

Title	Growing Tomatoes from Seed	Time	2 hours
Subject:	Biology, Science,		
Aims	Students will learn how to grow tomatoes from seed and understand the lifecycle of a tomato plant.		
Key CS elements:	Decomposition; Pattern recognition; Abstraction; Algorithm design.		
Age group :	10-12 years old		
Learning situations:	Growing plants fosters a sense of connection with the environment, teaching students about ecosystems, biodiversity, and the importance of plants in sustaining life.	Activity type:	in-class activity for science and biology
Resources:	<ul style="list-style-type: none"> • Educational Websites: Encourage students to visit websites from universities, agricultural extension services, and reputable gardening organizations. • Local agricultural extensions or government websites. • Plant seeds (beans, sunflower, or other easy-to-grow plants) • Soil, pots, and water • Rulers for measuring plant growth 		
Learning development:			

Introduction

What is a Tomato Plant?

Explain that tomatoes are a type of fruit that grow on vines and are one of the most popular plants grown in home gardens. Discuss the basic structure of the plant: roots, stems, leaves, flowers, and fruit. Mention that tomatoes are grown from seeds, which contain everything the plant needs to begin its life.

Why Grow Tomatoes?

Highlight the benefits of growing tomatoes: they are nutritious, easy to grow, and students can use them in meals like sandwiches, salads, and sauces. Emphasize that growing plants teaches responsibility, environmental awareness, and patience.

The Tomato Plant Lifecycle

Stage 1: Seed:

Explain that the lifecycle starts with the seed, which is planted in the soil.

Tomato seeds need the right conditions (water, warmth, and light) to germinate.

Stage 2: Germination:

After a few days to two weeks, the seed sprouts, and a small plant emerges.

Stage 3: Seedling:

The plant grows leaves and starts to get stronger.

Seedlings need sunlight, water, and space to grow.

Stage 4: Mature Plant:

As the plant matures, it grows larger leaves and begins to develop flowers.

Stage 5: Flowering and Pollination:

Flowers appear, and pollination occurs (by wind or insects).

Stage 6: Fruit Development:

Once pollinated, flowers turn into small green tomatoes, which grow and ripen over time.

Stage 7: Harvest:

Tomatoes are ready to harvest when they turn red (or yellow/orange depending on the variety).

Basic Requirements for Growing Tomatoes

Sunlight:

Tomatoes need 6-8 hours of sunlight daily. Explain that without enough sunlight, they will grow slowly and produce fewer fruits.

Water:

Tomato plants need regular watering, but the soil shouldn't be too wet. Overwatering can lead to root rot.

Teach students to check the soil with their fingers: if it feels dry, it's time to water.

Soil:

Tomatoes grow best in well-drained, nutrient-rich soil. They thrive in soil that contains organic matter like compost.

Temperature:

Tomatoes need warmth to grow. They do best in temperatures between 18-30°C .

Space:

Explain that as the plants grow, they need space to spread out and develop strong roots and vines. Show students how to space the seeds or seedlings apart to allow room for growth

Four Principles of Computational Thinking:

Decomposition: Breaking down the tomato planting and growing process

Pattern Recognition: Identifying similarities and patterns in growing tomatoes

Abstraction: Getting into the basic details of growing tomatoes

Algorithmic Thinking: Designing a step-by-step guide to Growing tomatoes

1. Decomposition

Break down the overall task of growing tomatoes into clear, manageable steps:

- Choosing the tomato variety: Decide which type of tomato to grow.
- Preparing materials: Gather pots, soil, seeds, and water.
- Planting seeds: Plant the seeds in soil at the correct depth.
- Watering and caring for seeds: Maintain a watering schedule and ensure proper sunlight.
- Transplanting seedlings: Move seedlings to larger pots or outdoor gardens.
- Caring for mature plants: Provide consistent care (watering, fertilizing, sunlight).
- Managing pests and diseases: Identify common issues and apply solutions.
- Harvesting tomatoes: Pick the tomatoes when they are ripe.

2. Pattern Recognition

Identify recurring patterns during the tomato-growing process:

- Growth stages: Seed, germination, seedling, flowering, and fruit-bearing stages are common to all tomato plants.
- Watering needs: Tomatoes need regular watering throughout their lifecycle, though the amount varies based on the stage.
- Sunlight requirements: Tomato plants need consistent sunlight (6-8 hours daily) at all stages.
- Plant health: Healthy plants have strong stems, green leaves, and show visible growth patterns like the appearance of flowers before fruit.

3. Abstraction

Focus on the key details necessary to grow tomatoes and simplify the lesson:

- Essential needs: Water, sunlight, and nutrients are the key elements for growth.
- Stages of care: Differentiate between key growth stages—germination, seedling, flowering, and fruit-bearing—without overcomplicating each step.
- Simplified instructions: Use general rules like "water when soil feels dry" instead of precise measurements that might confuse students.
- Ignore irrelevant complexities: For beginner students, skip in-depth details like advanced fertilization techniques or pruning strategies.

4. Algorithm Design

Step 1: Choose a tomato variety that is suitable for your climate.

Step 2: Prepare your materials: Fill pots with nutrient-rich soil and have seeds ready.

Step 3: Plant the seeds: Place each seed $\frac{1}{4}$ inch deep in the soil.

Step 4: Water the soil until it's moist (but not soaked).

Step 5: Place pots in a sunny spot where they will get 6-8 hours of sunlight per day.

Step 6: Water regularly: Check the soil and water when it starts to dry out.

Step 7: Transplant seedlings into larger pots or outdoors when they grow to 6-8 inches tall.

Step 8: Provide support for the plant as it grows by staking or caging.

Step 9: Continue regular care: Water, provide sunlight, and monitor for pests.

Step 10: Harvest the tomatoes when they are fully ripe and ready to pick.

This lesson structure ensures that students are learning how to grow tomatoes step-by-step, with a focus on the essentials and applying computational thinking concepts throughout the process.

5. Activity

Planting Activity: Allow students to plant their own tomato seeds using the steps they've developed. Over time, they will observe the growth stages and care for their plants.

6. Reflection

Group Discussion: Have students present their algorithms to the class. Discuss the differences between the algorithms and how certain steps or conditions might vary. Reflect on how computational thinking helps to simplify complex tasks like growing plants.

7. Conclusion (5 minutes):

Scientific Understanding:

Plant Lifecycle Knowledge: Students learn the stages of plant growth from seed to harvest, including germination, seedling, flowering, and fruit-bearing

Hands-On Skills:

Gardening Techniques: They develop practical skills such as planting, watering, and transplanting.

STEM Skills:

Mathematical Applications: Growing tomatoes involves measurement (e.g., planting depth, spacing), estimating water quantities, and timing germination and growth stages.

Responsibility and Patience:

Nurturing Skills: Taking care of plants teaches responsibility as students need to water and monitor their plants regularly.

Health and Nutrition Awareness:

Healthy Eating Habits: By growing their own tomatoes, students gain an understanding of where food comes from and can develop an appreciation for fresh, healthy ingredients.

Personal Growth and Well-Being:

Confidence: Successfully growing tomatoes from seeds to mature plants boosts students' confidence in their ability to care for living things and complete long-term projects.

Homework:

Germination: Monitor the seeds daily and record the germination date

Measurements: Measure plant height and leaf size at regular intervals.

Photographs: Take clear photos of the plant at different stages to visually document growth.

Journaling: Maintain a detailed journal describing observations, challenges faced, and any interventions.

Analysis and Reporting: At the end of the growing season, analyze the collected data to assess the plant's growth cycle.

Assessment:

Algorithm Rubric: Evaluate students' algorithms based on:

- Completeness (does it include all necessary steps?).
- Logical flow (are the steps in the right order?).
- Condition checks (does it account for plant needs at different stages?).
- Participation: Active participation in group work and discussions.

Expected results:

- Students will understand the role plants play in ecosystems.
- Students will learn how to plant seeds and care for them.
- Students will recognize patterns in plant growth and environmental needs.
- Students will be able to create a step-by-step guide (algorithm) to successfully grow a plant.

Notes: