WAMC Lab Template
Math Concept(s): Slope, Intercept(s), and Linear Equation.
Source / Text:
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Attach the following documents:
- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):
- For this lab, students will work in groups of 4, but present individually, to how fast the temperature of heated tap water cools off. They will use different types of containers to collect and store the water. They will take an initial temperature reading followed by temperature checks at a constant time interval. They will collect the data, make a graph, find the slope, and find the intercepts.

Lab Plan
Lab Title: Hot Water Graph

Prerequisite skills:
- Understand how to graph ordered pairs and how to interpret the information.
- Understand Slope Intercept Form and how to solve of the missing unit.
- Understand slope/rate of change.
- Knowledge of how to make a linear equation.

Lab objective: Students will work collaboratively but collect their own date of temperature versus the time it takes to cool a container of hot tap water over a 25-minute period.

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards:
- CCSS.MATH.CONTENT.HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest.
- CCSS.MATH.CONTENT.HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- Ccss.MATH.CONTENT.HSF.LE.A.1.C Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Standards for Mathematical Practice:
- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 4: Model with mathematics.
- MP 8: Look for and express regularity in repeated reasoning.

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

- CCSS.ELA-LITERACY.SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners.
- CCSS.ELA-LITERACY.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically.

[K-12 Science Standards](#)

- K-PS2-2 Analyze data to determine if a design solution works as intended.

[Engineering](#)

- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

[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			

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

Materials

- Heat safe container (cup, thermos, tumbler, water bottle), thermometer, timer, computer, data table, graphing paper, writing utensil, ruler, and a calculator.

Set-Up Required:

- Four students per group.
- Allow tap water to run until heated.
- Hand out data table and graphing paper

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Work collaboratively with a team.

- Display creative thinking.
- Be responsible to others.

Cooperative Learning:

- Students will work together to strategize on collecting data for ordered pairs.
- Students will be able to communicate their own ideas and receive input from others.

Expectations:

- All team members will be respectful to each other.
- Team members will interact within their respective team.
- Problem solve as a team.
- Distribute the workload evenly and be accountable for the delegated task.

Timeline:

- 1 hour to complete the lab and have a whole class discussion.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

This lab involving slopes, finding intercepts, and generating a linear equation can be applied in several real-world situations. Those situations include but are not limited to:

- Identifying unknown angles in geometry.
- Calculating speed, distance, or time.
- Solving problems related to force and pressure.
- Determining an unknown age.

Career Applications

- Economics, Engineering, Finance, Physics, Data Science, Construction, Architects, Surveyors, Computer Programmer, Insurance Agents, and more.

Optional or Extension Activities

- This lab could also be done with more control over the variables for a more constant result. Those variables include the water containers and using a constant heat source.