

**Mathematics Governor's Institute 2003
Problem-in-a-Bag Template**

Title of Project:

If We Build It, It Will Grow!

Team Members:

Karen Beer
Curt Cairns
Joe Hartnett
Jennifer Krauza
Chris Perri

Grade Level and/or Course:

4th Grade Math
** Project can be adapted for both 3rd and 5th grade

Concept(s) used:

Measurement, Area, Estimation, Scale Drawings, Research

PA Standard(s) Addressed:

Mathematic Standards

2.2 Computations and Estimation

2.2.3. Grade 3

- E. Use estimation skills to arrive at conclusions.

Measurement and Estimation

2.3.3. Grade 3

- E. Determine the appropriate unit of measure.
- F. Use concrete objects to determine area and perimeter.
- G. Estimate and verify measurements.

Mathematical Reasoning and Connections

2.4.3. Grade 3

- A. Make, check and verify predictions about the quantity, size, and shape of objects and groups of objects.
- B. Use measurements in everyday situations (e.g., determine the geography of the school building).

Statistics and Data Analysis

2.6.3 Grade 3

- A. Gather, organize, and display data using pictures, tallies, charts, bar graphs, and pictographs.

Geometry

2.9.3. Grade 3

- A. Build geometric shapes using concrete objectives (e.g., manipulatives).
- C. Draw two- and three-dimensional geometric shapes and construct rectangles, squares, and triangles on the geoboard and on graph paper satisfying specific criteria.

Reading Standards

Research

1.8.3 Grade 3

- B. Locate information using appropriate sources and strategies.
 - Locate resources for a particular task (e.g., newspapers, dictionary).
 - Select sources (e.g., dictionaries, encyclopedias, interviews to write a family history, observations, electronic media).
 - Use tables of contents, key words, and guide words.
 - Use traditional and electronic search tools.
- C. Organize and present the main ideas from research.
 - Take notes from sources using a structured format.
 - Summarize, orally or in writing, the main ideas.

NCTM Standard(s) Addressed:

Make Reasonable Estimates

- Select appropriate methods and tools for computing with whole numbers.

Understand Patterns

- Make generalizations about geometric patterns.

Describe Spatial Relations

- Make and use coordinate systems to specify locations to describe paths.
- Find the distance between points along horizontal and vertical lines of a coordinate system.

Use visualization, spatial reasoning and geometric modeling to solve problems

- Create and describe mental images of objects, patterns, and paths.
- Identify and build a two-dimensional representation of a three-dimensional object.

Introduction:

The teacher will place a bowl containing lettuce, onions, carrots, tomatoes, and cucumbers in front of the students. Discuss the ingredients and where to find them. Each group will need four packs of unopened seeds and four loose seeds to begin the opening activity. Explain to the students that they will be constructing a two-dimensional diagram of a vegetable garden.

Objectives:

Through the completion of this project the students will show knowledge of area by planning a 10 x 10 foot garden that can be planted by:

- Determining the area of their garden.
- Dividing a predetermined area into four equal parts.
- Measuring distances between plants by researching the traits of each specific plant.
- Making predictions, matching the unknown loose seeds with the unopened packets.
- Making predictions regarding the number of seeds in each unopened packet.
- Graphing the actual number of seeds per packet for each vegetable.
- Making a scale drawing of the planned garden.

Question:

Is it possible to plant a vegetable garden in a 10 x 10 foot area using four different types of seeds? Justify your findings.

Resources and Materials (estimated cost):

1. Seeds (four packs per group, approx 6 groups) -- \$50.00
2. Tablet of Grid Paper (1/2 inch squares)-- \$3.00
3. Markers, 1 set per group -- \$18.00
4. Glue and/or glue sticks, one set per group -- \$18.00
5. Scissors (3 pack), one pair per group -- \$8.00
6. Newspaper
7. Home and Garden Magazines

**** Helpful Hints****

If you are resourceful, this project can be done with minimal cost. Most of the art supplies should already be in the classroom or in a student's supply bag, thus eliminating that particular cost.

If possible, contact a local company about sponsoring, for the classroom, the cost of the seeds. In turn, the food grown can be donated to a local food shelter. The result of this would be a certificate of donation from the food bank and a tax write-off for the company. If this is not possible, obtain the name of the seed company and email the contact regarding the donation of the seeds or a reduced cost. Explain why you are choosing this project and the learning outcomes of completing the tasks. Be sure to do this several months prior to the activity to ensure a timely delivery of the seeds.

The newspapers and/or magazines can be saved by the students or other faculty and stored in a designated classroom area.

Procedures & Activities:

1. Pass out the seed packets to each group and discuss their logistics and how far apart they need to be planted.
2. Students predict the number of seeds in each packet and record the results.
3. Students open packets and count the actual number of seeds in each packet and record the results.
4. Compare the predictions with their actual findings, is there a pattern between the types of seeds? Discuss as a class.
5. Review making bar graphs with students.
6. Students graph the results of the actual number of seeds and write a paragraph explaining the construction of the graph. Justify the length of each bar in comparison to the different types of seeds.
7. Discuss with the students why it is important to choose the correct type of graph for this project. i.e. would a pictograph or line graph be more effective?
8. Pass out large block graph paper that is cut into a rectangle representing 100 square feet. Introduce the concept of area and have students work together to calculate the area of the rectangle.
9. Introduce the concept of perimeter and have students work together to calculate the perimeter of their rectangle.
10. Explain to the students that they will be using the rectangle graph paper to make a rough draft of their garden and that will represent the 10 X 10 area that will be allotted outside, in the actual garden. Again, each square represents 1 square foot.
11. Have the students create and use symbols to represent the different types of vegetables to be planted in their garden.
12. Students use the information given on the back of the seed packets to design a garden representation while considering the amount of room each plant needs to fully mature, while allowing for maximum number of plants.
13. Individual groups consult with teacher when finished for a stamp of approval on their garden representation.
14. Introduce and demonstrate proper planting techniques and tool safety that students will have to practice while planting the garden.
15. Plant the garden on a nice day and enjoy!

Accommodations/Adaptations

ESL:

- Each ESL student will be paired with two English speaking students.
- ESL enrichment: The ESL student will build their garden using the currency from their Native country. Students will then be able to determine the difference between the exchange rate of American currency versus another country.

Special Ed:

- Special needs students will be paired in a group with three regular education students.
- Special needs students will be provided with a scaled drawing of the 10 x 10 garden and the plants. These materials will be provided for them as manipulatives to work.

Enrichment:

- Each enrichment student will be provided with a different budget. They will need to design and build their garden based the budget they are allotted.

Answers / Rubric:

Math - Problem Solving: **If We Build It, It Will Grow!**

Teacher name: Karen Beer, Curt Cairns, Joe Hartnett, Jennifer Krauza, Chris Perri

Student Name _____

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Mathematical Reasoning	Uses complex and refined mathematical reasoning.	Uses effective mathematical reasoning	Some evidence of mathematical reasoning.	Little evidence of mathematical reasoning.
Working with Others	Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson.	Student was an engaged partner but had trouble listening to others and/or working cooperatively.	Student cooperated with others, but needed prompting to stay on-task.	Student did not work effectively with others.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Diagrams and Sketches	Diagrams and/or sketches are clear and greatly add to the reader's understanding of the procedure(s).	Diagrams and/or sketches are clear and easy to understand.	Diagrams and/or sketches are somewhat difficult to understand.	Diagrams and/or sketches are difficult to understand or are not used.