Garden Lesson – Basic

Topic: What Are Seeds? (Germination)

Learning Points:

- Seeds are plants' way of continuing their species.
- Without seeds plants can't survive and therefore humans can't survive,
- Seeds grow in a variety of different environments but must have the key ingredients to germinate (grow into seedlings). The key factors are: water, oxygen, favorable temperature, and usually light.
- Unspoken learning point is students/parents can sow seeds indoors or outdoors at a relatively low cost and time commitment.

Common Core Standards:

Science: K-LS1-1: Use observations to describe patterns of what plants and animals need to survive.
Science: 5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.
Speaking and Listening K-SL3 thru 3-SL3: Ask and answer questions…….for understanding.

Lesson Plan Design Options:

There are many ways to design this lesson plan depending on class size, academic level, time allotment, space limitations, financial limitations, and/or core curriculum goals. The lesson could be as simple as having each student or group of students plant a couple of seeds in planting cells by following standard indoor or outdoor planting procedures. That is the approach being describe in this Lesson Plan. If you want to apply more of a scientific investigative model, especially for upper elementary or middle school students then refer to "Lesson 2 – With Variables (Scientific Investigation)". If your goal is to start a garden having a variety of crops then you can choose a variety of seed types for this lesson. If you want to transplant the seedlings into an outdoor garden then plan to conduct this lesson about 5 to 6 weeks before transplanting them outdoors.

Items Needed: (Based on a maximum of 144 students)

- 2 sets of plant germination kits (each kit has 12 ea. 6-cell planting containers, a water tray, and a clear plastic dome cover) . These kits are available at most gardening centers for about $7 each and are reusable. You can also purchase these kits with 48 larger cells instead of 72 smaller cells.
- 432 seeds (allow for 3 seeds per cell) – decide which seeds you wish to grow that can be started indoors in planting cells. Some possible choices to start indoors from seed would be lettuce, Kale, Endive, Mustard, and Spinach. These also can be planted directly in the garden. Seeds vary in price, but many are around $2 per package with varying seed quantities.
- starter soil mix (8 qts bag) – costs between $5 - $8
- Water
- Maximum of 144 popsicle sticks or plant labels (about $10) if you wish to label each of the seedling cells,
- Optional items (all of these items are reusable, often for several years):
    - a grow light with stand (standard size is 2 feet wide, which will accommodate 2 trays – about $60)
    - a heating mat to control soil temperature (about $10-$20)
    - a soil moisture meter (about $10) to monitor moisture level of soil
    - a soil thermometer (about $10) to monitor soil temperature
    - a timer to set on/off times for heating mat and/or grow light (about $5)

Preparation:

- Fill planting containers with the starter soil mix. Tap down lightly. Moisten soil before activity.
- Sort seeds in groups of 2 for each student. Keep extra seeds handy at time of activity. If using more than one type of seed (different crops) be certain each seed type is labeled when placed in their planting containers. Do not place two different seed types in the same seed cell. Preferrably place the same seed type in all six cells of a planting container.
- Obtain information (seed depth, germination temperature and time frame) on each plant you choose to grow. A reference is The Vegetable Gardener's BIBLE) or read the instructions on the seed package.
- Create group seating chart (groups of 6).
- Create labels (use popsicle sticks or regular planting labels) . You can choose to place labels into cells before handing planting containers to the students or have the students do the labelling at the time of the activity.
- Have extra starter soil mix available at each table for students to sprinkle over the seeds.
- Have something to use to lightly sprinkle water on top of starter soil after students place seeds and additional soil in cells.
- Prepare a location where planting trays will get sunlight (next to window) during the day after activity is over. If you are using a grow light system, then you can place trays whereever is most convenient. It is suggested that once seeds germinate and form at least two leaves you should keep lighting on seedlings for 16 continous hours each day. Also adjust light so that it is about 3" to 4" above plant as they grow.
- If you are using a heating mat keep it on a flat non-combustable surface and keep it dry.

Class Instruction and Activity

Statement: We are going to talk about plants and seeds today.

Questions: (10 minutes)

1. Who can name a fruit that has seeds in it? (watermelons, apples, grapes, cherries, plums, tomatoes)
2. Why do you think these fruits have seeds? (so more plants with the same fruit can grow)
3. Do most plants have seeds (not just fruits)? (yes)
4. What do you think would happen if plants did not have seeds? (plants would eventually become extinct)
5. What would happen to us if plants became extinct? (we would become extinct as well because we rely on plants) – Note: This is a follow up from Lesson 1.

Statement: Seeds are important for plants survival as well as our survival. Plants are important because we eat them for energy or eat animals that eat them for energy.

Questions: (5 minutes)

1. What do you think seeds need(key factors) in order to grow into seedlings (young plants)? (water, oxygen, correct temperature, and usually light) – Refer to Germination handout (pages 30-31) for background reading.
2. What do you think would happen if the seeds did not get enough water, oxygen, light or the proper soil temperature? (the seeds would either not germinate (grow into seedlings) or would be small, weak seedlings and plants)) – Refer to Germination handout (pages 30-31) for background reading.

Activity

Statements: (3 minute)

- We are going to plant some seeds. {state the seed type(s)}.
- We will plant them indoors and eventually transplant them outdoors in our garden (if you have a garden).
- Perhaps one day before school ends we will be able to eat some of these crops.
- We will break up into groups of 6 students each. (If you have a group seating chart refer to it).
- Each student in each group will sow (plant) 2 seeds.
- Select one of the cells as your own (show them what the seed cell is and help groups as needed.
- Place both of your seeds into your seed cell so that the seeds are somewhat separated but not near the edges of the cell. Be prepared to help students and give them extra seeds if needed.
- Don't press down on the seeds; just place them on the top of the soil.
- Take a small amount of extra soil (on their table) and lightly sprinkle it over the seeds, just enough to cover them.
- Lightly press down the newly added soil.
- Carefully water the soil on top of the cell with a light sprinkle, but be careful not to disturb the seeds.
- If labels are not already placed in the students' cells instruct the students to stick their labels near one edge of their cell after any needed information has been written on the labels.
- Collect the planting containers and place them in the tray(s).
- Place the clear plastic domes over the trays.
- Place the tray(s) on top of the heating mat if the air temperature will fall below 50 degrees.
- Place the trays near windows so they get light or under your grow light if you have one.

Wrap up:

Question: (5 minutes)

- Who can tell me the 4 key factors that seeds need to grow into healthy seedlings? (water, oxygen, temperature, and light). Reinforce these key factors.
- Have students wash their hands.

Follow Up Activities:

Below are the things you need to know and/or do during the days following the classroom activity.

- Lightly water the cells in the morning and afternoon each day to maintain adequate moisture in the soil. Do not water them excessively, just enough to keep them moist. A soil moisture meter would help, but be careful not to disturb the seeds while testing the soil moisture.
- Wipe off any condensation that develops on the inside of the clear plastic domes with paper towels or a cloth. Cover domes promptly.
- Once seedlings have sprouted two leaves, remove the domes and keep the seedlings in a location where they continue to get light.
- If seedlings are bending over in one direction toward the light, turn the tray around so they can reverse direction.
- Try to maintain soil temperature between 60 to 70 degrees. A soil thermometer would help.

Analysis and Discussion:

Approximately two weeks after sowing seeds the groups should discuss their observations. This could be incorporated into the following gardening lesson plan as a transitional activity.

- Bring groups together
- Discuss students observations about the seeds and seedlings over the past weeks. What actually happened?
- Discuss possible reasons some seeds performed better than others

- Revisit the 4 key factors (water, oxygen, temperature, and light)
- State that these key factors will continue to be important as the seedlings grow into mature plants.
- State that we will talk about soil and nutrients next and how they play an important part as well.
- State that these seedlings will need more space for their roots to grow, so we will need to transplant them into larger containers or into the garden.

Transplanting seedlings:
Germination for the above described seeds should occur within a couple of days to a couple of weeks. We would usually leave the seedlings in their existing planting cells for an additional two to three weeks after germination, perhaps longer. At this point the seedlings should be transplanted into larger pots and kept inside if the weather is not conducive to planting outdoors or you plan on keeping them indoors. If you plan to transplant the seedlings outdoors the seedlings will need to undergo a two week "hardening off" process before planting them into the outside garden.

Hardening off is the process of gradually introducing the seedlings to the outdoor weather. This is accomplished in stages as follows: During the first week of hardening off, set seedlings outdoors during the warmer part of the day for a few hours in a sunny, protected area (no heavy wind, rain or excessive cold or heat). During the second week of hardening off leave the seedlings outdoors (day and night) in a sunny, protected area as long as the weather isn't excessively cold (freezing), hot, or excessively windy or rainy.

Be sure to check on the seedlings on a regular basis during the hardening off period to make sure they are not showing signs of stress (wilting, yellowing). If so, bring them indoors until conditions improve. By the end of the two weeks the seedlings should have adapted well enough to the outdoors to be planted in the garden beds.