<u>**WAMC Lab Template**</u>
Math Concept(s): Calculating Slope, Predicting Growth
Source / Text: Big Ideas Math – Algebra 1
Developed by: Bill Every
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Date: June 22, 2022

<u>**Attach the following documents:**</u>
- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

<u>**Short Description (Be sure to include where in your instruction this lab takes place):**</u>

<u>**Lab Plan**</u>
Lab Title: School Enrollment Projection Using Lines of Fit.

Prerequisite skills:
Students will have previously been introduced to concepts including ordered pairs and X/Y Axis.
Students will have previously been introduced to Lines of Fit.
Students will have previously been introduced to Solving and Creating Linear Equations.

Lab objective:
Students will determine X, Y coordinates during a lab based on school enrollment and years. X will be represented by time/years and Y will be represented school enrollment.
Students will determine Slope.

<u>**Standards:**</u> *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards:
- CCSS.MATH.CONTENT.HSA.REI.A.1
- CCSS.MATH.CONTENT.HSA.REI.D.10
- CCSS.MATH.CONTENT.HSA.CED.A.2
- CCSS.MATH.CONTENT.HSA.CED.A.3
- CCSS.MATH.CONTENT.HSA.CED.A.4

Standards for Mathematical Practice:

- CCSS.MATH.PRACTICE.MP1
- CCSS.MATH.PRACTICE.MP2
- CCSS.MATH.PRACTICE.MP3
- CCSS.MATH.PRACTICE.MP4
- CCSS.MATH.PRACTICE.MP5

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):
- CCSS.ELA-LITERACY.RST.9-10.3
- CCSS.ELA-LITERACY.RST.9-10.7
- CCSS.ELA-LITERACY.RI.9-10.4

K-12 Science Standards
- (HS-PS2-2)
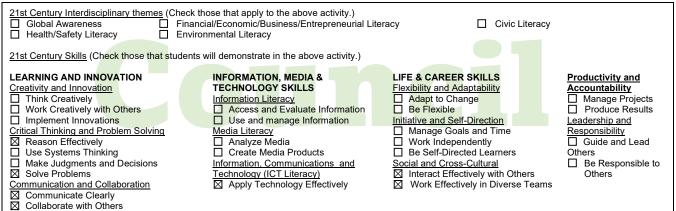- (HS-PS2-4)
- (HS-PS2-6)

Technology
- 3.c. Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.
- 3.d. Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

Engineering
- (HS-PS2-2)
- (HS-PS2-4)
- (HS-PS2-6)

Leadership/21st Century Skills:

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

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 Technology Effectively

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
- ☒ Work Effectively in Diverse Teams

Productivity and Accountability
- ☐ Manage Projects
- ☐ Produce Results

Leadership and Responsibility
- ☐ Guide and Lead Others
- ☐ Be Responsible to Others

https://wa-appliedmath.org/

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

Materials
- Chromebooks or computers
- Data collection document

Set-Up Required:
- Discuss the world of data. We are a world that is "Data Rich" and "Information Poor."
- Discuss data to be collected from, in this case, the OSPI website.
- Discuss data to be collected and "Why would we be collecting this data." Include the theory or projecting numbers.
- Review of OSPI website and methods of filter data.
- https://www.k12.wa.us/data-reporting/data-portal
- Hand out data collection worksheet.

Lab Organization Strategies:
  Leadership (Connect to 21st Century Skills selected):
- See above.

Cooperative Learning:
- Have students work in dyads.
- One student will be the online researcher.
- One student will be the recorder.

Expectations:
- Students will be able to see a line of best fit.
- Students will be able to see a linear function.
- Student will graph and save data utilizing Desmos online graphing calculator.

Timeline:
- 1 class period

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab
- Public Schools
- Cities or County, or state government.
- Budgeting

Career Applications
- Data Analysts
- Controllers
- Business Managers
- Human Resources

Optional or Extension Activities
- What other applications could this activity be applied.
- Discussion/brainstorm on other possible ways of projecting growth.

WAMC Lesson Plan

Name(s): Bill Every
Email Address: bevery@sheltonschools.org
Lesson Title: Applying Slope, Function, and Solving Linear Equations
Date: June 22, 2022
Text: Big Ideas Math – Algebra 1
STEM Correlation: Math
Lesson Length: 3 days including School Enrollment Projection Using Lines of Fit

Big Idea (Cluster): Create equations and solve word problems and predict future trends.

Mathematics K–12 Learning Standards:
1. CCSS.MATH.CONTENT.HSA.REI.A.1
2. CCSS.MATH.CONTENT.HSA.REI.D.10
3. CCSS.MATH.CONTENT.HSA.CED.A.2
4. CCSS.MATH.CONTENT.HSA.CED.A.3
5. CCSS.MATH.CONTENT.HSA.CED.A.4

Mathematical Practice(s): MP1, MP2, MP3, MP4, MP5

Content Objectives:	Language Objectives (ELL):
1. Students can graph linear equations in slope intercept form when given two coordinate points. 2. Students can develop time/distance algebraic equation. 3. Students can solve word problems. 4. Students can utilize critical thinking skills to predict future growth/decay.	1. Students can define the vocabulary words with 90% accuracy. 2. Students can graph linear equations in slope intercept form. 3. Students can develop time/distance algebraic equation. 4. Students can solve word problems. 5. Students can utilize critical thinking skills to predict future growth/decay.
Vocabulary: 1. Slope 2. Coordinate Point 3. Line, slope-intercept form 4. Quadrant 5. Region (coordinate plane) 6. Linear Equation 7. Line of Fit 8. Numerator 9. Denominator 10. Prediction/Predicting	**Connections to Prior Learning:** 1. How to determine slope from two points. 2. How to graph linear equations. 3. How to write an equation in slope intercept form. 4. How to solve a linear equation. 5. How to create and solve linear equations to predict growth.
Questions to Develop Mathematical Thinking: • How to utilize real world data and apply it to algebraic methods to project future growth. • How do you know where to start on the graph? • What parts of the equation are helpful when graphing? • How do you graph a slope from an	**Common Misconceptions:** • Plotting the opposite for X and Y. i.e., Y for X and X for Y. • Not knowing when to go left or right, up or down when graphing. • Placing X values for the Y values when completing the formula. • Developing formula's for solving word questions. • Be sure that the Delta Y is in the numerator

WAMC Lesson Plan

equation? • How do you know to go up or down? • How do you know to go left or right? • How to predict utilizing basic algebraic principles.	and the Delta X is in the denominator.

Assessment (Formative and Summative):

- **Formative Assessment:** Completion of day 2 worksheet and discussion.

- **Summative Assessment:** Written assessment with a similar type data set to project growth.

Materials:

- Worksheet
- Possibly calculators

Instruction Plan:

Introduction:
- Learning targets posted prior to the start of class.
- Review School Enrollment Projection Using Lines of Fit from prior day.

Explore:
- Discuss ways that this data could be used.
- What observations/insight might the students have from the data collections activity?
- Present worksheet for students to develop linear equations and solve word problems based on the data from School Enrollment Projection Using Lines of Fit lab.

When I observe students:
- Students should be collaborating and discussing possible solutions.
- All students should be engaged in dyad discussion.
- The look for is for any groups that are shutting down. Possibly have more successful students mentor these groups.
- Look for students that quickly identify math application processes. How might they be included as leaders in this and future process.

Questions to Develop Mathematical Thinking as you observe:
1. How do you know where to start on the graph?
2. What parts of the equation are helpful when graphing?
3. How do you graph a slope from an equation?
4. How do you know to go up or down?
5. How do you know to go left or right?
6. How do you explain the X coordinate?
7. How do you explain the Y coordinate?
8. What does the Slope represent?
9. Analyze the data and develop ideas/reasons why there is a jump in the numbers?

Answers:
1. Identify the y-intercept in the equation and graph the point.

2. The slope and the y-intercept.
3. Slope is rise over run, therefore a slope of 2 means to go up 2 values and to the right 1 value.
4. If the numerator is positive, then you go up. If the numerator is negative, you go down.
5. If the denominator is positive, you go right. If the denominator is negative, you go left.
6. The horizontal position on the graph.
7. The vertical position on the graph.
8. Slope of a line is **a measure of its steepness**.
9. Answers will vary depending on students' knowledge of the community.

Summarize:

- This lesson demonstrates the collection of data from a "real world" source.
- This lesson provides opportunity for student to work with and apply math to "real world" numbers.
- This lesson creates a connection to the world of prediction and math.
- This lesson brings multiple aspects of Algebra to life in an environment that the students can see and relate to.
- This lesson provides opportunity to students to collect data, create a new form of presenting data, and applying the data for the use of prediction.

Career Application(s):

- Careers could include but not limited to: Data Analyst, Business Manager, Controller, Human Resources, etc.

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	**INFORMATION, MEDIA & TECHNOLOGY SKILLS**	**LIFE & CAREER SKILLS**	**Productivity and Accountability**
Creativity and Innovation	Information Literacy	Flexibility and Adaptability	☐ Manage Projects
☐ Think Creatively	☐ Access and Evaluate Information	☒ Adapt to Change	☒ Produce Results
☐ Work Creatively with Others	☐ Use and manage Information	☐ Be Flexible	Leadership and Responsibility
☐ Implement Innovations	Media Literacy	Initiative and Self-Direction	☒ Guide and Lead Others
Critical Thinking and Problem Solving	☐ Analyze Media	☒ Manage Goals and Time	☒ Be Responsible to Others
☒ Reason Effectively	☐ Create Media Products	☒ Work Independently	
☒ Use Systems Thinking	Information, Communications and Technology (ICT Literacy)	☐ Be Self-Directed Learners	
☒ Make Judgments and Decisions	☒ Apply Technology Effectively	Social and Cross-Cultural	
☒ Solve Problems		☒ Interact Effectively with Others	
Communication and Collaboration		☐ Work Effectively in Diverse Teams	
☐ Communicate Clearly			
☒ Collaborate with Others			

Slope of a Line, Time, Distance, Prediction   Name:_____

Period:_____

Utilizing the formula for rise over run, ($\frac{\Delta y}{\Delta x}$), the Delta of Y divided by the Delta of X will determine the SLOPE.

The formula $\frac{y_2 - Y_1}{x_2 - x_1}$ equals $\frac{\Delta y}{\Delta x}$ which equals SLOPE.

1. Calculate the SLOPE for the School Enrollment:
   Formula:_____

   SLOPE:_____

2. From the School Enrollment lab and from the above information, develop the formula to calculate future growth of student enrollment.

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3. What would be the number of new students for the 2022-23 school year be?
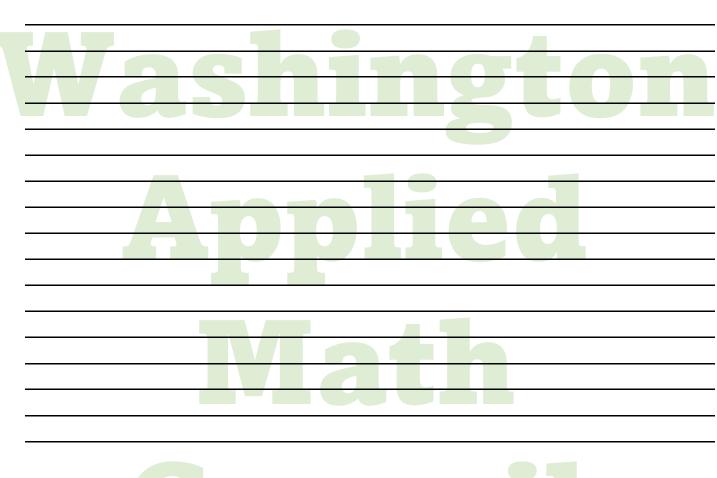   Formula:_____

   Solution:_____

4. What would the total number of students be for the 2022-23 school year?
   Formula:_____

   Solution:_____

5. Project out to the 2026-27 school year and calculate the projected enrollment?
   Formula:_____

   Solution:_____

6. What is the number of new students for the 2026-27 school year as compared to the 2020-21 school year?
   Formula:_____

   Solution:_____

7. Brainstorm a list of reasons why the projections may be off in future years. By off, either a higher or a lower number.

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