

Oregon



Agriculture in the
Classroom Foundation

Summer Ag Institute Lesson Plans

Developed By:

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Title of Lesson: What's Dirt Got To Do With It?

Academic Subject: Science

Theme: Hydroponics

Grade Level: Grade 8

CIM/CAM Standards:

1. Scientific Inquiry (8th gr BM) Ask questions and form hypothesis that are based on observation (S37).
2. Scientific Inquiry (8th gr BM) Design a scientific investigation to answer questions or test hypothesis (S39).
3. Scientific Inquiry (8th gr BM) Collect sufficient data to investigate a question, clarify information, and support an analysis (S41).
4. Statistics & Probability (8th gr BM) Create, interpret, and analyze charts, tables, and graphs to display data, draw conclusions (M19).
5. Personal Management (Related Learning Standards) Demonstrate appropriate workplace behaviors (SS4).

Learner Objective: (The student will)

1. Safely conduct pH testing.
2. Demonstrate safe handling of chemicals: measurements of dry chemicals, proper use of safety equipment, and transportation of supplies.
3. Demonstrate skills needed for hydroponics plant production: set up of equipment, evaporation and drainage rates of growing medium, effects of light on plants.

Vocabulary:

1. Hydroponics – growing plants, without soil, in a solution of directly applied minerals.
2. Macronutrients – basic minerals needed for plant growth, which include nitrogen, phosphorous, potassium, calcium, and magnesium.
3. Micronutrients – minerals needed for proper plant growth required in only small amounts (also called trace minerals).
4. Trace minerals – manganese, sodium, sulfur, iron zinc, copper, molybdenum, boron and chlorine.
5. pH – measure of acidity/alkalinity of a solution.
6. Medium – material that a plant lives in or on (also called substrate).

Anticipatory Set:

“What do plants USUALLY need to grow?” (Students will usually answer: water, light, air, and soil.) “Do they REALLY need all four of these things to grow successfully?”

Instructional Outline (Teaching Content)

Strategies (What to do, explain or have students do)

This is a multi-day/ multi-part lesson that uses workstation format to gauge student understanding of the involved concepts. Use 2 complete setups of each station.

Days 1-2

- | | |
|--|--|
| A. Using sprouted radish seeds | A. Divide class into teams of 3 students
-students fill jars & place seeds (after measuring them) next to glass sides of jars.
-cover one jar with paper.
-place jars in sunlight and water evenly. |
| B. Demonstrate/ explain pH testing
-test strips
-water testing kit | B. Students use test paper to test 2 or 3 solutions. |
| C. Demonstrate correct handling of nutrient chemicals | C. Read and explain in their own words MSDS for each product |
| D. Explain hydroponics system using completed model | D. Students listen and learn. |
| E. Describe workstations
-purposes and procedures | E. Students listen and learn |

Days 3-5 students work at various workstations and record results.

WS #1 pH

1. Students use test strips to find and record pH of sterilized, neutral pH soil saturated with distilled water, baking soda and water, lemon juice, 7-Up.
2. Students use water-testing kit to conduct pH test again on 7-Up sample.
3. Compare/contrast results from both test methods. Which is easiest? Most accurate? Which would be best to use?

WS # 2 Nutrient Mix (liquid)

1. Students assemble proper safety equipment according to directions on chart.
2. Measure and mix liquid nutrient mix according to percentage chart and written directions.
3. Test of nitrogen content with water testing kit to gauge accuracy.
4. Record test result (will be checked by teacher for accuracy).
5. Dispose of liquid.

WS # 3 Drainage rates of soil mediums

1. Students pour water into tubs and time how long it takes for $\frac{1}{2}$ of the measured amount of water to drain
 - 1) regular soil
 - 2) rockwool
 - 3) peat moss
 - 4) peat moss and perlite
 - 5) coconut husks.

2. Students use data to determine which medium drains the “best” and why that drainage rate would be the best growing medium to use.

WS # 4 Wordsearch

Students are given wordsearch with the definitions of the terms and the words in a puzzle (see vocabulary list); they must circle the correct word and write the number of the corresponding definition.

WS # 5 Hydroponics ID

Using teacher’s demonstration model as a guide students will:

- 1) draw a copy of the model
- 2) correctly label the parts
- 3) briefly state the use of each component.

Day 6

WS # 6 Light’s effect on plant growth

1. Students remove plants from shielded and unshielded jars after several days of exposure to sunlight and measure growth.
2. Students record growth of roots.
3. Students determine which method grows faster/better and therefore they can determine how seeds should be grown in a hydroponics system.

Day 7 – as a class share/review findings and discuss what would be contained in an ideal hydroponics system.

Resources:

Regular soil, workstation report/recording forms

Workstation 1. pH test strips, pH test protocols and materials from water testing kit, test sample vials.

Workstation 2. Percentage chart for nutrient mix, measuring spoons, nutrient chemicals, gallon jar, safety equipment, nitrogen test from water testing kit.

Workstation 3. Plastic tubs with drain holes, stopwatch, bucket, medium mixes.

Workstation 4. Worksearch.

Workstation 5. Demonstration model, drawing or graph paper.

Workstation 6. Sprouted radish sleds, small glass jars, paper, tape, rulers.

Evaluation:

1. Note student responses on Day 7.
2. Check work on workstation report forms.
3. Results on Continuation lesson.

Continuation lesson(s):

1. Students draw scale model plan for hydroponics system along with written explanation/rationale behind design.
2. Students construct system & implement growth process.
3. Record results & adjust procedures accordingly.
4. Introduce concept of aquaculture (next area to study).