Subject Area: Science

Grade Levels: The lesson can be adapted for grades 4–12 (ages 9–18).

Time: At least two 45-minute class periods; time outside of class as necessary

Lesson Objectives:
Students will:

• Classify and record measurement data about flowering plants.
• Develop a basic understanding of the Linnaean classification system.
• Build data literacy skills by comparing the plants using dynamic, visual plots.
• Explain their findings in writing and visual slide shows.

Standards:
National Science Education Standards:
Science as Inquiry – Content Standard A
All students should develop
• Abilities necessary to do scientific inquiry.

Life Science – Content Standard C
All students should develop understanding of
• Diversity and adaptations of organisms.

Common Core State Standards:
Common Core State Standards for Mathematics:

Mathematical Practices
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Use appropriate tools strategically.

Measurement and Data
• Represent and interpret data.

Statistics and Probability
• Summarize and describe distributions.
College and Career Readiness Anchor Standards for Writing:

**Standard 6.** Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

**Standard 7.** Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

**Overview:**

Students will use InspireData to classify flowering plants. They can work in pairs or small teams, or younger students can collect and analyze the data as a class. The lesson is ideal for support of a field experience or trip to a local botanical garden, but it can be easily adapted to use anywhere else plants are present, such as in a park or on school grounds, or plants can be brought into the classroom.

Students will compare the plants using a variety of plot types and explain their findings in annotated slide shows. In addition to classifying, measuring, and researching different types of flowering plants, students will also develop a basic understanding of the Linnaean system, the most widely used classification system in the scientific community.

**Preparation:**

- This lesson requires the InspireData® software application published by Inspiration Software, Inc. You can download a 30-day trial at [http://www.inspiration.com/InspireData](http://www.inspiration.com/InspireData).
- Arrange to go to an outdoor location with flowering plants, such as a botanical garden or the schoolyard. Alternatively, flowering plants can be brought into the classroom, but the lesson is more exciting and educational if students can identify plants they find interesting outside.
- Have tape measures available for student teams.
- Access to library resources and/or the Internet would also be helpful for student research.
Lesson:

1. Begin by asking students if they know what it means to classify and how they might classify things in their everyday lives. For example, how might they classify forms of writing or types of lab equipment? Tell them that today they will have the opportunity to observe and classify plants using InspireData.

2. Open the Classifying Flowering Plants database (InspireData Starter>Databases>Science>Classifying Flowering Plants).

3. Explain to students the process of gathering data in Table View as documented in the table notes of the Database Template tab.

4. Click on each of the field headings (Flowering Plant, etc.) and review field descriptions and choices for each field. Explain that Scientific Name refers to a system for classifying organisms (living things). Tell them that there are different systems for classifying organisms, but that a system originally developed by a scientist named Carl Linnaeus is the most common. Explain that the science of classifying living things is known as taxonomy, which is the main concept they will be exploring through this project.

5. Click on the Sample Data tab to show students an example of a completed table. Explain that after they gather their data they will switch to Plot View to analyze it visually.
6. Click the **Plot View** button on the Toolbar and demonstrate for students how they can click through the slides in the **Slide Sorter** for examples of the types of graphs and charts they will create with their data.

![Percentage of Plants with Each Flower Color](image)

7. Click the **Table View** button in the upper left to switch back to **Table View**, and demonstrate for students how data can be entered directly into the table in the **Database Template** tab or by using InspireData’s **Survey** or **e-Survey** tools. Suggest a minimum number of plants on which data should be gathered, such as 20.

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Optional: Students can use digital cameras to photograph the plants and import them into the database records. The images then become useful icons in student plots.

**Complete this Survey for Each Plant**

![Image of a survey form with fields for plant information and an option to import images]

Note: Students can select Table>Launch Survey to enter data via the Survey tool, completing the form as they explore the garden. They simply click Add Record each time they are finished adding a record. Once they are finished entering the information about the flowers, they can click Close, and the data will be automatically entered into the database. Alternatively, students can enter data directly into the table or record data on paper first and enter it into the database later. A third option for entering data is via the e-Survey tool if Internet connectivity is available.

8. Divide the class into groups of two or three students, provide each group with a tape measure, and go to your chosen outdoor location. If that is not an option, bring in flowering plants for students to observe and measure. Give student groups a time limit for their data collection, and if they are outside, boundaries for how far they can go in search of their flowering plants. Circulate outside among the students, answering questions as they arise.
9. When data collection is completed, return to class or to a computer lab and remind students how they can access the table notes. These include Possible Investigations they will be trying to answer via data analysis.

Questions include:

- How many different flower colors are represented? Which is most common? (Suggestion: Use the Pie plot and/or Stack plot tool.)
- Is the relationship between plant height and leaf length as you would expect? Are there any outliers? (Suggestion: Use the Axis plot tool.)
- What is the most common leaf texture? Hypothesize how leaf texture helps the plants in their survival. (Suggestion: Use the Pie plot and/or Stack plot tool.)
- Create two plots that explore relationships between plant characteristics. Why do you think these relationships exist? (Suggestion: Use the Venn plot tool.)
- Advanced questions for older students if they complete the basic questions:
  - Do plants with the same color of flowers have any other characteristics in common? If so, which characteristics? (Suggestions: Use the Stack plot tool with Color by Field feature, or Multiple Stack plot and/or Pie plot tool with Color by Field feature.)
  - Are there similarities among plants that originate from the same continent? (Suggestions: Use the Stack plot tool with Color by Field feature, or Multiple Stack plot or Pie plot tool with Color by Field feature.)
  - Explore a relationship between two numerical fields and mark any outliers. (Suggestion: Use the Axis plot tool with Mark and Label features.)

10. Switch to Plot View and demonstrate for students how they can answer the questions above. Explain that they should create at least one plot that will address each question. Your demonstration should include how to select plot types via the buttons on the Toolbar in the lower left. Demonstrate how to define the x/y axes in the plots (e.g., for a stack plot, click on X Axis and choose Flower Color). Use the InspireData handouts to help with plotting and analysis (Help>Documentation>Handouts). You may want to print out one or more sets of the handouts to make them available for students. You should also remind students how they can refer to the plots created with the sample data for examples.

11. Demonstrate for students how to record explanations of plots and answers to the questions in the Notes area at the bottom of the screen. Click on in the lower right to open the area. Be
12. Lead a class discussion about the students’ findings. What interesting discoveries did they make? Why is classification very important for scientists?

**Adaptations/Extensions:**

- For younger students, consider gathering and analyzing the data as a whole class, at least at first until students understand the process.
- Students can make presentations to the class about their findings using their slide shows.
- Students can enhance their plots by adding other InspireData features and computations. Pass out the “Learn to Use Plots” handout in InspireData for student reference (Help>Documentation>Handouts>Learn to Use Plots).
- Create a new database using different field headings for collecting different plant data. Use Inspiration® or Kidspiration® to brainstorm other characteristics that could be recorded.
- Students can use Inspiration to create an observation and conclusion document to record their findings. Students can use the Internet to further their research about the characteristics of flowering plants. Have students create hyperlinks to all Internet sources used.