

# The Inquiry Project Grade 5 Implementation Workshops

## Teacher Handouts

1. Science Concepts Grades 3-5 Chart
2. Directions for Making the Mini-lake and Recording Measurements
3. Mini-lakes: A Long-term Investigation
4. Data Table: Weight of Mini-lakes  
Student Notebook, pg. 5
5. Weight of Mini-lakes Over Time Graph  
Student Notebook, pg. 4
6. Student sample Mini-lake Graph

# Science Concepts for Grades 3–5 in the Inquiry Project Curriculum

A carefully constructed sequence of curriculum progressively builds student understanding about a network of concepts about weight, volume, material including the material property of density, and matter across a three-year period. These concepts are essential for understanding the core idea **matter** and will inform investigations in physical science, life science, earth science and engineering contexts from K–12.

Science Concepts				
	Weight	Volume	Material	Matter
<b>Grade 3</b>	The weight of objects can be compared using a pan balance and standard (gram) units.	Two solid objects cannot occupy the same space.  The amount of 3D space that objects occupy can be compared.	Objects can be described in terms of their weight and volume and the materials they are made of (clay, cloth, paper, etc.).  Materials have observable physical properties such as color, size, texture, flexibility, etc.  Same size objects can have different weights when they are made of different materials.	Materials can be subdivided into small pieces and the pieces still have weight.
<b>Grade 4</b>	The weight of solids and/or liquids can be compared using a digital scale and can be represented on a weight line or a table.  Weight is conserved during crushing and reshaping	Liquid and solid volumes can be measured in cubic centimeters.  When immersed, a solid displaces a liquid volume equal to the solid volume.	The relationship between weight and volume (i.e. density) is a property of solid and liquid materials.	Matter can be divided into tiny pieces, and even the tiniest pieces have weight and take up space.
<b>Grade 5</b>	Weight is conserved during dissolving, freezing, melting, evaporation and condensation.	Volume may not be conserved in phase change.	Air is a mixture of gaseous materials composed of particles too small and spread apart to see.  Melting, freezing, evaporation and condensation change the form of matter but do not change the material.	Matter is composed of particles that have weight, occupy space, and are too small to see.  Gases, liquids and solids are all forms of matter and have weight and take up space.

### Directions for Making the Mini-lake and Recording Measurements

There are many steps in this activity that are described in detail in the Teacher's Guide. Students weigh mini-lake materials in Investigation 1 and measure the volumes and assemble the mini-lakes in Investigation 2.

#### Record all measurements on Making Mini-lakes Data Table below

1. Measure and put each material in a plastic vial with cover

- 120g sand
- 120g gravel
- 120g water

(Note: in the classroom, you will assign each group a weight for the sand, gravel, and water, either 120g, 130g, 140g, or 150g.)

2. Weigh the small rocks directly on the scale. (The rocks do not need to weigh 120g.)

Note. By the end of Investigation 1, students have measured the weights of all their mini-lake materials. You will need to plan how to store the containers until the next class and find a place to store the completed mini-lakes. Students will need to be able "get at" their mini-lakes and scales on a regular basis. In some classrooms students weigh their mini-lakes independently before school or during recess.

3. Estimate the volume of sand. (Use centimeter cubes)

4. Measure the volumes of sand and gravel. (Use graduated cylinder)

5. Arrange the gravel, sand, and rocks in the sandwich box.

6. Measure and record the volume of water. (Use graduated cylinder)

7. Add water to the mini-lake, mark the water level on a piece of tape

8. Put on the cover so it's tight and weigh the completed mini-lake

#### Making Mini-lakes Data Table








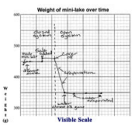
Weight of empty vial with cap (tare weight) \_\_\_\_\_

Estimate of volume of sand (Investigation 2) \_\_\_\_\_

Component	Weight (g)	Volume (cc) (Investigation 2)
Sandwich box and cover		X
Sand only		
Gravel only		
Rocks only		X
Water only		
Sum of weights		X

Weight of completed mini-lake (investigation 2) \_\_\_\_\_

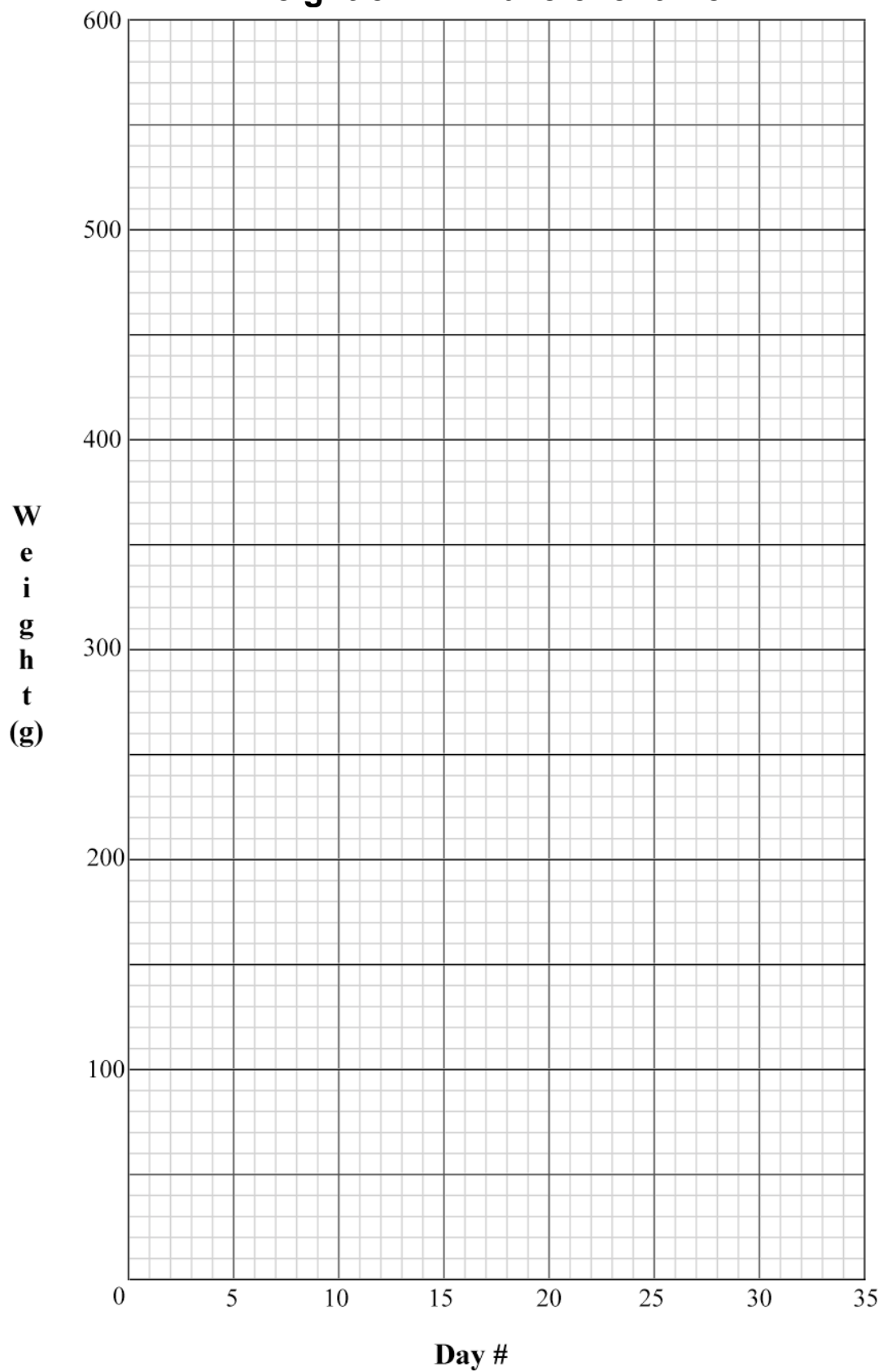
# Mini-Lakes: A Long-Term Investigation

Investigation	What students do with the mini-lake	How students use mini-lake data to track transformations of matter
Inv. 1	Measure weight of materials: sand, gravel, rocks, water, container and top 	Understand that weight is a reliable indicator of gains or losses of matter in the mini-lake system
Inv. 2	Measure volume of mini-lake materials  Build mini-lakes  Weigh mini-lake and record measurements in a data table  	Understand that in a closed system nothing is added and nothing is taken away  Seek explanations for any changes in the weight
Inv. 3	Compare heaviness—for-size of water and sand (For water: 1g=1cc) 	Plot data points on line graph to make a picture at tells the story of change in weight over time
Inv. 4		
Inv. 5	Transform mini-lakes to salt lakes 	Use measurement to calculate the amount of salt added
Inv. 6		
Inv. 7	Uncover the mini-lake thus changing from closed to open system 	Track rate of evaporation  Reason about how they will know when all of the water has evaporated that only water evaporates and solid matter is conserved
Inv. 8		
Inv. 9-16	Continue to collect and graph weight data until all the water has evaporated (weight of solid materials is conserved) 	
Inv. 17	Recognize that the line graph represents changes in their actual mini-lakes over time 	Annotate the mini-lake graphs to “tell the story” of transformations of in the mini-lake over time  Use the particle model to explain dissolving salt and evaporation of water

## Data Table: Weight of mini-lake

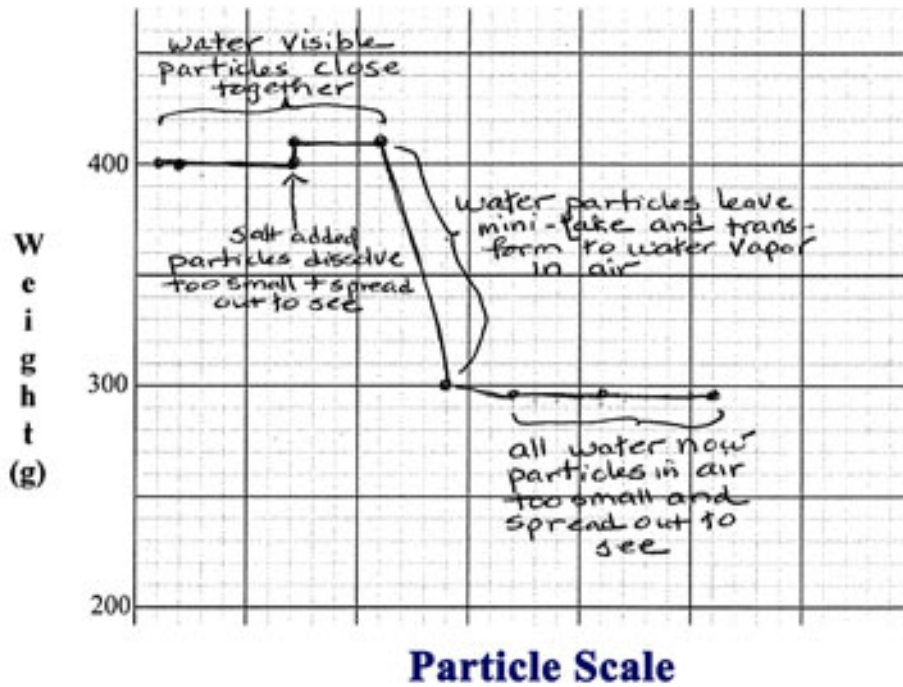
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**Weight of mini-lake over time**



## Student Sample Mini-Lake Graphs

Weight of mini-lake over time



Weight of mini-lake over time

