



Room to Grow

Purpose

Students will plant 5-6 different seeds of different sizes to investigate if seed size directly corresponds to the size of the plant the seed produces over time. Students will learn the importance of seed spacing in order to give the germinating plant the room it needs to grow and be healthy.

Time

Teacher preparation:
30 minutes

Student activities:
One 50-minute session for introduction and planting seeds.

One 10-minute session for three weeks to observe and care for seedlings.

Materials

For each student group:

- ▶ Shoebox (or long planter box or outdoor garden space)
- ▶ Plastic shopping bag for shoebox liners
- ▶ Centimeter ruler
- ▶ Potting soil
- ▶ Craft sticks
- ▶ Permanent marker

Background Information

Farmers must consider many factors when planning which crops to grow, including when to plant, demand for their product, and what nutrients the crop will need. Some factors are out of farmers' control such as lack of rain, hot or cool weather, and wind. The factors that farmers can control include, amending soil with appropriate nutrients, the type of seeds planted, and the spacing given to each seed. The objective in ideal spacing of crop plants is to obtain the maximum harvest for an area without decreasing the quality of the crop.

For the most part, farmers plant crops in rows or straight lines for convenience and optimum harvest. When crops are planted in rows, light absorption is maximized and wind passage between rows is enhanced, which increases air circulation and lessens the chance of wind damage to plants. Rows also provide convenient pathways for farm equipment and farmers tending to the plants.

Different factors come into play when farmers decide how many seeds to plant in each crop row. If there are too many plants in a row, the seedlings must compete for sunlight, water, and nutrients. The plants will not grow to their full potential and could become diseased and die, resulting in a failed crop. Farmers also need to make sure they don't plant seeds too far apart because this wastes space. Proper seed placement is very important for healthy plants and a good harvest that allows the farmer to make a living.

Procedure

1. Invite five students to stand near each other, with their shoulders touching, in the front of the classroom. Tell students to stretch their arms out to their sides, being careful not to hurt their neighbors. Share with students that their arms are like plant roots that cannot spread enough to get the proper nutrients they need.
2. Ask students to spread out really far and spread their arms. Walk between the students. Look at all that wasted space. Tell students there is so much extra room that more seeds could have been planted to fill in this wasted space.
3. Have students come together so that when their arms are spread their fingers are touching. Tell students that this represents perfect planting of a seed row, where no space is wasted and no crowding occurs.



Room to Grow

- ▶ A variety of seeds, such as: carrots, radish, large lima beans, zucchini, corn, pea, basil, pumpkin, tomato, cucumber, and sunflower
- ▶ *Room to Grow* student worksheet (pages 54-56)

California Standards

Grade 2

Common Core English Language Arts

- RI.2.1
- W.2.2
- W.2.7
- W.2.8
- SL.2.1a
- SL.2.1c

Common Core Mathematics MD.2.1

Next Generation Science Standards

- 2-LS2.A
- 2-ETS1.A
- 2-ETS1.B

Grade 3

Common Core English Language Arts

- RI.3.1
- W.3.2d
- W.3.7
- W.3.8
- SL.3.1b
- SL.3.1c

4. Ask students if they think seed size is related to the size of the plant that will grow from that seed. In other words, do large seeds produce large plants and do small seeds produce small plants? Write responses on the board.
5. Tell students that they are going to carry out an experiment to find out if seed size and plant size are positively related. Show students the shoeboxes and show them how the seeds will be planted in rows (*this can also be done outside if you have a garden space*).
6. Divide students into groups of 3-4 and distribute a worksheet to each student. Instruct student groups to line their shoeboxes with plastic bags and to fill their shoebox $\frac{3}{4}$ full with potting soil. Have students moisten the soil using a spray bottle (*this prevents over watering*).
7. Have student groups choose 4 different seed types, making sure they choose small and large seed types. Students may select 4-8 seeds from each group to plant depending on the seed's size.
8. Instruct students to use the millimeter scale on their rulers to measure the length of one of each type of seed that will be planted. Record the measurement on the worksheet chart.
9. Instruct students to make seed labels on craft sticks and correctly label each seed row. Have students record each seed type and number of seeds planted in their boxes on their worksheet.
10. Instruct students to use the spray bottles to keep soil moist, but not too wet. Seed boxes should be placed in a sunny classroom window.
11. Have students keep a log of when seeds germinated and the height of each seed type.
12. After three weeks, have student groups report and share their results. Record and compare results on the board.

Variations

- ▶ Instead of having each group do a variety of seeds, assign one seed type to each group and compile class results to find out if seed size is related to plant size.



Room to Grow

California Standards (cont.)

Grade 3 (cont.)

Common Core Mathematics

3.OA.1

3.OA.3

3.MD.4

Next Generation Science Standards

3-LS4.C

Grade 4

Common Core English Language Arts

RI.4.3

W.4.2d

W.4.2e

W.4.7

SL.4.1b

SL.4.1c

Common Core Mathematics

4.MD.1

Standards descriptions are listed
in the matrix on page 108.

Extensions

- ▶ Invite a Master Gardener in to plan a small vegetable garden area for your class. The Master Gardener can instruct students on seed placement during planting.
- ▶ Take a field trip to a local flower or vegetable farm to learn how farmers plant crops.
- ▶ Compare seeds from various trees and research the sizes of the trees. Is there a relationship between seed size in trees and their size?

ELL Adaptations

- ▶ Model math problems on the board by showing students how to find the average weight of a group of seeds and the average height of a group of plants.
- ▶ Place ELL students in a group with other students who are proficient in English. Cooperative learning provides opportunities for students to illustrate, label, and discuss information.



Room to Grow Data Sheet

Name: _____

Testable Question: Do plants with larger seeds need more room to grow than plants with smaller seeds?

Hypothesis: _____

Procedure

1. Take your shoebox and carefully line it with a plastic bag.
2. Fill shoebox $\frac{3}{4}$ full with potting soil.
3. Using a spray bottle filled with water, lightly spray the soil to make it damp.
4. With your lab partners, select 4 different kinds of seeds to plant. Make sure to choose seeds of different sizes.
5. Measure the length of 3 seeds of the same seed type in millimeters and record the results. Calculate the average seed size for each seed type.
6. Follow step 5 for each seed you will be using in your experiment.
7. Make seed labels on craft sticks and correctly label each row.
8. Plant seeds according to package instructions. Make sure to count the exact number of seeds you are planting and record in table below.
9. Place seed box in a sunny spot and make sure to keep soil moist using the spray bottle for watering.
10. Keep a record of the number of seeds that germinated and the average height of each seedling type.
11. Share results with the class after three weeks of observations and recordings.

Seed Measurements in Millimeters

Type of Seed	Seed 1 Length	Seed 2 Length	Seed 3 Length	Average Length

Room to Grow Data Sheet *(continued)*

List Seed Types from Smallest to Largest in Size

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Smallest

Largest

Results

Seedling Growth

Find the height of the three largest seedlings from each plant type and find the average plant height.

Week One

Type of Seedling	Seedling 1	Seedling 2	Seedling 3	Average Height

Week Two

Type of Seedling	Seedling 1	Seedling 2	Seedling 3	Average Height

Week Three

Type of Seedling	Seedling 1	Seedling 2	Seedling 3	Average Height

Room to Grow Data Sheet *(continued)*

List the order of seedlings from smallest type to largest type.

1. _____
2. _____
3. _____
4. _____
5. _____

Conclusion

Write a few sentences that address the following topics:

- ▶ Did my experiment support my hypothesis? _____

- ▶ What did I learn from this experiment? _____

- ▶ What changes could I make to the procedure to make it a better test? _____

