

WAMC Lab Template

Math Concept(s): Scatter Plots, Associations in Data, Trend Lines

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Short Description:

- This lab will allow students to investigate potential relationships between two variables on a graph. Students will survey their peers, asking two questions – one about the average ounces of caffeinated beverages they consume each day, and the other about the average hours of sleep they get each night. This lab will occur at the beginning of our Scatter Plots and Data module, allowing students to explore the concept first.

Lab Plan

Lab Title: Are You Awake?

Prerequisite Skills:

- Creating a Quadrant I graph with appropriate title, x- and y-axis labels, and scale.
- Plotting (x, y) ordered pairs on a coordinate plane.
- Determining the independent (x) and dependent (y) variables in a real-world situation.
- Writing equations of lines in Slope-Intercept Form ($y = mx + b$).
- Making sense of data on a graph.

Lab Objective: In this lab, students will survey their peers, collect data, and create a scatter plot showing the relationship between average ounces of daily caffeine consumption and average nightly hours of sleep.

Standards:

Mathematics K–12 Learning Standards:

- **8.SP.A.1**
Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
- **8.SP.A.2**
Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
- **8.SP.A.3**
Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

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Standards for Mathematical Practice:

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.

K-12 Learning Standards-ELA:

- ELA-LITERACY.SL.8.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<u>Accountability</u>
<input checked="" type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input type="checkbox"/> Manage Projects
<input type="checkbox"/> Work Creatively with Others	<input type="checkbox"/> Use and manage Information	<input checked="" type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<u>Leadership and Responsibility</u>
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input checked="" type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Guide and Lead Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	<input type="checkbox"/> Be Responsible to Others
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<u>Social and Cross-Cultural</u>	
<input type="checkbox"/> Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	<input checked="" type="checkbox"/> Interact Effectively with Others	
<input checked="" type="checkbox"/> Solve Problems		<input checked="" type="checkbox"/> Work Effectively in Diverse Teams	
<u>Communication and Collaboration</u>			
<input type="checkbox"/> Communicate Clearly			
<input checked="" type="checkbox"/> Collaborate with Others			

Teacher Preparation:

Materials:

- Materials list in lab instructions
- Pencils
- Paper (preferably quad-ruled)
- Rulers or straight-edges

Set-Up Required:

- Arrange classroom furniture in a way where all students can walk around freely.
- Ensure that all students have a flat surface on which to create a graph, whether this be on table surfaces or vertical surfaces (e.g. poster or easel).

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Lab Organization Strategies:

Leadership:

- Students take on roles within their partner groups when surveying their peers. One student conducts the survey, while the other records answers and measurements.

Cooperative Learning:

- Students, in pairs, will survey at least 15 people in the class.
- Each pair will construct a scatter plot and analyze the data on their graph, engaging in collaborative discussion.

Expectations:

- Students walk around the room calmly and engage with each other at a reasonable volume.
- Students use time wisely and engage with materials appropriately.
- **Formative Assessment:** Teacher will walk around the classroom, monitoring students and asking questions to gauge student understanding. Teacher will also ask students to self-assess on a 1-4 scale (1 = don't understand, 2 = somewhat understand, 3 = mostly understand, 4 = completely understand).

Timeline:

- Lab Launch/Expectation Review (5 minutes)
- Surveys (15-20 minutes)
- Scatter Plot Construction (20-25 minutes)
- Data Analysis/Self-Assessment (10 minutes)

Post Lab Follow-Up/Conclusions:

Discuss Real-World Application of Learning from Lab:

- Any scenario that requires one to follow simple instructions, collaborate effectively with others, and analyze given information would be applicable. This encompasses most scenarios and learning opportunities.

Career Applications:

- Any career in which one must solve problems, work well with others, gather information, and use that information to support ideas and decision-making.

Optional or Extension Activities:

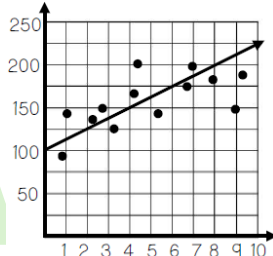
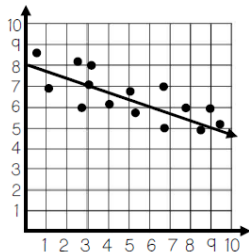
- Further reflection questions could be asked about extrapolating the data and its reasonableness.
- Students could be invited to conduct another survey with their choice of variables they would like to investigate, then create a scatter plot, and make conclusions about their relationship.
- One could modify this lab to investigate non-linear or exponential trends in scatter plots.

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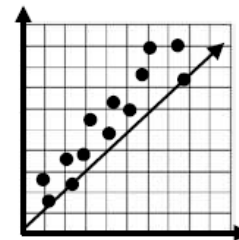
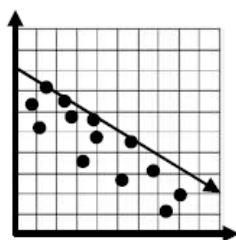
5. Plot each ordered pair on the graph. Don't connect the points!

6. Using a ruler or straight-edge, create a line that captures the "trend" of the data on your graph. Here are some good and bad examples:

GOOD FIT



BAD FIT



7. Somewhere next to your graph, write the equation of the line you drew in Slope-Intercept Form ($y = mx + b$).
If you were unable to draw a line that fit your data, include this in tomorrow's reflection.

Are You Awake?
Student Self-Assessment (Formative)

After completing the lab, circle your level of understanding about scatter plots.

CATEGORY	4 EXCEEDS	3 MEETS	2 APPROACHING	1 DOESN'T MEET
Student Understanding	I completely understand this concept and could teach someone else.	I mostly understand this concept.	I somewhat understand this concept, but I need some help.	I don't understand this concept at all.

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