Lesson Two: Growing Procedures

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STUDENT LEARNING OBJECTIVES:

After completing these activities students will…

1. Discuss sexual and asexual reproduction in plants.
2. Examine techniques used when potting young plants and selecting growing medium.
3. Identify commonly used asexual propagation methods and rooting hormone.
4. Understand the proper procedure for pinching plants to promote vertical growth.
5. Demonstrate ability to perform growing procedures in a greenhouse setting.

TIME REQUIRED:

1. 90 minutes (Lecture)
2. 60-90 minutes (Lab)

RESOURCES:

1. Floriculture CDE Handbook
2. **PLUG AND LINER BASICS**, https://www.harrisseeds.com/storefront/download/plugs/pluglinerbasics.pdf
3. **PLANT PROPAGATION — STEM CUTTING**, https://txmg.org/williamson/files/Stem-Cuttings-Propagation.pdf
4. **HOW TO START AN AFRICAN VIOLET FROM A LEAF CUTTING**, http://www.violetshowcase.com/Leaf_cut_how_to.pdf
5. Shry & Reiley (2011). *Introductory Horticulture* (8th ed.). Clifton Park, NY: Delmar Cengage Learning.
6. Boodley & Newman (2009). *The Commercial Greenhouse* (3rd ed.). New York: Delmar Cengage Learning.

EQUIPMENT AND SUPPLIES NEEDED:

For the Lecture:

1. "Growing Procedures" PowerPoint
2. Sheet of paper for the introduction activity
3. Poster supplies or a computer design application for the review activity

For the Lab:

1. Rubrics for the growing procedure practicums
2. A copy of the "Growing Procedures Student Guide" lab worksheet (list of materials included on the worksheet)

PREVIOUS KNOWLEDGE RECOMMENDED FOR THIS LESSON:

- Plant anatomy and terminology

THESE ACTIVITIES ARE ALIGNED TO THE FOLLOWING STANDARDS:

AFNR Performance Element

- PS.03. Propagate, culture, and harvest plants and plant products based on current industry standards.

FFA Precept

- FFA.PL-A.Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.
- FFA.PL-C.Vision: Visualize the future and how to get there.
- FFA.PG-J.Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking and coping.
- FFA-CS-M.Communication: Effectively interact with others in personal and professional settings.
- FFA.CS-N.Decision Making: Analyze a situation and execute an appropriate course of action.

Common Career Technical Core

- AG-PL3 Propagate, culture, and harvest plants and plant products based on current industry standards.

NASDCTEc

- AGPB01.01 Produce and manage plants in both domesticated and natural environments using application of principles of anatomy and physiology to enhance plant production.
- AGPB01.03 Examine and apply fundamentals of production and harvesting when producing plants to demonstrate plant management and production techniques.

Common Core- Reading: Informational Text

- CCSS.ELA-Literacy.RI.9-10.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

Common Core- Speaking and Listening

- CCSS.ELA-Literacy.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Common Core- Science & Technical Subjects

- CCSS.ELA-Literacy.RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Common Core- Literacy in Science & Technical Subjects: Writing

- CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Common Core- Math Practices

- CCSS.MP1: Make sense of problems and persevere in solving them.
- CCSS.MP3: Construct viable arguments and critique the reasoning of others.
- CCSS.MP6: Attend to precision.

AFNR Career Ready Practices

- CRP.02. Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.
- CRP.04. Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.
- CRP.05. Consider the environmental, social and economic impact of decisions. Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organizations and the environment.
- CRP.06. Demonstrate creativity and innovation. Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization.
  CRP.08. Utilize critical thinking to make sense of problems and persevere in solving them. Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.
- CRP.11 Use technology to enhance productivity. Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems.

Partnership for 21st Century Skills

- Collaboration
- Communication
- Environmental Literacy
- Information Literacy
- Initiative and Self-direction
- Productivity and Accountability
- Think Creatively

LESSON PLAN:

1. *Introduction* *(suggested time 10-15 minutes)* **Refer to slides 1 and 2 of the "Growing Procedures" PowerPoint to present lesson objectives and to do the introduction activity.**

   One thing we know about living things is their ability to reproduce, and plants are no exception. Let's take a moment to consider how plants reproduce and how that might affect production in a greenhouse.

   For the introduction activity, have students define the terms on the introduction slide. For this, they can use a textbook, dictionary, the internet or previous knowledge from a science class. After students have written down the definitions, have them use those terms to explain how plants reproduce. When they have completed this task, and when everyone is finished, discuss their answers as a class:
   - How can a plant reproduce?
   - Did anyone say plants can reproduce in more than one way? Why or why not?
   - What is the difference in sexual and asexual reproduction?

Refer to slide 3 of the "Growing Procedures" PowerPoint to compare and contrast sexual and asexual reproduction.

After classifying the two ways plant can reproduce, ask the class to consider the benefits and drawback of using one method over another. Think of factors such as time and cost.

Whether you are starting a plant from a seed or propagating from a parent plant, reproducing flowers is a huge part of the floriculture industry. In this lesson, we will look at different growing methods that produce more plants and ensure their growth through potting, propagating and pinching.

2. *Lecture* *(suggested time 15 minutes per section)* **Refer to slides 4-13 of the "Growing Procedures" PowerPoint to present information on potting, propagating and pinching.**

   The growing procedures in this lesson are potting young plants, propagating by cuttings and pinching plants. All three are part of the "Growing Procedures Practicum" in the floriculture CDE. In each section there is a brief introduction to the procedure and then a step-by-step explanation. As you go through the "Growing Procedures" PowerPoint, you may customize the lesson based on your availability of materials and time. If you have access to material and can allow your students to practice each procedure, consider adding the lab section of this lesson plan. Please note, if you add the lab section it will work best if you devote more than the required 90 minutes.

3. *Lab* *(Optional; timing will vary depending on number of students and access to materials)* **For scoring/grading options on these labs, refer to the Floriculture CDE Handbook for the "Potting of Young Plants," "Asexual Plant Propagation" and "Pinching Plants" practicum rubrics.**

   Before starting a Growing Practicum Lab consider your time, number of students and access to materials. These labs are customizable to fit the needs of your program. Labs can be done as a teacher demonstration or a student activity, in pairs or individually, and in stages or at stations. **Refer to the "Student Guide to Growing Procedures Lab" worksheet for a list of materials, step-by-step procedures and discussion questions.**

4. *Reflection* *(suggested time 15-20 minutes)* **Refer to slide 14 of the "Growing Procedures" PowerPoint to present the reflection activity.**

   In this lesson, we have identified several different growing methods used in the floriculture industry. To summarize the information, please select one of the methods mentioned in this lesson and create a "how-to" poster of the procedure. The audience of this poster will be a fifth grade class who volunteers at a local greenhouse, so you should try to simplify the procedure.

   As the students create their poster, have them refer to the slide to see examples of ways to organize the information. The procedure can be illustrated through an acronym or a series of boxes, whatever visualization works best for them. Make sure they use a combination of words and images and avoid making a linear list. Encourage creativity.

   Students can turn this in for a daily grade and/or summative review. Be sure to check their ability to summarize the procedures, and if any of the procedures have not been correctly captured, review those items in the lab or before moving on to the next lesson.

5. *Leveling Up:* For students who finish early or want to practice the identification activity in the floriculture CDE.
   a. If you have internet access, have students use the identification cards on the National FFA Quizlet page to practice identifying items discussed in class.
   b. If you do not have internet access, create a set of flash cards using the slides of this PowerPoint, so students can practice identifying plants.

NAME: _____

Aligned to the following standards:
PS.03; FFA.PL-A; FFA.PL-C; FFA.PG-J; FFA.CS-M; FFA.CS.N; AG-PL3; AGPB01.01; AGPB01.03; NRS.01; CCSS.RI.9-10.8; CCSS.SL.9-10.4; RST.9.10.3; RST.9.10.4; WHST.9-10.2; WHST.9-10.4; MP1; MP3; MP6; CPR.02; CPR.04; CPR.05; CPR.06; CPR.O8; CPR.11

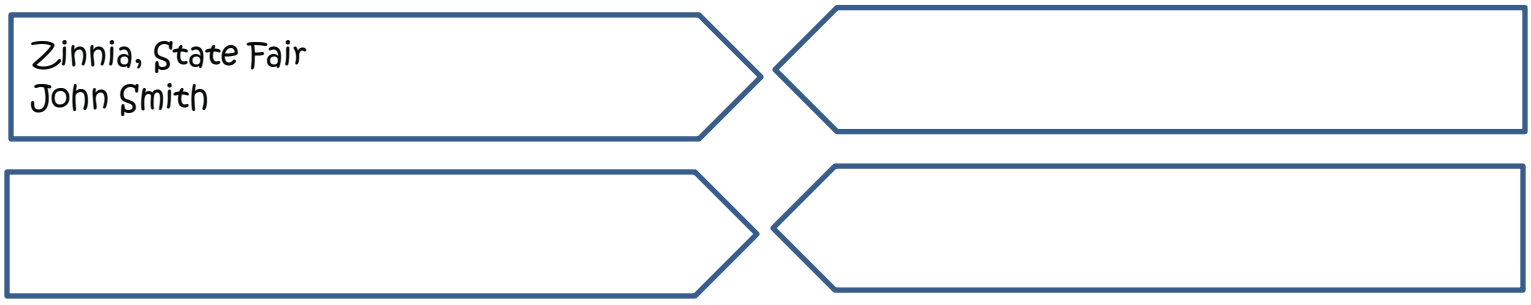
Student Guide to Growing Procedures

Participants of the floriculture CDE will be asked to compete in a "Growing Procedures Practicum" consisting of one or more of the growing procedures covered in the lesson.

Before You Get Started

CREATING A LABEL:

While plants are growing, it is sometimes hard to distinguish what species and variety of plant you are looking at. Thant is why it is important to always label a plant every time you put it into a container, basket, cell pack container, etc. All labels must include the following: Plant Name, Variety and Date Planted. Other specifications like your name, class or period is appropriate if instructed by your teacher. Practice labeling the plants you will be working with before you get started with the potting activity.



Activity: Potting of Young Plants

MATERIALS:

- Tray of plugs or liners
- Growing media
- Containers or hanging baskets
- Pencil or marker
- Label

PROCEDURE:

1. Select plugs or liners to be potted.
2. Fill container to the rim if growing media is dry or to the container lip if media is wetted.
3. Using your index finger, a pencil or a marker, arrange holes around the container based on the number of plants being potted. *Example: 5 arranged as a square with one in the middle, 3 arranged as a triangle, 1 centered*
4. Make the depth of the hole appropriate to the type of plant.
5. Remove the plant from the tray using a pencil or marker to gently push the plant out from the bottom of the tray. *Be careful not to damage the plant in the process!*
6. Place the plant inside the hole and pack the growing medium around it. The medium should be firm to provide structure but not so firm that the roots are compacted.

7. Label the plant by its name, variety and the day's date using a pencil or marker.
8. Water the potted plant until water runs through the pot and out of the drain holes.
9. Make sure any debris or excess media is wiped away and the label is clearly visible.

QUESTIONS TO THINK ABOUT:

- What are the differences in plugs and liners?
- How does the arrangement of the plants on the pot affect the plant's growth?
- How can plants be damaged during the potting process and what are tips to avoid damage?
- How can potting depth and firmness affect the plant's growth?
- Why is labeling important?

ADDITIONAL COMMENTS:

Aligned to the following standards:
PS.03; FFA.PL-A; FFA.PL-C; FFA.PG-J; FFA.CS-M; FFA.CS.N; AG-PL3; AGPB01.01; AGPB01.03; NRS.01; CCSS.RI.9-10.8; CCSS.SL.9-10.4; RST.9.10.3; RST.9.10.4; WHST.9-10.2; WHST.9-10.4; MP1; MP3; MP6; CPR.02; CPR.04; CPR.05; CPR.06; CPR.O8; CPR.11

Activity: Asexual Plant Propagation — Stem Cuttings

MATERIALS:

- Sanitation solution
- Plant (Suggested: Pentas)
- Garden scissors or snips
- Growing media
- Rooting hormone (powder solution)
- Containers
- Pencil or marker
- Label

PROCEDURE

1. Prepare containers by filling them to the rim if growing media is dry or to the container lip if media is wetted.
2. Select a plant that is healthy and mature (not too young or old) and free of insects, mites and diseases.
3. Select a section of your plant to cut that is healthy.
4. Before making the cut, first sanitize your scissors or snips in the solution. Then, make a cut at a 45 degree angle 1 inch down from the terminal stem and remove any lower leaves. Make sure when scissors or snips are not in use they are closed and out of the way.
5. Wet the end of the stem cutting in water and then dip it in the rotting hormone powder. To avoid contamination, put a small amount of rooting hormone in a separate container and discard after use.
6. Place the cutting into the growing medium deep enough that at least one node is below the surface and the stem is supported.
7. Pack the growing medium around the stem cutting so it is firm but not so firm that it prevents root growth.
8. Label the plant by its name, variety and the day's date using a pencil or marker.
9. Water the cutting until water runs through the pot and out of the drain holes.
10. Make sure any debris or excess media is wiped away and the label is clearly visible.

QUESTIONS TO THINK ABOUT:

- What are the pros and cons of propagating and germinating?
- Why was a rooting hormone applied?
- What hormone is used to promote root growth?

ADDITIONAL COMMENTS:

Activity: Pinching Plants

MATERIALS:

- Poinsettias or chrysanthemums

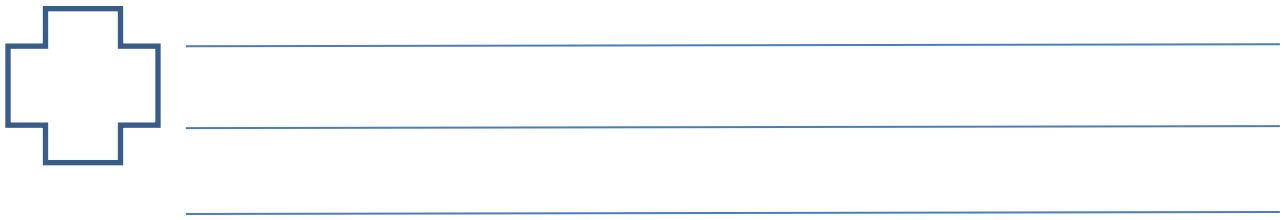
PROCEDURE:

1. Locate the grouping of leaves growing at the top of the plant.
2. Using your fingers, grasp the leaves by the nodes close the stem and pull them from the stem.
3. To do a "hard" pinch, remove several nodes at one time from the top of the stem.
4. To do a "soft" pinch, remove just the terminal node and immature leaves.

QUESTIONS TO THINK ABOUT:

- Why do we want to prevent vertical growth in these plants?
- When is a hard pinch appropriate?
- When is a soft pinch appropriate?

ADDITIONAL COMMENTS:



Aligned to the following standards:
PS.03; FFA.PL-A; FFA.PL-C; FFA.PG-J; FFA.CS-M; FFA.CS.N; AG-PL3; AGPB01.01; AGPB01.03; NRS.01; CCSS.RI.9-10.8; CCSS.SL.9-10.4; RST.9.10.3; RST.9.10.4; WHST.9-10.2; WHST.9-10.4; MP1; MP3; MP6; CPR.02; CPR.04; CPR.05; CPR.06; CPR.O8; CPR.11