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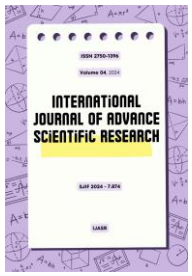

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Research Article

CONDUCTING PROJECT WORK ON STUDYING AND GROWING BEAN SEEDS

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Abstract

Practical projects play a significant role in studying natural sciences. Linking theory with practice facilitates easier comprehension and retention of topics. For instance, examining the internal structure of a bean seed and observing its germination process in experiments can spark students' interest in science and develop their experimental skills. Additionally, such projects are beneficial in preparing students for life, teaching them to work systematically and according to plans.

Keywords

Project work, natural sciences, bean seed.

Introduction

In teaching natural sciences, incorporating topic-related experiments leaves a strong impression on students. Practical application of knowledge ensures lasting understanding, as theoretical knowledge alone may fade without reinforcement through practice. Increasing the number of practical lessons is therefore crucial. These lessons can utilize easily available and commonly used materials.

One example of project work could involve studying the external and internal structure of a

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bean seed and the factors affecting its germination.

For this project, the following steps are planned:

1. Measuring the length of a dry seed.
2. Measuring the length of a soaked seed.
3. Observing the internal structure of the seed using a magnifying glass.
4. Identifying the conditions necessary for seed germination.
5. Monitoring the growth processes of beans in normal conditions.

The bean is an annual herbaceous plant whose seeds mature inside its pod. Bean seeds are commonly consumed in salads or as part of meals. Rich in nutrients and vitamins, bean seeds are particularly high in proteins and B-group vitamins, which enhance memory.

How do we study the structure of a seed?

The following experiment outlines the process:

Materials Needed:

- Bean seeds
- A glass of water
- White paper
- A ruler
- A magnifying glass

Procedure:

1. Take 10 bean seeds.
2. Measure the length of each seed and calculate the average length of the 10 seeds.
3. Place the seeds in a glass of water.
4. After one day, measure the length of the soaked seeds and calculate their average length.
5. Determine how much the seeds have increased in size by subtracting the average

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length of the dry seeds from the average length of the soaked seeds.

6. Peel the seed coat off the soaked seeds and separate the cotyledons.

7. Locate the embryo.

8. Observe the structure of the embryo using a magnifying glass.

9. Record your observations in your notebook.

- What changes occurred when the seeds were soaked?
- By how many centimeters did the length of the seeds increase after soaking?

What are the parts of a seed?

To determine this, we observe the seed using a magnifying glass. The seed consists of three main parts:

Seed Coat: Protects the seed from drying out.

Two Cotyledons: Store nutrients.

Embryo: Develops into a new plant.

Experiment on Studying the Germination Process of a Seed

To study the conditions necessary for bean seed germination, a plan is created consisting of the following steps:

1. Study the conditions required for germination.

2. Observe the germination process of soaked and unsoaked seeds.

3. Record daily observations in a notebook.

4. Grow beans in light and dark environments and monitor changes.

5. Draw conclusions based on the results.

Materials Needed

- Bean seeds
- Glass of water

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- Paper towels
- Spray bottle
- Plastic containers
- Stretch wrap
- Soil

Procedure

1. Soak 10 bean seeds in a glass of water for one day.
2. Place paper towels in two containers.
3. In one container, place 5 soaked seeds; in the other, place 5 unsoaked seeds.
4. Cover the seeds with a paper towel and moisten them using a spray bottle.
5. Cover the containers with stretch wrap and poke small holes for ventilation.
6. Keep the containers in a warm place.
7. Observe and record changes daily in your notebook.
8. Once the seeds develop roots, stems, and initial leaves, add soil over the roots to cover them.
9. Place one container in a bright location (e.g., near a window) and the other in a dark space (e.g., a cupboard).
10. Spray water on the seeds daily.
11. Monitor the plants for 10 days.
12. Compare and record the changes observed in both conditions.
13. Write the results in your notebook and draw conclusions

Day 1. Formation of the root.

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Day 2. Development of the root.

Day 4. Development of the stem.

Day 6. Development of the leaf.

What changes occurred in plants grown in the dark and in the light?

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Carrying out experiments as project work by each student increases their interest in science and helps develop their skills in conducting purposeful experiments. Drawing conclusions based on the experiments strengthens the students' acquired knowledge.

These experiments were conducted by students of grades 2, 5, and high school. The assignments were gradually made more complex according to the students' age. The experiments sparked great interest among students of all age groups, with the main differences lying in the conclusion phase. By studying the structure of seeds, observing the germination process, and testing it in practice, students developed skills to apply their knowledge in real-life situations.

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