Marshall University Sustainability Department

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Plants Seeds & Needs

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OBJECTIVES

Students will actively investigate seed dispersal through searching for seeds on campus and examining the seed forms. They will hypothesize the modes of transportation for such seeds and what seeds require for growth. Students will learn what plants need to be healthy and how to measure such needs.

LESSON PARAMETERS

1. **Key Terms** - form, function, edibility, seeds, soil acidity, nutrients, moisture levels, soil temperature
2. **Group Size** - groups of 3 to 5 students; applicable for a class ranging from 3 to 30 students
3. **Grade Levels** - 5^{th}- 9^{th}
4. **Duration** - one 60-90 minute session
5. **Setting** - outdoors
6. **Disciplines** - Science, Art, Biology, Environmental Education
7. **Learning Techniques -**
    a. Discussion
    b. Hands-On
    c. Group-based Collaboration
    d. Interdisciplinary
    e. Critical Thinking
    f. Activity-based
    g. Real-world application
    h. Expeditions
    i. Nature-based

GREEN CONNECTIONS

- **Connections to Home and Community -** Students search for seeds in the surrounding community during this lesson.
- **Sustainable Perspectives -**
    - Gardening
    - Sustainable habitats
    - Sustainable food sources

LESSON SUMMARY

Students will form groups of four and claim a different area of campus for their seed hunt. Each group will go to their area and search for seeds. Students will gather as many seeds of all kinds as they can find and then come back together as a whole class with their seeds. In the same table they used for “Edible Plant Parts”, students will draw the seeds they found and hypothesize what form of transportation such seeds use to help plants reproduce. After students have completed their hypotheses, students will discuss their findings and hypotheses. The instructor will guide this discussion adding accurate identifications and transportations.

After discussing how these seeds spread, the instructor will transition into a discussion of what the seed will need in order to grow as a way to segue into plant needs. Students may answer/discuss what they think plants will need to grow. This will allow the instructor to gauge students’ prior knowledge of plant needs. The instructor must also facilitate this discussion; probing for further discussion or introducing vital information the students may not have included initially (be sure to discuss how plants need water, sunlight, air, and soil with nutrients). Then the instructor will demonstrate how to measure the needs available to a plant such as soil acidity, nutrient levels, moisture levels, soil temperature, and space between plantings

The class will apply what they have learned by visiting the MU student garden where each group of four will be assigned a different plant. The group must ask themselves “Is our plant as happy as it can be?” To find out, each group will receive a handout for their specific plant describing proper planting time, water requirements, sun needs, nutrient needs, etc. Then the groups will take turns using the measuring tools and recording the data to determine if their plants are “happy”. To conclude, groups will share their data (should be similar measurements for all groups since all the plants are in the garden) and how it does or does not satisfy their plants’ needs (this may vary according to the plant).

ACTIVATING STRATEGY

Students will split into groups of four and go on a 10-15 minute seed hunt throughout campus. Students will gather as many seeds of all kinds as they can find then come back together to discuss their findings. This starts the lesson with an active, competitive task for students to become engaged in the lesson. It also triggers prior knowledge and piques curiosity as students take a closer look at items they may pass by outside without realizing they are seeds.

LESSON DEVELOPMENT

Exploration Lesson - Students actively search for seeds on campus then examine seed form to hypothesize seed transportation.	**Explanation Lesson -** Once students have examined seed forms and hypothesized the mode of transportation and seed needs, the instructor will facilitate a whole class discussion sharing their thoughts as well as correct information. This offers students the information they need to know about “How to make a plant happy.”	**Application Lesson -** Having learned about plant needs and how to measure such needs, students will apply their new skills in the MU student garden as they measure soil acidity, nutrient levels, moisture levels, soil temperature, and space between plantings.

LESSON WEATHER CONTINGENCY

If bad weather, off season, or unable to visit campus or any working garden/farm, then students must brainstorm all the different types of seeds they can think of. The class may participate in group discussions about seeds and plant needs just as the lesson plan describes. Then students will be split into groups and assigned a plant to research online what that plant needs to be healthy and productive. If done properly, how much harvest could they expect from that plant? Students may then present findings to the class and discuss.

LESSON ADDITIONS

If time allows, students may participate in a plant-needs activity (outdoors or indoors). Students and instructor must create a boundary in an open space large enough for everyone to have space inside the boundary but small enough so that some students are close together. The instructor will toss pieces of colored paper randomly in the boundary. Yellow paper represents sunlight, blue paper represents water, brown paper represents soil, and white paper represents air. Then students (standing within the boundary) will pick up four different colored pieces of paper without moving their feet. Those who retrieved four different pieces remain standing with their paper while everyone else sits down in place. The instructor will indicate a second round for those standing to try to get four more pieces. Continue playing more rounds until only one person is left standing (the winner) or it is impossible to reach any paper. Upon completion, the instructor will ask the students if they know what the paper represents and what the students are acting as. They should discuss how the students are plants and the pieces of paper are plant essentials. Discuss how some plants had plentiful resources, others did not, and others had to compete with other plants. Relate this to real plant-life situations. What could help?

DISCUSSION QUESTIONS

- Do all plants reproduce alike? Do they all have the same kinds of seeds?
- How do seeds travel?
- What do seeds need to grow?
- What do plants need to grow?

MATERIALS

- Baggies for gathering seeds
- Seed Form/Function handout
- Pencils
- Specific plant handouts (determined by plants in season)
- Tools to measure soil acidity, nutrient levels, moisture levels, soil temperature, and space between plantings
- Colored Paper (yellow, blue, brown, and white)

RATIONALES

- Next Generation Science Standards
  - **MS-LS1-4 -** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively
  - **HS-LS2-8 -** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- 21st Century Science Content Standards and Objectives for WV Schools
  - **SC.O.ENV.2.2** - explain how the chemical components of biological and physical processes fit in the overall process of biogeochemical cycling such as photosynthesis, respiration, nitrogen fixation, or decomposition.
  - **SC.O.ENV.2.24** - classify and analyze characteristics of different soil types:
    - Texture
    - pH
    - Nitrogen
    - Phosphorus
    - Potassium
  - **SC.O.6.2.05** - examine how abiotic and biotic factors affect the interdependence among organisms.
  - **SC.O.6.2.08** - predict changes in populations of organisms due to limiting environmental factors (e.g., food supply, predators, disease, or habitat).
  - **SC.O.7.2.07** - evaluate how the different adaptations and life cycles of plants and animals help them to survive in different niches and environments (e.g., inherited and acquired adaptations).
  - **SC.O.7.2.08** - analyze how changes in the environment have led to reproductive adaptations through natural selection.
  - **SC.O.7.2.10** - analyze the differences in the growth, development and reproduction in flowering and non-flowering plants.
  - **SC.O.8.2.06** - analyze how behaviors of organisms lead to species continuity (e.g., reproductive/mating behaviors, or seed dispersal).