Title

TIME REQUIRED: 45 mins
GRADE: 6

DATE:
DESIGNER: Samantha Bennett, Dan Noonan, & Luciano Pietriano

Topic/Strand	UNDERSTANDING STRUCTURES AND MECHANISMS- FLIGHT
Curriculum Expectations	Overall: 3. Explain ways in which properties of air can be applied to the principles of flight and flying devices. 2. Investigate ways in which flying devices make use of properties of air. Specific: 2.2 use scientific inquiry/experimentation skills to investigate the properties of air 3.1 identify the properties of air that make flight possible
Goals and Objectives (desired student outcome)	Students will recognize that air has various properties that make it unique. They will also be able to identify each of these properties and briefly explain what they each mean. Lastly, they will begin to explore how they influence the flight of an object.
Resources	Balance, balloon, tank, glass cup, bag, books, paper strip
Introductory Activity	The class will begin with a discussion of the various properties of air. Students will take a brief note on these properties.

Lesson Development	Students are broken into small groups of 5-6. The classroom is set-up into four (4) stations, each of which is comprised of a different experiment that exemplifies each of the discussed properties of air. Students are not told which station represents which certain property. Each group is allotted 5-10 minutes at each station, and then the groups rotate. Stations: 1) Property: air has mass; Experiment: Create a balance, place a full balloon on one side and an empty balloon on the other- observe what happens (https://www.youtube.com/watch?v=o5LT_wfI98w) 2) Property: air takes up space; Experiment: Push an "empty glass to the bottom of a tank filled with water- observe what happens (https://www.youtube.com/watch?v=9bnfCgtTESc) 3) Property: air can be compressed: Experiment: blow up a bag filled with air that has books on top, what happens when the bag is full? (https://www.youtube.com/watch?v=KVcd2CtwQzw) 4) Property: air exerts pressure; Experiment: Air-pressure balloon in a bottle 5) Property: Bernouille's principle; Experiment: tent and strips of air; blow through the middle of the tented paper- observe what happens; blow on top of strip of paper- observe what happens
Concluding Activity	The lesson will conclude with a class discussion. The teacher prompts students as to what they saw in each of the experiments as well as to which experiment portrays each individual property of air. Moreover, a discussion about how these properties could influence the flight of a variety of common vessels (i.e. birds, airplanes, hot air balloons, helicopters, etc.).
Assessment, Evaluation	Assessment AS Learning: Reflect on hypothesis- "Was my hypothesis right? Why?" Assessment FOR Learning: Collect experiment worksheets once they have been completed, and have discussion with groups during class walkthrough to see findings. Assessment OF Learning: **N/A**

Follow-Up	Once students have been introduced to the properties of air, we will further explore the forces of flight.
Self-Reflection	The goal of the lesson is for students to make connections to the properties of light through understanding after completing the stations. We will reflect on what was gathered by student findings based on their worksheet answers and what we have gathered throughout the lesson.

Name(s): Samantha Bennett	
Subject: Science Level/grade: 6 Strand: UNDERSTANDING STRUCTURES AND MECHANISMS- FLIGHT	
Title of the Curriculum and Assessment Plan: Flight	
Enduring Understanding (Overall Expectation): 3. Explain ways in which properties of air can be applied to the principles of flight and flying devices. 2. Investigate ways in which flying devices make use of properties of air. 1. Assess the societal and environmental impacts of flying devices that make use of properties of air. □	
Big Ideas & Concepts (Specific Expectations): **Matter-** Air has many properties that can be used for flight and for other purposes. **Structure and Function-** Flight occurs when the characteristics of structures take advantage of certain properties of air.	
Essential Question (linked to Urban Communities): How does aviation technology influence our daily lives?	
Link to Achievement Chart:	❑ Knowledge and Understanding ❑ Thinking ❑ Communication ❑ Application

Culminating Task & Evaluation tool:

- Test on the basic concepts of air and flight that have been examined.
- Making and video analysis of a flying device (Rubric).
- Opinion Presentation (Rubric).

Materials:
Worksheets, Netbooks and ipads
For experiments: Balloons, tape, scissors, straw, marble, string, stick/meter stick, empty 2L pop bottles, clay/plaster

Lesson #	Specific Expectations	Link to Achievement chart	Learning Intention (What are students learning this lesson?)	Success Criteria (What will students be able to DO by end of lesson?)	Instructional and/or learning Strategy (matches learning intention)	Assessment Purpose (for, of & as)	Assessment Tool (feedback for teaching and learning)	Differentiation/ Accommodation/ Modification

1. Introduction to the properties of air (40 min)	3.1 identify the properties of air that make flight possible 3.2 identify common applications of the properties of air, such as its compressibility and insulating qualities 2.2 use scientific inquiry/experimentation skills to investigate the properties of air □	Students are familiar with the terminology associated with the properties of air. Students understand how to follow the scientific method. (K/U)	Students will learn about the 4 properties of air so that they can understand the common applications of these properties in daily life. They will also be learning how to use the scientific method.	* I can identify the 4 properties of air * I can give an example of how each property of air is applied in daily life. * I can follow the scientific method.	Inquiry based learning.	AfL	Fill in the scientific model worksheet. Students will be guided through how to follow the scientific process but will have to write their own concluding statements using what they've learned.	Modification: There will be more guiding questions provided on the worksheet. Accommodation: the ESL students will sit in a group where I can verbally explain the instructions to them.

2. Forces of flight (1h20min)	3.3 identify and describe the four forces of flight – lift, weight, drag, and thrust 3.4 describe, in qualitative terms, the relationships between the forces of lift, weight, thrust, and drag that are required for flight.	Students are familiar with the forces of flight. Students understand how the forces of flight are related. (K/U)	Students will learn about the four forces of flight so that they can apply this knowledge to building a flying device.	* I can identify the 4 forces of flight * I can explain the opposing forces of flight. * I can describe Bernouille's principle.	Practice & Inquiry based learning. (will perform an experiment based on students' interest chosen in first class)	AfL	Worksheet on the forces of flight.	Accommodation: the ESL students will sit in a group where I can verbally explain the instructions to them.

3. Living things that fly (40 min)	2.3 investigate characteristics and adaptations that enable living things to fly.	Students gather evidence of adaptations that enable living things to fly. (T/I)	Students will learn about the different living things that can fly and the special adaptations they have that allow them to fly.	* I can identify the properties that allow living things to fly. * I can give an example of how each property enables flight.	Student led learning- Research.	AfL	Worksheet linked with website they will use to find information. Exit Cards	Differentiation: use of computers
http://www.rspb.org.uk/birds-and-wildlife/read-and-learn/fun-facts-and-articles/adaptation/flight/airandblood.aspx								

4. Unbalanced Forces (40 min)	3.5 describe ways in which flying devices or living things use unbalanced forces to control their flight 3.6 describe ways in which the four forces of flight can be altered.	Students explain how flying devices and living things use the forces of flight. (Comm)	Students will learn about how the forces of flight can be altered and how unbalanced forces control flight.	* I can explain how unbalanced forces control flight. * I can name the different movements in flight. * I can give an example of how each of the 4 forces of flight can be altered.	Inquiry based learning	AfL AasL	Students will create a design for a flying device based on their knowledge of forces. Thei will peer –assess eachother's designs and give feedback. Entry Cards	Modification : guidance will be given to student who have an IEP.

5. Building a flying device (1h20min)	2.4 use technological problem-solving skills to design, build, and test a flying device (e.g., a kite, a paper airplane, a hot air balloon)	Students can connect their knowledge of properties of air and forces of flight in order to build a flying device. (App)	Students will learn how to build a flying device through trial and error. (with guidance as needed)	* I can use my knowledge of forces of flight to design a flying device. * I can follow the scientific method.	Inquiry based learning	AfL	Checklist based on progress of building the flying device	Modification: different checklist
6. Test	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 2.2, 2.3 (Lessons 1-4)					AofL		

7. Testing the flying devices (40 min)	2.1 follow established safety procedures for using tools and materials and operating flying devices	Students are able to apply their knowledge of safety procedures when performing an experiment. (App)	Students will learn about the safety procedures requred to perform the experiment.	* I can name all of the safety procedures. * I can name the steps in the scientific method.	Inquiry based learning	AfL	Safety proceedure checklist	N/A
8 & 9. Analyzing the results (1h20min) (+40 min)	2.5 use appropriate science and technology vocabulary, including aerodynamics, compress, flight, glide, propel, drag, thrust, and lift, in oral and written communication	Students can articulate their ideas using proper terminology and through a variety of forms. (Comm)	Students will learn how to analyze data.	* I can find the design flaws in a flying device. * I can think of adaptations that would improve a design for a flying device.	Student led learning	AofL AfL	Rubric Exit Cards	Modification : adapted expectations / rubric

	2.6 use a variety of forms to communicate with different audiences and for a variety of purposes.							
10 & 11. Societal Impact (40 min)(+1h 20min)	1.1 assess the benefits and costs of aviation technology for society and the environment, taking different social and economic perspectives into account	Students can analyze the pros and cons of aviation technology. (T/I)	Students will learn about the effects that aviation technology has on society and the environment.	* I can name 4 positives that come from aviation technology. * I can name 4 negative aspects that stem from aviation technology.	Student centered learning	AfL	Checklist Entry Cards	Modification : adapted checklist

12. Presentations						AofL	Rubric	Modification: adapted rubric
Reference list **The Ontario Curriculum Grades 1-8 Science and Technology 2007**								
Appendix List (see other document for assessments)								