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# MATHEMATICS LESSON with Scratch

# SUBJECT: Testing Bridge Lengths

1. **Age of students: 13-14**
2. **Goals of the Lesson:**
   1. Collect and express data in the form of tables and graphs
   2. Look for patterns to make predictions from tables and graphs
   3. Distinguish between linear and non-linear relationships from tables and graphs.
3. **Specific Aims** :

-To express data in tables and graphs

-To make predictions from tables and graphs models

-To distinguish between linear and non-linear relationships

-To identify inverse relationships and describe their characteristics

3. ACTIONS:

* Use variables to generalize patterns and information presented in tables, charts, and graphs created manually.
* Construct tables and graphs with the data collected to make predictions about the experiment.
* Creating and interpreting equations, tables, and graphs that deal with linear relationships
* Representing the same information in different forms, such as an equation, a table, or a graph.
* Connecting various methods of finding information in graphs, tables, and equations; how are they related.

**Materials:**

Paper bridges models ( can be plastic ones as toys)

Computers with Scratch installed

**4. Instructions given to students to create tasks in Scratch or try out mates' works:**

**Students work in groups of 3 or in pairs creating graphs in Scrach after measuring models of their bridges, they put datas in the charts and do calculations.**

* Use graphs, tables, and algebraic representations to make predictions and solve problems that involve change.
* Estimate, find, and justify solutions to problems that involve change using tables, graphs, and algebraic expressions.
* Use appropriate problem-solving strategies (e.g., drawing a picture, looking or graph, working a simpler problem, writing an algebraic expression or working backward) to solve problems that involve change.
* Analyze problems that involve change by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing, and observing patterns.
* Recognize the same general pattern of change presented in different representations.

When students observe patterns in tables and graphs, they are able to formulate conjectures and make predictions based on the data. For example, students have been exposed to collecting data, reporting data in tables, and representing data on a coordinate graphs. However, all of their experiences thus far have dealt with linear relationships in which there is a very visible pattern in their tables and graphs. In turn, students will be able to extend their initial understanding of situations involving variables beyond linear relationships to now include inverse relationship.

In this lesson students will encounter inverse relationships in which one variable decreases and another increases, but not a constant rate. This lesson should provide the students with an opportunity to recognize the differences between linear and non-linear relationship. A table and graph is often a good starting point for deciding what type of relationship is suggested by the data. Students must extend this initial understanding lo linear relationships to include various representational forms and patterns of change associated with non-linear functions. Students are not expected to acquire formal vocabulary about inverse relationships at this time, but to express their relationships in their own words, focusing on the pattern of change in variables.

**6. Flow of the lesson**

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| Activities | Teachers’ Support | Evaluation |
| 1. **Introduction**   As a class reflect on Problem: Testing paper model Bridge Length   * Read with students about the new experiment they will conduct to model how the strength of a bridge changes as its length increases. * Go through materials. * Establish with class what it means for a bridge to break.   After each group understands the problem and the materials being used they will be asked:   * What do you expect to happen in this experiment? * We are using equipment similar to what we used before. What are the variables this time?   What will the data look like? What shape do you think the graph will be? | Use prior experiment to make corrections.  Make sure students who were absent understand previous experiment. | Do students understand the situation? |
| 1. **Problem Solving**   Working with a group of students try to find the answer to the problem.  Anticipate students’ responses:   * Longer bridge length will not support as much.   Graph will be linear in Scratch visualisation. | Encourage students to use previous knowledge.  Provide students with materials:   * Paper bridges * Pennies * Cups * Graph paper * Laptops * Pencils * Markers * Rulers * Poster paper | Each group of students collect the data and display it in a table and graph? |

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| 1. **Discussing Students’ Solutions**    1. Students will display and explain their information to other groups.    2. Facilitate students’ discussion.   Help students deepen their understanding of non-linear data. | Display student work for entire class during discussion. |  |
| 1. **Summing Up** 2. Review what students learned throughout lesson. | Encourage students to use mathematical vocabulary while their explanations |  |