# MNLA Curriculum Unit A, Lesson 5

**UNIT TITLE:** HOOKED ON HORTICULTURE: USING GARDEN CENTERS TO DISCOVER THE WONDERS OF PLANTS

**LESSON 5**: Scheduling Planting Dates for Flowering Potted Plants;
Two 30-40 minute sessions

## MINNESOTA ACADEMIC STANDARDS IN SCIENCE:

3.1.1.2.1-- Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one's own observations or investigations

3.1.1.2.3 -- Maintain a record of observations, procedures and explanations, being careful to distinguish between actual observations and ideas about what was observed. *For example:* Make a chart comparing observations about the structures of plants and animals.

3.1.1.2.4-- Construct reasonable explanations based on evidence collected from observations or experiments.

3.1.3.4.1-- Use tools, including rulers, thermometers, magnifiers and simple balances, to improve observations and keep a record of the observations made.

4.2.1.1.1-- Measure temperature, volume, weight and length using appropriate tools and units.

## MINNESOTA ACADEMIC STANDARDS IN MATH:

3.1.2.2-- Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.

3.3.2.1 -- Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.

3.3.2.1 -- Use half units when measuring distances.

3.4.1.1 -- Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.

4.1.1.5 -- Solve multi-step real-world and mathematical problems requiring the use of addition, subtraction and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of technology, and the context of the problem to assess the reasonableness of results.

4.4.1.1 -- Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.

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**GRADE LEVEL/SUBJECT**: 3rd or 4th grade Science and Math

**OVERVIEW**: The Garden Center provides a unique opportunity to discover the diversity of the plant world. This activity was designed to teach children how to collect data, use their results to determine a specific outcome and then plan for specific future outcomes using the results of their previous observations. Students will observe the growth and development rate of a flowering plant and predict appropriate planting dates for new situations by utilizing results from collected data.

## OBJECTIVES:

As a result of this activity, students will be able to:

1. Plant a bulbous plant, measure its growth and development rate, and collect the data in an organized chart.
2. Graph a set of data that they have collected.
3. Analyze collected data and make predictions based on the interpretation of the results of their observations.

**MATERIALS**:

- Samples of at least 3-4 species of flowering greenhouse crops (annuals, potted flowering plants or cut flowers) as examples of what a greenhouse Technician (Horticulturist/Grower) might grow.
- Paperwhite Narcissus bulbs (1/student with a few extra)
- Plastic Cups (18 oz) (1 / student with a few extra)
- Pea gravel to fill all plastic cups
- Marker to write student names on cups
- Paperwhite Narcissus "Data Collection" Worksheet - 1 per student (see attached)
- "Greenhouse Plant Technicians Planting Schedules to Get a Plant to Bloom on a Specific Day" Worksheet - 1 per student (see attached)
- Rulers for each student (Ask the teacher if the class has metric rulers for each student or if you need to supply them.)
- One BIG calendar to show students dates OR one copy per student of a small calendar. Number the days from 1 (January 1) to 352 (December 31).

**ACTIVITIES AND PROCEDURES**:

1. Describe for the students what you do as a Green Industry Professional / Professional Horticulturists.
2. Show students the examples of flowering crops that are grown in the greenhouse. Say the name of each plant and ask the students to repeat the name in unison.

3. Explain that it is the job of the Greenhouse Plant Technicians (Horticulturists/ Grower) to start these and other crops at the right time so they flower or are ready at the exact time the customer wants to buy them.
4. Pass out the handout "Greenhouse Plant Technicians Planting Schedules to Get a Plant to Bloom on a Specific Day" worksheet. Have students work in small groups of 4-6 students and encourage each group to think of at least 5 things the Greenhouse Plant Technician would need to know to schedule a crop to flower on a specific date. Students should write their ideas down on the handout.
   Prompt students if needed by asking questions such as:
   a. What does a plant need to have in order to grow?
   (5 environmental factors from Lesson A3)
   b. Do all plants grow at the same speed?
   c. Do all plants take the same number of days to flower?
   d. Will a plant grow as fast in the winter as it does in the summer?

5. Give students 3-5 minutes to work and then have the students share their ideas. Take at least 2 ideas from each group. Try to be accepting of students creative answers and not overly critical. Look for concepts including:
   - Desired date of sales
   - How many days it takes the plant to grow from start to flowering
   - How much light is present
   - Specific temperatures; some may even note that plants grow faster at warmer temperatures
   - Watering requirements
   - Fertilizer available
   - Carbon dioxide and oxygen requirements

5. Explain that the students will be setting up an experiment which will help them determine when to plant a Paperwhite Narcissus in order to get it to bloom on a specific date. They will be measuring how fast the plant grows and collecting those measurements as data. They will determine how many days it takes the plant to flower.
6. Demonstrate how to plant the bulb. Fill the plastic cup 1/2 full with the pea gravel, place the bulb on top of the gravel and then finish filling the cup with

pea gravel.

7. Pass out cups and circulate a marker so each student can write their own name on the side of their cup.
8. Call small groups of students to come up and fill their cups with pea gravel and plant the bulb.
9. Pass out "data collection" worksheets. Show students how to measure plant height by placing the ruler on the top of the bulb. Explain how to fill out the data table. Instruct students to measure the plant and record the height of the shoot three times a week, every Monday, Wednesday and Friday. Students should also write down the date it flowers.
10. After students place the cups of planted bulbs on a counter in the classroom, fill the cups with water to within one-inch of the lip.
11. Collaborate with the teacher to arrange for the on-going watering. Typically cups will need about 1/4 cup of water every other day. This could be done by the teacher or the individual students.
12. *OPTIONS:* Students can collect data in the classroom OR take the plants and data sheets home and do the measuring at home. Both methods have shown to be effective.

**AFTER the Plant Blooms** return to the classroom OR have the teacher complete the lesson as follows.

1. Pass out calendars or have a big calendar in front of the room.
2. Ask students to use their data sheet to figure out how many days it took the bulb to flower. Remind them they took data every MWF. Share the results.
3. Explain that a Greenhouse Plant Technician can determine how fast a plant is growing by looking at how tall it is and by how many leaves it has. This gives them a clue to how close it is to flowering.
4. Explain and diagram on the board how to graph the growth rate of the plant by using date on the x-axis and height on the y-axis. Place the data points on the graph from actual data collected. Connect the data points with a line. Place a star on the line at the date the plant flowered. Have students graph their own data.
5. Explain how counting leaves can also be a clue to when the plant will flower. Many plants make a certain number of leaves and then flower, corn typically makes 22 leaves, Easter Lilies make about 90 leaves and then flower. Ask students how many leaves their plants had when it flowered. Share responses with the class.
6. Demonstrate how to graph leaf development by using a bar graph with the dates along the x-axis and the number of leaves on the y-axis. Place a star showing when the plant flowered.
7. The instructor should select a hypothetical number of days to flower and demonstrate how to use a desired date to flower (select a date on the calendar) and then count back the number of days to flower to get to the planting date.
8. Have students use their own data and let them select their own desired date to flower --- they may want to choose the last day of school, a holiday, their

pet's birthday, or someone's birthday, etc. Ask students to count back on the calendar to find when they should plant their bulb to get it to flower at the right time.

9. Repeat steps 7 and 8 using the *numbered days* of the year (1-365). Have students identify the *number* of the flowering date and subtract the number of days required to flower. Ask what date they should plant.
10. OPTIONAL: Have students select a second flowering date and find the required date to plant.
11. Explain that this is how the Greenhouse Plant Technician / Grower figures out when to plant and schedule many different crops throughout the year. Each crop is different.

**ASSESSMENT:** Students should be able to complete the data worksheet provided and graph the data. Students should be able to determine an appropriate planting date for alternative flowering dates.

## ADDITIONAL ACTIVITY:

OPTIONAL: Compare the number of days to flower among all of the students and ask students to think of reasons why the days are not always exactly the same. Discuss how temperature and light can affect growth rates. Discuss natural variability and the importance of using means (averages).

## HANDOUTS AND WORKSHEETS:

- Paperwhite Narcissus Data Collection Worksheet (see attached)
- Greenhouse Plant Technicians Planting Schedules to Get a Plant to Bloom on a Specific Day Worksheet (see attached)

# Greenhouse Plant Technicians Plan Planting Schedules to Get A Plant to Bloom on a Specific Day

**Background:** **Consumers want to buy flowering plants on specific days during the year. For example, they buy poinsettias for winter holidays and geraniums for their summer garden. Greenhouse plant technicians start growing the plants exactly on the right day in order to have the plant flowering on the exact day that a customer wants to buy it.**

**Question:**

**Think about how a Greenhouse Plant Technician could schedule a crop to flower at a specific time. What do they need to know? (write your ideas below)**

Name _____

# Paper White Narcissus Data Collection

| DATE ⇨ | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |
| Plant Height (cm) | | | | | | | | | | | | | | | | |
| Number of Leaves | | | | | | | | | | | | | | | | |

**Instructions:**

1. **Take data every Monday, Wednesday and Friday.**
2. **Measure the height of the plant by placing the ruler on the top of the bulb and looking at how tall the green shoot is above the bulb.**
3. **Add 1/4 cup water every other day.**
4. **Write down the date the white flower opens.**