Lesson Plan

Hydroponics

Created: 02/2019 by the National FFA Organization

SAE Video Summary: *Giovanni's supervised agricultural experience (SAE) program is working in his school's greenhouse, specifically with different types of hydroponic systems. Follow along as he shares what he has learned and how this SAE will impact his future.*

STUDENT LEARNING OBJECTIVES:

After completing these activities, students will …

1. Compare and contrast the types of hydroponic systems.
2. Examine the advantages and disadvantages of hydroponic systems.
3. Design a hydroponic system.
4. Develop a plan to sustain the hydroponic system.

TIME REQUIRED: 60 minutes

RESOURCES:

1. Giovanni Roman – SAE – Hydroponics, https://vimeo.com/300298524
2. AgExplorer, AgExplorer.ffa.org
3. Make a Super-easy Hydroponics System!, https://www.instructables.com/id/Make-a-super-easy-hydroponics-system/
4. Easy Hydroponic Planter: Grow Lettuce in Repurposed Coffee Container!, https://foodiegardener.com/easy-hydroponic-planter-grow-lettuce-in-repurposed-coffee-container/
5. Hydroponic Systems, https://www.epicgardening.com/hydroponic-systems/
6. Drip System for Hydroponics, https://www.hydroponic-gardens.com/how-to/drip-system/
7. Maintaining Your Hydroponic System, https://www.grodan.com/global/

EQUIPMENT AND SUPPLIES NEEDED:

1. A copy of the "Hydroponics Q & A" worksheet for each student
2. A copy of the "Hydroponics" worksheet for each student
3. A copy of the "Build Your Own Hydroponics" worksheet for each student
4. Internet access to play the video in real time or embed it in a PowerPoint ahead of time
5. Internet access for student research

THIS QUICK LESSON PLAN WOULD WORK WELL AS:

1. Part of an SAE lesson.
2. Part of a plant science lesson.
3. Part of a greenhouse lesson.

STUDENT ACTIVITY SHEETS:

Direct access to student activity sheets without lesson plan or answer key for easy upload to learning management systems or printing for classwork.

https://ffa.box.com/s/blkv1p8v22vzzip7ycykeygaofchmhij (Word)

https://ffa.box.com/s/r53ja7dd6ytotp0o7y4ki9bj6e7atwce (PDF)

THESE ACTIVITIES ARE ALIGNED TO THE FOLLOWING 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-B.Relationship: Build relationships, work as a team player and appreciate the talents of others.

- FFA.PL-D.Character: Conduct oneself appropriately in relation to others regardless of the situation.
- FFA.PL-F.Continuous Improvement: Accept responsibility for learning and personal growth.
- FFA.PG-H.Social Growth: Successfully interact with others and adapt to various social situations.
- 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.
- FFA.CS-O.Flexibility/Adaptability: Be flexible in various situations and adapt to change.

Common Core – Reading: Informational Text

- CCSS.ELA-LITERACY.RI.9-10.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

Common Core – Writing

- CCSS.ELA-LITERACY.W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- CCSS.ELA-LITERACY.W.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-LITERACY.W.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

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 – 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.9.10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.WHST.9.10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Common Core – Math Practices

- CCSS.MP1: Make sense of problems and persevere in solving them.
- CCSS.MP2: Reason abstractly and quantitatively.
- CCSS.MP6: Attend to precision.

AFNR Career Ready Practices

- 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.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
- Flexibility and Adaptability
- Information, Communications, and Technology Literacy
- Initiative and Self-direction
- Leadership and Responsibility
- Productivity and Accountability
- Think Creatively
- Social and Cross-Cultural Skills
- Work Creatively with Others

LESSON PLAN:

1. *Bell Ringer:* What are the requirements to grow a plant?

2. *Introduction:* *Today, we are going to talk about an SAE involving hydroponics. Giovanni will introduce us to his SAE where he grows plants and seeds using hydroponics.*

3. *Activity:*
   a. Each student needs a copy of the worksheet, "Hydroponics Q & A." Students will answer the questions while watching the video "Giovanni Roman – SAE – Hydroponics," available at https://vimeo.com/300298524.

   b. Each student needs a copy of the worksheet "Hydroponics." The worksheet has two parts: (1) students will compare and contrast the types of "ponic" systems (such as aeroponics, hydroponics, drip system, nutrient film technique (NFT), ebb and flow [flood and drain]) and (2) students will examine the advantages and disadvantages of hydroponic systems.

   c. Next, each student needs a copy of the "Build Your Own Hydroponics" worksheet. The worksheet has two parts: (1) students will research and plan step-by-step how to build their own do-it-yourself hydroponic system and (2) students will develop a sustainability plan for the hydroponics system.

4. *Follow-up:* Have students discuss the differences between the types of hydroponic systems they learned about during the lesson.

5. *Leveling Up:* Have students visit AgExplorer (AgExplorer.ffa.org) and research careers that involve working with hydroponics.

6. *Exit Ticket:* If your school has a hydroponic system, explain what is produced/grown in it and what the final product is used for. If your school doesn't have a hydroponic system, what plants could easily be grown and what purpose would those plants serve?

NAME: _____

Aligned to the following standards:
FFA.PL-A.; FFA.PL-B.; FFA.PL-D.; FFA. PL-F.; FFA.PG-H.; FFA.CS-M.; FFA.CS-N.; FFA.CS-O; CCSS.ELA-RI.9-10.4; CCSS.ELA-W.9-10.2; CCSS.W.9-10.4; CCSS.ELA-W.9-10.6; CCSS.ELA-SL.9-10.4; CCSS.ELA-WHST.9.10.2; CCSS.ELA-WHST.9.10.4; CCSS.ELA-WHST.9.10.6; MP1; MP2; MP6; CRP.04; CRP.06; CRP.08; CRP.11

Hydroponics Q & A

DIRECTIONS

Answer the questions below as you watch the video Giovanni Roman – SAE – Hydroponics," available at https://vimeo.com/300298524.

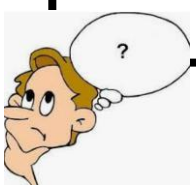
1) What motivated Giovanni to start his SAE?

2) What were some of the beginning steps he had to take to start his SAE? *(Identify 4 steps.)*

3) What did he learn the most from his SAE?

4) What advice does Giovanni give to those starting an SAE?

5) How does this SAE impact his future?



6) After watching this video, what did you learn that can be applied in your life?

NAME: _____

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Hydroponics

DIRECTIONS:

Part 1

Compare and contrast the major types of "ponic" systems by completing the chart below. (*For example, compare drip system and aeroponics. Suggested websites to use for research are* https://www.epicgardening.com/hydroponic-systems/ *and* https://www.hydroponic-gardens.com/how-to/drip-system/.

Ponic System 1:

Ponic System 2:

Differences:

How are the systems alike?

Differences:

What does hydroponics mean?

NAME: _____

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Part 2

Examine the advantages and disadvantages of hydroponics, and identify 3 advantages and 3 disadvantages. Record your responses on the containers below. Suggested websites to reference for your research are https://dyna-gro.com/hydroponics-advantages-and-disadvantages/ and http://easyponic.com/pros-and-cons-hydroponics.

Advantage:

Advantage:

Advantage:

Disadvantage:

Disadvantage:

Disadvantage:

Aligned to the following standards:
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Build Your Own Hydroponics

Part 1

Let's build it! Research how to build an easy DIY (do-it-yourself) hydroponic system. Suggested websites to reference for your research are https://www.instructables.com/id/Make-a-super-easy-hydroponics-system/ and https://foodiegardener.com/easy-hydroponic-planter-grow-lettuce-in-repurposed-coffee-container/.

What supplies are needed to build the DIY hydroponic system?

In the areas below, write step-by-step instructions as though you were explaining how to build it to an elementary student. (Some boxes will contain more than one step.)

Steps 1 and 2:

Step 3:

Step 4:

Steps 6 and 7:

Step 5:

Aligned to the following standards:
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Part 2

Now what? You have built your own hydroponic system (or researched how to do so). Now, construct a plan to sustain the hydroponic system. In the boxes below, record which steps are the most important and explain why they are the most important. A suggested website to reference for your research is https://www.grodan.com/global/.

Develop Your Plan

NAME: _____

KEY: Hydroponics Q & A

Aligned to the following standards:
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DIRECTIONS

Answer the questions below as you watch the video "Giovanni Roman – SAE – Hydroponics," available at https://vimeo.com/300298524.

1) What motivated Giovanni to start his SAE?

A teacher at his school asked if he wanted to learn something new and Giovanni did. That teacher taught him about hydroponics.

2) What were some of the beginning steps he had to take to start his SAE? *(Identify 4 steps.)*

He first went to his teacher and showed interest in hydroponics and taking over the greenhouse. Next, he brainstormed ideas for different systems. His junior year, the new teacher encouraged him to start slowly with the project. Finally, in his senior year he implemented different systems.

3) What did he learn the most from his SAE?

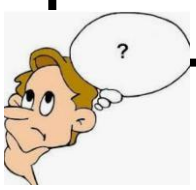
He learned researching skills through this SAE. He had to learn what plants would grow best in certain types of systems. He also learned dedication because he had to come to the greenhouse every day and check on his plants.

4) What advice does Giovanni give to those starting an SAE?

Giovanni's advice is to find something you want to do and have an interest in.

5) How does this SAE impact his future?

This SAE impacts his future because he plans to major in engineering in college. This SAE has helped give him a background in learning how things work.



6) After watching this video, what did you learn that can be applied in your life?

Answers will vary.

NAME: _____

KEY: Hydroponics

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DIRECTIONS:

Compare and contrast the different types of hydroponic systems by completing the chart below. (*For example, compare drip system and aeroponics. Suggested websites to use for research are* https://www.epicgardening.com/hydroponic-systems/ *and* https://www.hydroponic-gardens.com/how-to/drip-system/.

Part 1

Ponic System 1:
Aeroponics:

Ponic System 2:
Drip System

How are the systems alike?
Answers may vary, but this is an example response:
-Both are considered an advanced method of growing.
-Simple to learn

Differences: Answers may vary, but this is an example response:
Drip System
-Common in commercial operations
-Simple to operate for large-scale purposes (overkill for small operations)

Differences: Answers may vary, but this is an example response:
Aeroponics
-Roots are mostly suspended in air.
- Constantly mists root zone with a nutrient solution

What does hydroponics mean?
Process of growing plants in sand, gravel or liquid

NAME: _____

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Part 2

Examine the advantages and disadvantages of hydroponics, and identify 3 advantages and 3 disadvantages. Record your responses on the containers below. Suggested websites to reference for your research are https://dyna-gro.com/hydroponics-advantages-and-disadvantages/ and http://easyponic.com/pros-and-cons-hydroponics.

Advantage:

You can grow plants anywhere. (Answers may vary.)

Advantage:

Uses 20 times less water than soil gardening.

Advantage:

Harvesting is much easier.

Disadvantage:

Systems can be expensive.

Disadvantage:

Constant monitoring is required.

Disadvantage:

Disease can spread easily.

Aligned to the following standards:
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KEY: Build Your Own Hydroponics

Part 1

Let's build it! Research how to build an easy DIY (do-it-yourself) hydroponic system. Suggested websites to reference for your research are https://www.instructables.com/id/Make-a-super-easy-hydroponics-system/ and https://foodiegardener.com/easy-hydroponic-planter-grow-lettuce-in-repurposed-coffee-container/.

What supplies are needed to build the DIY hydroponic system?
Plant; empty spice container (small) with a lid with a flip up top with holes that can easily be removed; a lid from another same-size spice container, no holes; gravel or pebbles; old T-shirt or socks; bottled water; fertilizer that will dissolve in water; tape; (optional) black tape

In the areas below, write step-by-step instructions as though you were explaining how to build it to an elementary student. (Some boxes will contain more than one step.)

Step 1 – Gather supplies.
Step 2 – Prepare the Jar: Wash and clean the jar. Take the cap and cut off the bit without holes. Take the other cap and cut a hole in the center big enough that the holes from the other cap show through. Tape the caps together.

Step 3 – Prepare medium: Wash your gravel or pebbles in hot water. Remove any debris.

Step 4 – Prepare wicks: Take the T-shirt or socks and cut five thin strips an inch longer than the height of the jar. Wash with water and dry until damp. Feed one through each hole of the jar lid. Next, loosely braid the long ends. Tie a knot at the end.

Step 6 – Assembly, Part 1:
Mix fertilizer and water according to fertilizer package and pour into jar. Then, put long ends of wicks into water, and put cap on.
Step 7 – Assembly, Part 2:
Place plant into the top, and make sure wicks are touching roots. Fill the top with gravel until roots are covered.

Step 5 – Prepare plant:
Remove any excess soil from the roots of the plant.

Aligned to the following standards:
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Part 2

Now what? You have built your own hydroponic system (or researched how to do so). Now, construct a plan to sustain the hydroponic system. In the boxes below, record which steps are the most important and explain why they are the most important. A suggested website to reference for your research is https://www.grodan.com/global/.

Develop Your Plan

Answers may vary, but some example responses are provided on this page:
Keep the system clean.

If you use a drip system, buy extra drippers in case they clog.

Always check the pH. Never go below pH 5.

Check the plant.