WAMC Lab Template

Math Concept(s): *Line of Best Fit / Dependent / Independent Variables*
Source/Text: *Online*
Developed by: *Cherin Erickson* **E-Mail:** *cerickson@sheltonschools.org* **Date:** *6/22/22*

Attach the following documents:

- *Lab Instructions*
- *Student Handout(s)*
- *Rubric and/or Assessment Tool*

*****Assignment to be graded on individual data collection and participation***

Short Description (Be sure to include where in your instruction this lab takes place):

In the following investigation, students will use mathematics to examine the relationship between a glider's wing span and the distance the glider flies from its launching point. Students will work with a partner and together build four gliders, each of different sizes. Students will begin by measuring the wing span of each glider and then they will record the measurement. Students will then fly their gliders and record the distance flown. When the data-recording is complete, students then follow specific steps to plot their data points on a Cartesian Plane (scatter plot) showing the relationship between the wing-span of their gliders and the distance that each of the four gliders fly.

Lab Plan

Lab Title: *Hang gliding: An Investigation*

Prerequisite skills: *Student must have understanding of coordinates, independent and dependent variables, how to graph a line of best fit, and write a linear equation.*

Lab objective:

-I can determine the correlation between the collected data.
-I can determine the relationship between the wing-span of a glider and the distance the glider flies.
-I can determine the dependent and independent variables.
-I can find the slope for my glider descents.
-I can plot the data collected during the activity.
-I can create a "Line of Best Fit" for data collected.
-I can create an equation based on the "Line of Best Fit".

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- *A1.1.A Select and justify functions and equations to model and solve problems.*
- *A1.1.B Solve problems that can be represented by linear functions, equations, and inequalities.*
- *A1.3.B Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.*

Standards for Mathematical Practice:

- *Construct viable arguments and critique the reasoning of others. Make sense of problems and persevere in solving them.*

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- *Reading: 1.2 Use vocabulary (word meaning) strategies to comprehend text. 2.1 Demonstrate evidence of reading comprehension. Writing: 2.2 Write for different purposes, such as telling stories, presenting analytical responses to literature, persuading, conveying technical information, completing a team project, and explaining concepts and procedures.*

K-12 Science Standards

- *HS-PS2 (motion and stability)*

Technology

- *4.A Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.*

Engineering

- *HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.*

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☒ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☒ Think Creatively
☒ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☒ Make Judgments and Decisions
☐ Solve Problems
Communication and Collaboration

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☒ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☒ Apply

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☒ Be Flexible
Initiative and Self-Direction
☐ Manage Goals and Time
☐ Work Independently
☒ Be Self-Directed Learners
Social and Cross-Cultural
☒ Interact Effectively with Others

Productivity and Accountability
☒ Manage Projects
☐ Produce Results
Leadership and Responsibility
☒ Guide and Lead Others
☒ Be Responsible to Others

☒ Communicate Clearly	Technology Effectively	☒ Work Effectively in Diverse Teams
☒ Collaborate with Others		

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- *Four sheets of paper, each of different sizes*
- *Directions on folding 4 different sized paper to make gliders (provided in the lab)*
- *scotch tape*
- *scissors to trim glider*
- *Recording table (provided in the lab)*
- *2 sheets of graph paper for plotting data points (provided in the lab)*
- *Measuring tape or ruler*

Set-Up Required:

- *Pair students up*
- *Have students gather required materials*
- *Ensure adequate space for flying gliders*

Lab Organization Strategies:

Cooperative Learning:

- *Students will work with a partner in order to communicate and think critically while completing the assigned lab.*

Expectations:

- *Students will understand the correlation between wing span and distance.*

Timeline:

- *Lab will be completed within a 50-minute class period.*

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Real world applications include, but not limited to, aeronautics, engineering, and/ or architecture.

Career Applications

- Airplane mechanic, pilot, and/or architect to name a few.

Optional or Extension Activities

- Students could use this activity to dovetail into the next lesson of calculating velocity.

WAMC Lesson Plan

Name(s): Cherin Erickson
Email Address: cherin1123@yahoo.com
Lesson Title: Line of Best Fit
Date: 6/23/22
Text: Big Ideas Math
STEM Correlation: Aeronautics, Engineering, Architecture
Lesson Length: 2 days (50 minute classes)

Big Idea (Cluster):	
Mathematics K–12 Learning Standards: HSA.CED.A1.A, HSA.CED.A1.B, HSA.CED.A3.B	
Mathematical Practice(s): CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically	
Content Objectives: Determine the correlation between data collected, determine dependent and independent variables, find slope, plot data collected, create “Line of Best Fit” for data collected, create an equation based on the “Line of Best Fit”.	Language Objectives (ELL): Understand the vocabulary pertinent to this lesson with 90% accuracy.
Vocabulary: Line of Best Fit, dependent and independent variables, slope, data, and plot	Connections to Prior Learning: Students will have learned to plot data on a graph and have a thorough understanding of dependent and independent variable.
Questions to Develop Mathematical Thinking: • How can you use a scatter plot and line of best fit to analyze data? • What does the line of best fit refer to? • How do you know to go up or down on the graph? • How do you know to go left or right? • When do you graph a vertical line? • When do you graph a horizontal line?	Common Misconceptions: • Mixing up the x and y axes (independent/dependent variables) • Misplacing the slope or y-intercept in the equation prior to graphing

Assessment (Formative and Summative):

- 1.Formative: Exit Ticket: Four sets of coordinates that students must graph on their paper, including drawing a line of best fit. Exit ticket is to be turned in before leaving class.
- 2.Summative: End of Unit Test

Materials:

- Pencil
- Textbook
- Worksheet
- Exit ticket

Instruction Plan:

Introduction: Students should come in and start on the Entry Task. After roughly 5 minutes, go over the entry task with students, and discuss possible answers to the prompt.
Explore: Ask students, “How can you use a scatter plot and line of best fit to analyze data?” Go over

two examples of plotting on a graph with students and show them how to find the line of best fit. Present worksheet from Lesson 4.4 from text and go over the directions with them. Once students are done with the worksheet or there are 10 minutes left in class, students should work on the Exit Ticket (formative assessment).

When I observe students: Students should be collaborating and taking turns solving problems. There shouldn't be any groups who are not talking or working together. As I walk around the classroom I will be sure to observe and assist all students.

Questions to Develop Mathematical Thinking as you observe:

- How can you use a scatter plot and line of best fit to analyze data?
- How do you know to go up or down on the graph?
- How do you know to go left or right?

Answers:

- Scatter plot data on a graph then form the line of best fit to determine the average trend in data.
- If the numerator is positive, then you go up. If the numerator is negative, you go down.
- If the denominator is positive, you go right. If the denominator is negative, you go left.

Summarize: To determine the line of best fit, you look for the mid-section of the data plotted on the graph. To do this, you must know how to graph coordinates. Give students the Exit Ticket for this lesson to be turned in at the end of the period.

Career Application(s):

- Airplane mechanic, pilot, and/or architect

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