Lesson Plan 1

LESSON PLAN CODE: L-8-1

SUBJECT: Geometry/Science (Cross-Curricular)

GRADE LEVEL/COURSE: 8th Grade Algebra & Science

TITLE: The Geo-Scientific Success of the Wright Brothers

ALIGNMENTS:
Eligible Content: PA Common Core Standards
2.1.7.D.1 – Analyze proportional relationships and use them to model and solve real-world and mathematical problems
2.4.8.B.1 – Analyze and/or interpret bivariate data displayed in multiple representations

VOCABULARY (part Algebra, Geometry, & Science):
Key Words: Wright Brothers, angles, design, distance vs. time, line graph/chart, ratio, scientific method, trial & error, hypothesis, experiment

OBJECTIVES: As a result of this unit plan, students will be able to...

- Identify the Wright Brothers and tell of their inspiration for flight
- Discuss primary sources through observation, reflection, and questioning methods
- Solve ratio, distance/time, and angle problems utilizing appropriate math skills
- Create a flying machine that demonstrates a direct relationship among distance and time

ESSENTIAL QUESTIONS: Guiding Investigative Questions

1. Where did they find their inspiration?
2. How did their ideas and designs for the flying machine change after each attempt/trial and error?
3. **How did the Wright Brothers bring together the ideas of math, problem solving, and science to invent the first recognized flying machine? How did their experiments follow the scientific method?

DURATION: Cross-curricular unit (8th grade science) – 8 to 9 days

MATERIALS: Flight evolution – short YouTube video, background knowledge hand-out on Wright Brothers, primary source copies/lamination (flying machine pictures, letter to father, and patent), graphic organizer (analyze- observe, reflect, and question), PowerPoint (geometry review: angles, distance vs. time, ratios, line graphs), math review worksheet with Wright Brother questions, project/lab packets (contains scientific method, group hypothesis, trial and error charts, blueprint page, and final line graph), Kitty Hawk: The Wright Brothers’ Journey of Invention (2003)

Carina Honeygosky
INSTRUCTIONAL STRATEGIES & PROCEDURES:

The Wright Brothers unit is a cross-curricular plan developed with the 8th grade science teacher. We will be working with different components with the students to bring the whole unit together. While, he/she would teach and do activities with the scientific method, I will be teaching and doing activities with the designs and math behind the invention. The part we will collaborate on will be the ending project of designing and constructing students’ own flying machine. Students will work on their flying machine in both math and science class.

Anticipatory Set:

We will begin this lesson with an introduction to the topics of success and failure. I want to draw upon students’ background knowledge and personal experiences. These topics should be relevant to each student while we discuss some examples of having success vs. having failure and what could have caused each experience. Also, we will move into talking more specifically about flight and the beginning of flying machines. I want the students to understand why it is so important to today’s world. We will view a couple short YouTube videos about the evolution of flight that contains some introductory information about the Wright Brothers and their experiences.

Main Lesson:

After getting the students engaged with our discussion and the video clips from my anticipatory set, I want to get into the main lesson. Now that the Wright Brothers have been mentioned, I want the students to develop a further understanding of who they were and what they did since they will be our main topic of interest. I will lecture briefly of certain historical background information pertaining to the Wright Brothers, such as their childhood and relationship with their father, their jobs/apprenticeships, and their inspiration behind their invention. I want their focus to be more on their inspiration and how they were able to use math and science to achieve their goals.

Continuing to engage the students, they will arrange their desks into groups of four. I will have about six primary source documents (including photographs, letters, and a patent) laminated and available, one for each group. To start, the students at each group will look at their primary source and WONDER about the Wright Brothers and their flying machine. I want them to talk about the source amongst themselves and then analyze what they are seeing and/or reading. The students will be given a packet of graphic organizers that they will fill in individually. This graphic organizer will allow them and help them to organize their thoughts and ideas by categories: Observe, Reflect, and Question. Once they are done analyzing the source and jotting down ideas onto their graphic organizer, they will pass the source to the group of students to left and so on, until each group has seen and discussed each source. I will allot the students about 10 minutes for each primary source, while I will be walking around and monitoring discussion and progress. I want to hear what students are thinking and wondering about the topic.

Once the students have had the chance to observe, discuss, and analyze the primary sources, I want them to INVESTIGATE the topic and make inferences about how they think the Wright Brothers finally arrived at a successful flying machine. I will make more copies of the primary sources and laminate them for protection during this next activity. The students will remain in their groups of four and each group will share a set of the primary sources. The sources will be laid out on the desks in a randomized pile; here, the students will have to talk about and think critically about how the sources should be arranged into a timeline. I want them to infer and make educated decisions about the chronological process of the Wright Brothers. With this timeline activity, they should take into account what they see, what they read, and what kind of designs have been made as well as changes to the designs. They will be given about 15

Carina Honeygosky
minutes to collaborate and complete the timeline. I will walk around to each group and have them tell me why they chose the order they did for their timeline. This will allow me to grasp what the students are thinking and gauge how much they have learned up to this point. Briefly as a class, we will discuss the correct order of the sources and how we are able to come to that conclusion together.

Next, I will take a day to talk about and review the concepts of geometry that the students should know and will have to utilize during the next part of our unit. Here, I will address the vocabulary words and make sure they understand what they mean and how they will be used in our final unit project. First, we will review angles and ratios. They must be able to identify different angles, measure drawn angles, and draw particular angles using a protractor and ruler. Also, students must understand the concept of distance over time or distance versus time as it pertains to the flight of the Wright Brothers flying machine. Each attempt to fly their machines at Kitty Hawk resulted in a certain distance over a certain amount of time; as they continued to be successful, each measurement increased. The increase in one measurement (distance) caused an increase in the other measurement (time), which concludes a direct and positive relationship. The students will be able to solve problems on a worksheet relating to the measurements that the Wright Brothers took as well as some extra ratio problems that I will make up for them. This review will lead us into finally making line graphs/charts out of this information. They will do practice line graphs with answers from their distance versus time worksheet to practice and show me their understanding. Eventually, the line graph of their own flying machine will be the biggest, most important part of their unit grade. All of this guided and independent practice via the worksheets will be on an individual basis and worth a homework grade or two.

I will select the pairs of students that will work on and complete the next phase of the unit. They will be responsible for using the mathematical and scientific information that they have learned and reviewed to **construct** their own flying machines. Obviously, their final machine will not be engine-powered, but will most resemble a type of kite. The students are encouraged to use whatever materials they find will be most useful to them as well as their own creative designs. The main idea is to build/create a flying machine that will fly high and long, resulting in a direct, positive relationship among distance versus time just like the Wright Brothers established. They will be provided with small materials to use during class, but I want the main materials to be something that they have come up with so that the groups have different flying machines and are thinking critically about the project.

Along with working on their flying machines in both math and science class (over a three day period), the students will be given a combined packet that contains all related math and science work. The project packet will allow students to **express** their beginning thoughts and ideas, rough draft and final designs/blueprints, scientific method including a hypothesis about their flying machine, trial and error charts with distances, times, and ratios, and finally their line graphs. Throughout their design and experiment, the students will answer questions pertaining to their progress and highlight any changes made and why. There will be roughly two to three days allotted for the flying experiments outside. Students and their partners will take turns flying their machines and recording distances, times, and observations. They will be allowed one day to make any changes to their machines to improve their flying success before we fly them outside one more time. At this point, students will have enough information to finish their line graphs as they graph their first fly day against their second fly day, after any changes have been made.

**Closure:**

Students will **reflect** upon their math/science unit project by giving a small presentation (about 2-3 minutes) about their initial thoughts, success vs. failure during design and experiment days, and what they can conclude and have learned as a result of the project.

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This unit plan CONNECTS with student learning in both math and science classes because of the components involved throughout the anticipatory set, main instructional method, and closure. They can make the connection that relevant, real-life things like travel via aircrafts started with the Wright Brothers and their ability to use certain math and science skills. Doing on worksheets on ratios and graphing distance vs. time does not help the students see the usefulness of math and where it can be used.

To conclude our unit, we will show the students a movie about the life of the Wright Brothers. This will take about a day and a half to show, but will be a nice way to end the unit and reward the students for their hard work. The movie is called, “Kitty Hawk: The Wright Brothers’ Journey of Invention.”

Pennsylvania Standards Aligned System
Topics in Geometry/Scientific Method – Cross-Curricular Unit – The Geo-Scientific Success of the Wright Brothers

Performance Task:

The students will be given a few different forms of formative assessment during the Wright Brothers unit plan because it does last about two weeks. I want to monitor the progress of each student and make sure that they are learning during the different activities. First, they will be given an individual quiz on the math (geometry) topics and skills that we are going to review because they will be utilizing those skills during the flying machine project. Their results will allow me to determine whether to move on to our next activity. Students should be able to work with angles and their measurements as well as solve ratio problems.

The second formative assessment will be the biggest, most important grade of the unit because it involves the most time and work. Students will design and construct their flying machine with their partner as well as fully complete their project packets. The student and partner will receive a group grade, and the grade will encompass different parts of their project, including, their designs/blueprints, flying machine, charts and line graph, and questions throughout their packet.

Lastly, their presentation of their project at the end of the unit will be another type of formative assessment. I want to hear what they were thinking and how they were progressing from start to finish. They will have a set rubric to follow for basic content and presentation skills. Again, this will be a partner grade as they will both be contributing to the discussion of their flying machine. The students will be getting feedback from me throughout the unit to guide their learning.

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Rubric:

1.) Flying Machine – Building a Structure

Building a Structure: Flying Machine

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modification/Testing</td>
<td>Clear evidence of troubleshooting, testing, and refinements based on data or scientific principles.</td>
<td>Clear evidence of troubleshooting, testing and refinements.</td>
<td>Some evidence of troubleshooting, testing and refinements.</td>
<td>Little evidence of troubleshooting, testing or refinement.</td>
</tr>
<tr>
<td>Scientific Knowledge</td>
<td>Explanations by all group members indicate a clear and accurate understanding of scientific principles underlying the construction and modifications.</td>
<td>Explanations by all group members indicate a relatively accurate understanding of scientific principles underlying the construction and modifications.</td>
<td>Explanations by most group members indicate relatively accurate understanding of scientific principles underlying the construction and modifications.</td>
<td>Explanations by several members of the group do not illustrate much understanding of scientific principles underlying the construction and modifications.</td>
</tr>
<tr>
<td>Data Collection</td>
<td>Data taken several times in a careful, reliable manner.</td>
<td>Data taken twice in a careful, reliable manner.</td>
<td>Data taken once in a careful, reliable manner.</td>
<td>Data not taken carefully OR not taken in a reliable manner.</td>
</tr>
<tr>
<td>Construction Care Taken</td>
<td>Great care taken in construction process so that the structure is neat, attractive and follows plans accurately.</td>
<td>Construction was careful and accurate for the most part, but 1-2 details could have been refined for a more attractive product.</td>
<td>Construction accurately followed the plans, but 3-4 details could have been refined for a more attractive product.</td>
<td>Construction appears careless or haphazard. Many details need refinement for a strong or attractive product.</td>
</tr>
</tbody>
</table>
Journal provides a complete record of planning, construction, testing, modifications, reasons for modifications, and some reflection about the strategies used and the results.

Journal provides quite a bit of detail about planning, construction, testing, modifications, and reasons for modifications.

Journal provides very little detail about several aspects of the planning, construction, and testing process.

2.) Wright Brothers Presentation

**Oral Presentation Rubric : Wright Brothers Presentation**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension</td>
<td>Student is able to accurately answer almost all questions posed by classmates about the topic.</td>
<td>Student is able to accurately answer most questions posed by classmates about the topic.</td>
<td>Student is able to accurately answer a few questions posed by classmates about the topic.</td>
<td>Student is unable to accurately answer questions posed by classmates about the topic.</td>
</tr>
<tr>
<td>Enthusiasm</td>
<td>Facial expressions and body language generate a strong interest and enthusiasm about the topic in others.</td>
<td>Facial expressions and body language sometimes generate a strong interest and enthusiasm about the topic in others.</td>
<td>Facial expressions and body language are used to try to generate enthusiasm, but seem somewhat faked.</td>
<td>Very little use of facial expressions or body language. Did not generate much interest in topic being presented.</td>
</tr>
<tr>
<td>Preparedness</td>
<td>Student is completely prepared and has obviously rehearsed.</td>
<td>Student seems pretty prepared but might have needed a couple more rehearsals.</td>
<td>The student is somewhat prepared, but it is clear that rehearsal was lacking.</td>
<td>Student does not seem at all prepared to present.</td>
</tr>
<tr>
<td>Time-Limit</td>
<td>Presentation is 5-6 minutes long.</td>
<td>Presentation is 4 minutes long.</td>
<td>Presentation is 3 minutes long.</td>
<td>Presentation is less than 3 minutes OR more than 6 minutes.</td>
</tr>
</tbody>
</table>

Teacher Name: **Ms. Honeygosky**

Student Name: ________________________________

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<table>
<thead>
<tr>
<th>Speaks Clearly</th>
<th>Shows a full understanding of the topic.</th>
<th>Shows a good understanding of the topic.</th>
<th>Shows a good understanding of parts of the topic.</th>
<th>Does not seem to understand the topic very well.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaks clearly and distinctly all (100-95%) the time, and mispronounces no words. Also, maintains good posture and <strong>eye contact</strong> at all times.</td>
<td>Speaks clearly and distinctly all (100-95%) the time, but mispronounces one word. Also, maintains good posture and eye contact most of the time.</td>
<td>Speaks clearly and distinctly most (94-85%) of the time. Mispronounces no more than one word. Also, rarely maintains good posture and eye contact.</td>
<td>Often mumbles or can not be understood OR mispronounces more than one word. Also, never maintains good posture or eye contact.</td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration with Peers</td>
<td>Almost always listens to, shares with, and supports the efforts of others in the group. Tries to keep people <strong>working</strong> well together.</td>
<td>Usually listens to, shares with, and supports the efforts of others in the group. Does not cause &quot;waves&quot; in the group.</td>
<td>Often listens to, shares with, and supports the efforts of others in the group but sometimes is not a good team member.</td>
<td>Rarely listens to, shares with, and supports the efforts of others in the group. Often is not a good team member.</td>
</tr>
</tbody>
</table>