a ‘disease’?” (Yellow highlighted segment.)
   - Ask students to come up and underline sections of the letter that make references to nature. Discuss these sections as a class to determine Wilbur’s meaning.
     - The two other sections they should underline are:
       - Green segment: “The flight of the buzzard…”
       - Blue segment: “… for man, but reason of his greater intellect…

2. Weather permitting, go outside to observe birds in flight (may also bring up a YouTube video instead of going outside). Students should be quiet and observant while outside. They should answer the following questions in their observations.

   - When in the air, do the birds always flap their wings? No
   - How do you think the birds stay in the air when they aren’t moving their wings? They’re help up by air currents
   - How would you describe this type of flight? Gliding

3. Once inside, students may choose a partner to work with on the remainder of the activity. With their partner, students will get onto their laptops/tablets to begin researching bird anatomy. There are several websites recommended for this step, but students may choose any other reliable website they want. The following is a list of topics they should learn about in their research.

   - Main components of body
   - Adaptations for flight and which anatomical systems are involved
• **How do bird fly?** (bones, muscles, feathers, etc.)

4. Once they are familiar with the bird information, students should view the photographs “First Flight” and “Kitty Hawk #3” from the LOC website.

• **Discuss with your partner the main components of the glider.** (*Support beams, double-decker wings, fabric stretched across each portion of the wing, pilot in the middle, etc.*)

• **How do you think the structure of the glider allows it to stay in the air?** (The fabric on the wings allows it to glide in the air. The pilot can maneuver it by adjusting the “tail” using the levers in the middle section.)

5. Now that they have information on natural flight and man-made flight, the partners can write three statements comparing each type of flight. After their comparisons are made, they may begin designing and creating their poster. Students should consult the rubric for the posters.

6. Each team will present their poster. Following the presentations, each student must turn in an “exit slip” that lists at least one comparison (made by another team) that the student did not come across in their research.

**FORMATIVE ASSESSMENTS [PERFORMANCE TASK AND RUBRIC]**

Performance Task – Graphic Organizer: How does the Wrights’ glider compare to avian anatomy? After reading informational texts on avian anatomy and viewing the images of the Wright Brothers’ glider, write a paragraph that addresses the question and support your statements with evidence from the texts/photographs. Once you have your ideas down in paragraph form, design a poster that conveys your statements.

• Students may choose how to depict the information, but a table or chart is suggested.
• An image or drawing of a bird **and** the Wrights’ machine must be included. If using a photograph, the image must be cited.
• See the attached rubric for details.

**RELATED MATERIALS & RESOURCES:**

Library of Congress Primary Sources (**Required**)
• “Wilbur Wright to Octave Chanute” (letter)
• “First Flight” (photograph)
• “Kitty Hawk #3” (photograph)

Various Secondary Sources (Recommended)

• National Aviary, “Wings to Fly”
• Ornithoper Zone
• Adaptations for Flight
• Students may choose any other reliable resources they can find

Excerpt from “Wilbur Wright to Octave Chanute” used in this lesson—this is how it should be underlined on the Smart Board.

Dear Sir,

For some years I have been afflicted with the belief that flight is possible to man. My disease has increased in severity and I feel that it will soon cost me an increased amount of money if not my life. I have been trying to arrange my affairs in such a way that I can devote my entire time for a few months to experiment in this field.

My general ideas of the subject are similar to those held by most practical experimenters, to wit: that what is chiefly needed is skill rather than machinery. The flight of the buzzard and similar sailors is a convincing demonstration of the value of skill, and the partial needlessness of motors. It is possible to fly without motors, but not without knowledge and skill. This I conceive to be fortunate; for man, by reason of his greater intellect, can more reasonably hope to equal birds in knowledge, than to equal nature in the perfection of her machinery.
Performance Task Rubric

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<th>Points Earned</th>
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