INSTRUCTOR'S NOTES
MODULE OVERVIEW

Greenhouse Work

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This package deals with occupations in the greenhouse area. These jobs bring beauty and enjoyment into people's lives. There are opportunities in this kind of business for everyone. There are part-time jobs available for students after school and for those who want to work only a few months out of the year.

The activities in the package deal mainly with plant propagation. The activities also explore testing seeds for germination, mixing potting soil and building a greenhouse.

Students might also explore packages related to running a business such as Management, Accounting and Bookkeeping, Banking and Credit, Filing, Sales Representative and Retailing.

ACTIVITIES IN PROGRAM

Activity 1 - Testing Seed for Germination
Activity 2 - Mixing Potting Soil
Activity 3 - Growing Plants from Seed
Activity 4 - Transplanting
Activity 5 - Stem Cuttings
Activity 6 - Other Plant Propagation Methods
Activity 7- Graftage
Activity 8- Building a Small Greenhouse (Optional)

MATERIALS IN PROGRAM

Instuctor's Notes
Student Instructions
Work Performance Benchmarks
mixing pan
drain trays
package of marigold seeds

plastic film wrap
potting soil
vermiculite/perlite
plastic bags
pots
petri dishes
wooden pot labels
measuring cup
transplanting trowel
filter paper
textbook
"First Look at Greenhouse Work"
First Look Audio CD
package of flower seeds
string
paring knife
rubber bands
garden gloves
rooting containers
wire strainer
DVD
hair pins
glass jar/drinking glass
Pre/Post Test
Floral Wire
Masking Tape

MATERIALS NEEDED

soil
African Violet
Rex Begonia
stem cuttings
Aspidistra, Sansevieria or Fern
sand
water
peat moss
Sedum, Jade plant or Echeveria
cactus plants

Optional:

wooden box
coathangers/wire
thumb tacks
pliers

CAREER CLUSTER CORRELATION

Career Cluster Areas: Agriculture, Nature, Science, Natural Resources
Job Areas:

groundskeeper
florist
plant scientist
greenhouse/nursery worker
gardener

NOTES TO TEACHER

There are several activities where students must be aware that they will have to wait for a certain time frame for plants to germinate, grow, etc.
Activity 4 - You may want to have other seedlings ready instead of waiting for the ones they have planted.
Activities 5, 6 & 7 - Make sure students practice safe procedures when using a knife.
Activity 7 - Make sure students wear the gloves when working with the sharp cactus plants.
Activity 8 - You may unbend coat hangers as an option for the greenhouse supports, but have students use extreme care when handling.

REQUIRED KNOWLEDGE

Activity 1 - some experience with percentages would be helpful
Activity 2 - none intended
Activity 3 - none intended
Activity 4 - knowledge from Activity 2 on mixing soil
Activity 5 - none intended
Activity 6 - experiences from Activity 5 helpful
Activity 7- experiences from Activities 5 & 6 helpful
Activity 8 - knowledge from all other activities on plants' needs

MANIPULATIVE SKILLS

Activity 1 - gross motor dexterity; physical arrangement of petri dish
Activity 2 - gross motor skills; mixing soil using a trowel
Activity 3 - gross motor dexterity and eye-hand coordination; filling pot with prepared soil, putting seeds on soil and covering
Activity 4 - gross motor dexterity and some fine dexterity with tools; filling small pots, transplanting seedlings, using wooden pot labels
Activity 5 - gross motor dexterity; placing root cuttings into various mediums
Activity 6 - gross and fine motor dexterity; manipulating leaf cuttings and various mediums, separating roots of a plant
Activity 7 - gross motor dexterity; cutting plants with knife, using a rubber band to hold plant parts together
Activity 8 - gross motor dexterity with hand tools; manipulating floral wire, a box and plastic to make a greenhouse

CONCEPTUAL SKILLS

Activity 1 - defining germination; understanding purpose of determining percent of germination in a group of seeds; realization that seeds need warmth, sun and water in order to germinate
Activity 2 - understanding that plants need soil that allows air and water to get to roots; realization that greenhouse operators often have their own special soil mixture
Activity 3 - understanding that the depth at which seeds are planted depends on the size of the seed; understanding that while seeds need moisture in order to grow, too much water and sun is no good; understanding the differences between seed leaves and true leaves
Activity 4 - understanding reasons for transplanting; following the process for transplanting
Activity 5 - understanding that there are several ways to reproduce or increase plants and that one way is by cuttings; there are several types of cuttings and different ways of rooting these cuttings.

Activity 6 - understanding there are various methods of propagation involving leaf cuttings; understanding that there are methods of reproducing plants other than cuttings and seeds; understanding that not all plants are capable of these methods
Activity 7 - understanding that causing part of a plant to grow on another is graftage and that it is often done with fruit trees and roses; realizing that they will only be attempting graftage indoors on cactus plants
Activity 8 - understanding that the greenhouse is a controlled environment for plants providing all their basic needs along with protection from weather extremes, etc.

ACQUIRED KNOWLEDGE

Activity 1 - definition of germination; how seeds germinate and the length of time required; how to figure the percentage of germination; understanding that if the germination percentage is low, more seeds would have to be planted to get the necessary number of adult plants
Activity 2 - how to mix soil for growing plants indoors; measurements of components of potting soil.
Activity 3 - how to plant seeds; understanding that new plants are called seedlings; understanding the importance of the correct amount of sun and water; understanding that there are two kinds of leaves on a seedling plant - seed leaves and true leaves
Activity 4 - why plants must be transplanted; how to transplant seedlings
Activity 5 - three methods of reproducing new plants from stem cuttings; some knowledge of particular plants being worked with
Activity 6 - how to reproduce plants by leaf cuttings and division
Activity 7 - some knowledge about graftage in general
Activity 8 - how one might build a small greenhouse; something about the growing of plants in such an environment

SCOPE AND SEQUENCE

This 10 - day curriculum is designed as a skeleton lesson plan. Instructors must adapt time constraints to level and ability of students.

DAY ONE: Complete Pre-test
Introduce unit materials

DAY TWO: Complete Activity 1:
"Testing Seeds for Germination"

DAY THREE: Complete Activity 2: "Mixing Potting Soil"
Complete Activity 3: "Growing Plants from Seed"

DAY FOUR: Complete Activity 4: "Transplanting"

DAY FIVE: Complete Activity 5: "Stem Cuttings"

DAY SIX: Complete Activity 6: "Other Plant Propagation Methods"

DAY SEVEN: Complete Activity 7: "Graftage"

DAY EIGHT: Complete Activity 8: "Building a Small Greenhouse"

DAY NINE: Visit local nursery or guest speaker.

DAY TEN: View DVD
Complete Post-test.

Name: _____ **Date:** _____

GREENHOUSE WORK – PRE/POST TEST

ITEM # 1704

Directions: Read each item and decide which choice best completes the statement or answers the question.

1. Germination tests are performed to determine the:
   A. amount of sun required.
   B. number plants needed.
   C. sprouting ability of seeds planted.
   D. depth for planting seeds.

2. What item is needed to perform a germination test?
   A. Soil.
   B. Filter paper.
   C. Bacteria.
   D. Fertilizer.

3. Which of the following measures of soil, peat moss, and vermiculite (perlite) would result in a good soil mixture?
   A. More soil.
   B. Equal parts of each.
   C. More peat moss.
   D. Less peat moss.

4. Which tool should be used to combine the soil mixture?
   A. Dibble.
   B. Trowel.
   C. Wire strainer.
   D. Spade.

5. The depth and amount of soil required to plant a seed depends on:
   A. pot size.
   B. number of seeds.
   C. seed size.
   D. soil mixture

6. Why are seedlings transplanted?
   A. To transport the plant.
   B. To provide fresh nutrients and encourage root growth.
   C. To increase the growth rate.
   D. To provide fresh nutrients for grafting.

7. What is necessary to transplant a seedling?
   A. Grafting.
   B. Loosely covering roots.
   C. Larger pot.
   D. New soil mixture.

8. "Propagate" means to _____new plants.
   A. support
   B. separate
   C. transplant
   D. grow

9. "Graftage" means placing part of one plant:
   A. in a soil mixture.
   B. on another plant.
   C. in a greenhouse.
   D. on another vein.

10. What is used to hold together plant parts that are being grafted?
    A. Wire.
    B. Sap.
    C. A rubber band.
    D. toothpicks.

11. How much do you know about working with plants in a Greenhouse?
    A. Nothing.
    B. Very little.
    C. Some.
    D. A lot.

12. How prepared are you to make a decision about a career in working with plants in a Greenhouse?
    A. Not prepared.
    B. Prepared very little.
    C. Somewhat prepared.
    D. Very prepared.

GREENHOUSE WORK - WORK PERFORMANCE BENCHMARKS

Client's Name: _____ Date: _____

ITEM # 1710

Trial Number ___1___2___3___4___5___6___7___8___9___10

Overall Rating: 1 2 3 4

Performance Scale

Activity 1 - Testing Seed for Germination

1. | 1 | 2 | 3 | 4 |
|---|---|---|---|
| | Yes | | No |

(a) Placed filter paper in bottom of petri dish. (a) _____
(b) Dampened filter paper with a small amount of water. (b) _____
(c) Placed 10 seeds on filter, and put lid on dish. (c) _____
(d) Placed dish in sun and kept damp. (d) _____
(e) Calculated germination percentage after five days. (e) _____

Activity 2 - Mixing Potting Soil

2. | 1 | 2 | 3 | 4 |
|---|---|---|---|
| | Yes | | No |

(a) Measured one cup of soil, one cup of peat moss, and one cup of vermiculite into mixing pan. (a) _____
(b) Mixed ingredients well with trowel (b) _____
(c) Covered pan with plastic film wrap. (c) _____

Activity 3 - Growing Plants from Seed

1. | 1 | 2 | 3 | 4 |
|---|---|---|---|
| | Yes | | No |

(a) Placed 4 1/2" pot in mixing pan, filled pot using the trowel, tapped pot lightly on a table, and used the bottom of the 2 1/2 pot to press the soil down. (a) _____
(b) Sprinkled some seeds on the soil, spacing them; shook soil, using a strainer, to provide a cover twice as deep as the size of the seed. (b) _____
(c) Watered soil until moisture showed on the surface, covered pot with plastic, and placed in light. (c) _____

Activity 4 Transplanting

4. | 1 | 2 | 3 | 4 |
|---|---|---|---|
| | Yes | | No |

(a) Mixed equal parts of peat moss, soil, and vermiculite in the mixing pan. (a) _____
(b) Filled five 2 1/2" pots and placed them in the drain tray. (b) _____
(c) Manipulated the wooden pot label to lift the seedling from the pot. (c) _____
(d) Held seedling in one hand, made a hole in the soil of 2 1/2" pot. (d) _____
(e) Placed the seedling in the hole up to the leaves, pressed soil firmly around the seedling with thumb and forefingers. (e) _____
(f) Transplanted four more seedlings following procedures. (f) _____
(g) Watered the plants. (g) _____

Activity 5 - Stem Cutting

5. | 1 | 2 | 3 | 4 |
|---|---|---|---|
| | Yes | | No |

(a) Placed one stem cutting in a jar or glass filled with water. (a) _____
(b) Filled 2 1/2" pot with sand and poured water in. (b) _____
(c) Manipulated wooden pot label to make a hole in the center of the sand, put cutting into the hole and pressed sand firmly around it, and placed the pot in a plastic bag. (c) _____
(d) Filled 2 1/2" pot with perlite or vermiculite to the top and wet the material (d) _____
(e) Manipulated the wooden pot label to make a hole, placed the cutting into the hole and pressed the vermiculite firmly around the stem. (e) _____
(f) Compared roots after several weeks. (f) _____

Activity 6 - Other Plant Propagation Methods

Rex Begonia

1. | 1 | 2 | 3 | 4 |
|---|---|---|---|
| | Yes | | No |

(a) Placed peat moss or sand in 4 1/2" pot, wet the medium. (a) _____
(b) Manipulated a knife to cut a large, healthy leaf from the parent begonia plant leaving about 3/4" of the leaf stalk. (b) _____
(c) Manipulated a knife to cut the largest vein completely through. (c) _____
(d) Placed leaf top side up on the wet medium in the pot, stuck the leaf stalk into the medium; used hair pin to hold leaf in place. (d) _____
(e) Covered the pot with plastic wrap and placed the pot out of bright light. (e) _____

African Violet

(f) Put peat moss, sand or vermiculite in the 4 1/2" pot and wet the medium. (f) _____

(g) Removed a leaf with at least 2" of leaf stalk from the parent plant. (g) _____

(h) Pushed the leaf stalk into the medium to one-half its length. (h) _____

Sedum, Jade Plant or Echeveria

(i) Mixed soil and sand together, put in a small pot and dampened. (i) _____

(j) Removed a leaf from the parent plant, stuck leaf stalk into the medium and kept medium relatively dry. (j) _____

Division

(k) Removed plant to be divided from pot. (k) _____

(l) Manipulated hands to separate the roots carefully, placed each division in a pot of its own, filled with soil mixture to the top of the pot, and watered each plant. (l) _____

Activity 7- Graftage

7.

1	2	3	4
Yes		No	

Myrillocactus & Zygocactus or Trichocerus & Zygocactus

(a) Manipulated the knife to make a slit in the top of the myrillocactus or the trichocereus. (a) _____

(b) Manipulated the knife to cut off the top of the zygocactus, to cut a sliver off the base of its stem, and placed the zygocactus in the slit. (b) _____

(c) Manipulated the rubber band around cactus to hold the grafting in place. (c) _____

Notocactus & Trichocereus or Pilocereus and Cereus

(d) Manipulated the knife to slice off the top of both cactus plants. (d) _____

(e) Placed the top of the notocactus or pilocereus on the cut place of the trichocereus or cereus. (e) _____

(f) Manipulated string and also used cactus thorns to tie the two pieces together. (f) _____

Activity 8 - Building a Small Greenhouse

8.

1	2	3	4
Yes		No	

(a) Bent floral wire into a curve. (a) _____

(b) Placed wire in box, one piece at each end. (b) _____

(c) Filled box with soil and planted seeds/plants. (c) _____

(d) Watered plants. (d) _____

(e) Covered with plastic wrap, leaving one end loose. (e) _____