"Beanie Babies"

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Editor's notes:

Website URLs listed in this resource were current as of publication, but may now be obsolete. If you know of a replacement URL, please suggest it in the resource's "Comments" section.

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"Beanie Babies" Teacher Section

Purpose

The purpose of this activity is to identify the needs of plants for germination, growth, and survival.

Objectives

The students will be able to:

- Practice inquiry by developing hypotheses and conducting experiments of their own design.
- Practice acquiring knowledge using the Internet to learn about the needs of plants.
- Demonstrate comprehension by applying knowledge directly to growing a plant.
- Present results of an experiment to the class.
- Synthesize information about growing plants.
- Differentiate between biotic and abiotic factors.

Grade Level

This lab is designed for students in grades 6-8 but can easily be adapted for other levels.

National Science Education Standards

K-12 Unifying Concepts and Processes
Systems, order, and organization
Evidence, models, and explanation
Change, constancy, and measurement
Grades 5-8
Science as Inquiry
Abilities necessary to do scientific inquiry
Understandings about scientific inquiry
Life Science
Structure and function of living systems
Regulation and behavior

South Dakota Science Standards

7. L. 3. 1. Analyze how organisms are linked to one another and the environment.
Students are able to predict the effects of biotic and abiotic factors on a species' survival.

Prior Knowledge

Students should be familiar with experimental design and internet research. They should know the requirements of all living things: food, water, living space, and stable internal conditions (homeostasis).

Including All Students

- All students will participate in this activity either with a partner, as during the Internet Treasure Hunt, or alone when designing and conducting the experiment. Students can also work in small groups and complete the entire activity at school, producing a group poster as their final report.
- All students should be encouraged to seek plant-growing advice from more experienced gardeners in the community to add to their knowledge of growing plants gathered from their internet research. Topics for optional guest speakers could include: Native American medicinal plants, growing crops for food, and bioengineered foods.

Questions to Ask Along the Way

1. What do plants need to grow? Are the things plants need biotic (living) or abiotic (nonliving)? How do you know?
2. What factors affect the height of a plant?
3. What is a hypothesis?
4. How can a hypothesis be tested?
5. What is a controlled experiment?
6. What is a variable?
7. What does it mean to control all variables except for the one you are testing?
8. How can you make sure you are testing only one variable at a time?
9. Why is it important to perform more than one trial in your experiment?
10. What changes could be made for future experiments?
11. Were some parts more difficult to carry out than others? Were any variables hard to control?
12. Was it difficult to collect accurate data?
13. What other questions can you explore about plants?

Materials

- Seed samples of a variety of native and non-native plants
- Plastic cups – 4/student
- Plant seeds – 20/student (Wisconsin Fast Plants, broccoli raab, bush green beans)
- Plants or pictures of plants
- Student Worksheets: KWL, Treasure Hunt, "Beanie Babies: How can you grow the tallest plant?" Beanie Babies Rubric
- Letter from Poppy Seed on overhead transparency
- Computers with Internet access
- Construction paper, graph paper
- Markers, tape measure, rulers
- Students will provide other materials needed for their experiment

Safety

In this activity students will design and conduct their own experiments **at home**. **Approve their procedures before they begin the experiment**, paying special attention to any fertilizers or chemicals proposed by the students. Have parents approve of the procedure that the students will follow at home by signing their rough draft.

Procedure

1. Review steps required in designing an experiment.
2. Read the letter from Poppy Seed to the class, requesting help in growing plants.
3. Display seed samples of a variety of native and non-native plants: tomato, pin oak, common milkweed, soybean, or Echinacea, for example.
4. Ask students: "How can this seed become a plant?" Accept any answers.
5. Distribute a KWL sheet to each student and ask them to write what they **know** about what plants need to germinate, grow, and survive.
6. Follow a discussion of what they know (completed "K") with writing what they need to find out to complete the "W" section.
7. Break students into teams of two for the Internet Treasure Hunt. Using the Internet, identify needs of plants for germination, growth, and survival.
8. When the Treasure Hunt has been completed, distribute "Beanie Babies: How Can You Grow the Tallest Plant?"
9. Working independently, students will develop their own hypothesis and design an experiment to explore this question. They should be prepared to defend their hypotheses by providing information from their Internet research.
10. The teacher should monitor students as they proceed through their experimental designs. Be sure they control variables, determine a method for measuring the plants, design a table for the data, and write out a detailed experimental plan for the teacher to review.
11. Students can revise the plan, if needed, and get teacher approval.
12. Give each student 20 seeds to use in their experiment. Bush green beans work well but others may be attempted. You could try broccoli raab or Wisconsin Fast Plants.
13. Students should set up the experiment at home and collect data over several weeks. Using the data, students should graph their results comparing the height of the control plants to those in the variable groups. They can make their own or follow the step-by-step directions at the following website to create a colorful line graph: http://nces.ed.gov/nceskids/Graphing/
14. Students will prepare a poster or written lab report. Have them share their experimental set-up and results with the class.
15. Lab report, presentation and poster should include:
    - ✧ What changes that could be made for future experiments?
    - ✧ Were some parts more difficult to carry out than others?
    - ✧ Were any variables hard to control?
    - ✧ Was it difficult to collect accurate data?
16. Revisit KWL and complete what you learned. This can be used to assess student learning.
17. Have students write a letter to Poppy Seed telling her how to grow plants.
18. Optional: On a given date (40-50 days), students should bring in their plants to be measured. For each class, the student who grows the tallest plant will "win" a house plant.

Where to Go From Here

- Take the average growth for all plants and compare the growth rate.
- Wisconsin Fast Plants could be used in the classroom to identify the needs of plants. This could be followed with the tall plant bean challenge. For more advanced students.
- Wisconsin Fast Plants could be used to study genetics.
- Students could explore plant growth in space.
- As students learn more about plants they can compare the height of vascular and non-vascular plants.

Suggestions for Assessment

- Each student could write what they learned about what plants need.
- Use the rubric to evaluate student posters.

References and Resources

- "Bean Stalks to the Sky." *Sciencewise Book I.* p. 162. (1996).
- Science Explorer (2005).*The Nature of Science*. Upper Saddle River, New Jersey:Pearson Prentice Hall.
- West, Donna. "Beanplants: A growth experience." *Science Scope,* (April, 2004). p. 44-46.
- "How Does Your Garden Grow?" National Aeronautics and Space Administration (NASA) (http://www.nasa.gov/vision/earth/livingthings/gardengrow.html)
- "Helping Plants Grow Well" British Broadcasting Corporation (BBC) (http://www.bbc.co.uk/schools/scienceclips/ages/7_8/plants_grow.shtml)
- "The Great Plant Escape" University of Illinois Extension (http://www.urbanext.uiuc.edu/gpe/case1/c1facts3a.html)
- "Plant Needs" Maryland Department of Natural Resources (http://www.dnr.state.md.us/forests/education/needs.html)
- "Biology of Plants" Missouri Botanical Garden (http://mbgnet.mobot.org/bioplants/grow.html)
- "Create a Graph" (http://nces.ed.gov/nceskids/Graphing/)

Letter from Poppy Seed

Dear Ms. Stoll,

I have been walking by and admiring your garden everyday all summer long. What a wide variety of plants you have in such a small space; from vegetables to native wildflowers!! You must be a really good gardener.

I have never had a garden before and think I finally have the space and time to try it. Can you help me? Since it is pretty late in the summer, I wonder how I can grow my plants really tall before it freezes outside.

Thanks for your help.

Sincerely,
Poppy Seed

K W L

Name _____ **Class** _____

What do you know about what plants need to grow?		
What I know…	**What I need to know…**	**What I learned…**

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"Beanie Babies" Internet Treasure Hunt

This web info search will help you find information about what plants need to grow, develop, and survive. You will be looking at pre-selected web sites to answer each question. It is important to not only find the information at the site, but also to consider who wrote the site, what their purpose is in writing it, and how credible (accurate) you think the information is.

Question: **What do plants need to grow, develop, and survive?**		
	Site 1: http://www.bbc.co.uk/schools/scienceclips/ages/7_8/plants_grow.shtml	**Site 2:** http://www.urbanext.uiuc.edu/gpe/case1/c1facts3a.html
Who created this web site (organization, company, etc.)?		
Why did they create it? (check all that apply)	▫ To provide factual information ▫ To influence the reader's opinion ▫ To sell a product or service ▫ I'm not sure	▫ To provide factual information ▫ To influence the reader's opinion ▫ To sell a product or service ▫ I'm not sure
How credible (accurate) do you think the info is?	▫ Very accurate ▫ Somewhat accurate ▫ Not very accurate ▫ I'm not sure	▫ Very accurate ▫ Somewhat accurate ▫ Not very accurate ▫ I'm not sure
What did you learn?		

"Beanie Babies" Internet Treasure Hunt

Question : **What do plants need to grow, develop, and survive?**		
	Site 3: http://www.dnr.state.md.us/forests/education/needs.html	**Site 4:** http://mbgnet.mobot.org/bioplants/grow.html * Requires Quick Time and may take a while to load.
Who created this web site (organization, company, etc.)?		
Why did they create it? (check all that apply)	▫ To provide factual information ▫ To influence the reader's opinion ▫ To sell a product or service ▫ I'm not sure	▫ To provide factual information ▫ To influence the reader's opinion ▫ To sell a product or service ▫ I'm not sure
How credible (accurate) do you think the info is?	▫ Very accurate ▫ Somewhat accurate ▫ Not very accurate ▫ I'm not sure	▫ Very accurate ▫ Somewhat accurate ▫ Not very accurate ▫ I'm not sure
What did you learn?		

How Can You Grow the Tallest Plant?

Name _____ Class _____

Design, conduct, and write up your experiment following this format:

1. Think of an idea: **How can you grow the tallest bean plant?**

2. Research your topic. Use information from your Internet Treasure Hunt, seed packages, experience, and other people.

3. Plan the experiment:
   - ✧ What is your **hypothesis**? (What do you think will happen?)
   - ✧ What **materials** will you use?
   - ✧ What **variables** will you control? What variables will you test?
   - ✧ **Procedure** (Write your plan in numbered steps.)

4. Conduct the experiment.

5. Collect and record data (include a **data table**).

6. Analyze your data (include a **graph**).
   Create A Graph http://nces.ed.gov/nceskids/Graphing/
   Once you have data from an investigation or survey, follow the step-by-step directions here to create colorful line graphs, pie charts, or bar graphs. No special software is required and you can print your results.

7. Draw a **conclusion** based on your findings.

8. What's next? How could you improve this experiment if you did it again? What other experiments could you do?

Rough draft of plan due _____

Plan approved _____ _____
Parent signature **Date**

_____ _____
Teacher signature **Date**

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"Beanie Babies" Lab Report Format & Rubric

Lab Report:

- Hypothesis
- Materials
- Procedure
- Data (include a data table)
- Graph
- Conclusion

Rubric:

CATEGORY	4	3	2	1
Experimental Design	Experimental design is a well-constructed test of the stated hypothesis. Clearly defined control and variables to be tested.	Experimental design is adequate but leaves some unanswered questions	Experimental design is relevant but not a complete test.	Experimental design is not relevant to the hypothesis.
Description of Procedure	Procedures are listed in clear, logical steps. Each step is numbered and a complete sentence.	Procedures are listed in logical order but steps are not numbered and/or not in complete sentences.	Procedures are listed but not in logical order or are steps hard to follow.	Procedures do not accurately list steps of the experiment.
Data Table	Professional looking and accurately represents data. Labels and titles are present.	Accurately represents data. Labels and titles are present.	Accurately represents data in written form. No table present.	Data inaccurate or not shown.
Conclusion	Detailed conclusion clearly based on the data and related to research findings and the hypothesis statement.	Somewhat detailed conclusion clearly based on the data and related to the hypothesis statement.	Student provides a conclusion with some reference to the data and the hypothesis statement.	No conclusion is apparent OR important details are overlooked.
Poster	Poster is typed or neatly written. Uses headings to visually organize information. All items are neatly and correctly labeled.	Poster is typed or neatly written but formatting does not help visually organize information. Most items are neatly and correctly labeled.	Each element has a function and clearly serves to illustrate some aspect of the experiment. Most items are correctly labeled	The poster seems incomplete or chaotic with no clear plan. Many labels are missing or incorrect.