WAMC Lab Template

Math Concept(s): Functions
Source / Text: CORD
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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):

We will experience this lab fairly early in our exploration of linear equations.

Lab Plan

Lab Title: The Bouncing Ball Function

Prerequisite skills: Using a tape measure and a stopwatch

Lab objective: To show that Y varies as a function of X.

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

Mathematics K–12 Learning Standards:

- A - CED - 2:   Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- F - IF - 2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Standards for Mathematical Practice:

- 6: Attend to precision.
- 5: Use appropriate tools strategically.
- 2: Reason abstractly and quantitatively.

K-12 Science Standards

- dependent and independent variables

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	
☐ Think Creatively	☐ Access and Evaluate Information	☐ Adapt to Change	☐ Manage Projects
X Work Creatively with Others	☐ Use and manage Information	☐ Be Flexible	☐ Produce Results
☐ Implement Innovations	Media Literacy	Initiative and Self-Direction	Leadership and Responsibility
Critical Thinking and Problem Solving	☐ Analyze Media	☐ Manage Goals and Time	☐ Guide and Lead Others
☐ Reason Effectively	☐ Create Media Products	☐ Work Independently	
☐ Use Systems Thinking		☐ Be Self-Directed Learners	

☐ Make Judgments and Decisions	Information, Communications and Technology (ICT Literacy)	Social and Cross-Cultural	X Be Responsible to Others
☐ Solve Problems	☐ Apply Technology Effectively	X Interact Effectively with Others	
Communication and Collaboration		X Work Effectively in Diverse Teams	
X Communicate Clearly			
☐ Collaborate with Others			

Washington Applied Math Council

https://wa-appliedmath.org/

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

Materials

- Measuring devices (tape measure, meter stick, etc.), stopwatches (often on student phones), ?ladder?,

Set-Up Required:

- Mark several heights on a wall - two feet, four feet, six feet

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students take turns dropping a ball from measured height and depend on teammates to measure the time the ball bounces.

Cooperative Learning:

- Groups of four

Timeline:

- One to two 50 minute class periods

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Mathematical models can be used to make predictions.

https://wa-appliedmath.org/

The Bouncy Ball Lab

Question:

Can we develop a mathematical model of a bouncing ball that we can use to make predictions? What do you predict?

Materials:

- A bouncy ball - basketball, golf ball, tennis ball, etc.
- Measuring device - tape measure, meter stick, etc.
- Masking tape, or some other easy to see and easy to remove tape
- Stopwatches - usually on student's phones
- Tables to store collected data

Procedure:

- For each group, put pieces of tape on the wall at two, four and six feet from the floor.
- Each member of a four-person team will drop their ball from the three different heights while their teammates use stopwatches to measure the time from when the ball first hits the floor until it comes to rest.
- Once the data is collected, it is graphed as a function. Should you graph all of the data you collected or should you graph averages of your group's data? Maybe you should try one of each.
- Which of your two measurements belongs on the X axis and which belongs on the Y axis? Which is the dependent variable, and which is the independent variable? Which did you manipulate and which did you measure? Y should vary as a function of X.
- Once the data is graphed, find the equation that fits the data. Write it in the form: f(x) = mx + b.
- Once you have your equation, use it to predict the time the ball would bounce from different heights.

- Test the predictions, if you can, by dropping the ball from those heights and, like before, measure the time it takes the ball to come to rest.

Product:

Each student will produce:

- a graph of their results
- The equation that best fits their graph
- Their predictions for the time balls will bounce when dropped from different heights
- Their evaluation of how well their graph predicted new results.