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Kansas Foundation for AGRICULTURE IN THE CLASSROOM
KFAC

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Course:	Biology 9-12	**Unit:**	Vertical Gardening - Agriculture Careers
Lesson Title:	Planting the Seeds for Agricultural Education		
Estimated Time:	4 class periods of 40 minutes		

Objectives:

1) Evaluate plant experiment results
2) Developed and taught a lesson about agriculture to elementary school students
3) Complete a RAFT about the importance of agricultural education.

Equipment Needed:

Electronic device or a way for students to create a presentation
Electronic device or projector to allow students to view videos
Green Wall Video (7:46)

Supplies Needed:

Lesson Plan Template
Science Video Review
Vertical Garden Vocabulary List

Accessibility Options

Students can access information visually through online videos with subtitles and auto-translations.
Utilize Speech-to-Text and text-to-speech add-ons for reading/listening/writing support (Updated 7/17/23)

For more suggestions, please visit:
https://www.washington.edu/doit/equal-access-science-and-students-sensory-impairment

Instructor Directions & Estimated Time	Procedures
Day 1 40 minute period	Students evaluate plant experiments and design a lesson for elementary students.

Day 2 40 minute period	Teach lesson
Day 3 40 minute period	RAFT activity with careers

No.	9-12 Next Generation Science Standards		
HS-ET S1-2	Engineering Design:		
	Disciplinary Core Ideas	Science and Engineering Practices	Cross-Cutting Concepts
	ET S1 .B: Developing Possible Solutions	Constructing Explanations and Design Solutions	Cause and Effect

No.	National Agriculture Literacy Outcomes
T5. 9-12 a,c,d,e,f,&h	a. Communicate how the global agricultural economy and population influence the sustainability of communities and societies c. Compare and contrast the economic challenges facing developed and under-developed countries (poverty, population, and hunger) d. Describe essential agricultural careers related to production, consumption, and regulation e. Discuss how agricultural practices have increased agricultural productivity and have impacted (pros and con) the development of the global economy, population, and sustainability f. Discuss the relationship between geography (climate and land), politics, and global economies in the distribution of food h. Explain how comparative and absolute advantage in agriculture impacts supply and demand in relation to trade

Vocabulary	
sustainable agriculture	Farming in such a way as to protect the environment, aid and expand natural resources, and make the best use of nonrenewable resources.

sorghum	a widely cultivated cereal native to warm regions of the Old World. It is a major source of grain and feed for livestock.
Profitability	is the state of yielding profit or financial gain.
Famine	an extreme hunger from scarcity of food
crop varieties	distinct groups of plants within a single species, cultivated for food, fiber, or other agricultural products, that exhibit reproducible and distinguishing genetic characteristics

Careers Mentioned	
Agricultural science teacher	Responsible for the education of agriculture, food science, and natural resources for students.
Extension agent	Employed by land-grant universities and serve the citizens of that particular state by serving as an expert or teacher on a topic relating to economics, community development, agriculture, family, animal production, diet, and nutrition.

Day 1 and 2

Days 1-2: Essential Questions: How can we use what we learned from our project to teach the community about agriculture? What does our community need to know about agriculture?

Goals:
1) Students reflect on the results of the experiment
2) Students create presentations/lessons for elementary classroom

OPTION 1
Give students a template for a lesson plan, background knowledge of the target audience, types of learning activities based on students' strengths, and assessment design- how do you know your students have learned the information?
(Vocabulary, labeling, modeling/game)

*Ideally, students will visit an elementary class to share their lesson and receive questions and feedback about agriculture in their community. (Time for this project may vary based on logistics for teaching the lessons to elementary students.)

3) Use feedback from elementary students to create a proposal to the principal/superintendent/food bank to help more students/families develop agricultural skills and knowledge
Product: Formal letter/video/presentation

OPTION 2
*If the logistics/time are barriers to teaching a lesson, consider conducting a schoolwide survey.

Essential Question: How can student voices impact our local community?

1) Bellringer: If you could design an interior green space in your school, what would it look like? Spend 2-3 minutes sketching and labeling your idea. Think about size, colors, location, etc.

2) Watch the video (7:46, translated subtitles are available) about the **Green Wall at Kansas State University**. As you watch, record examples of how students were involved in the development and maintenance of the green wall. Here is a sample Science Video Review document students can use as they watch the video.

After the video, give students 5 minutes in small groups to discuss their observations. Prompt them to use the word "interiorscaping" in their descriptions. For more information on interiorscaping, visit this link: https://www.seedyourfuture.org/interiorscape_designer.

3) Create a short **survey** as a class for your school community. Share that your goal is to improve awareness and understanding of how agriculture impacts our daily lives.
Consider:
-Age group of respondents
-Role in the community (student, teacher, custodian, school nurse, food service worker, parent, administrator, etc.)
-Relevant topics such as
    1) Where does our food come from?

2) How can we eat more fresh, nutritious food?
3) How do plants impact our physical and mental health?

Survey options: Students can create a digital survey (Google forms, survey monkey, etc.) or a paper copy and share it with the school community. After collecting responses, students can analyze the data and determine which topics interest the community the most.

Days 3-4: Summative assessment

Goals:
1) Students will utilize the RAFT strategy to demonstrate their understanding of how community members are impacted by agriculture.
2) Students will utilize speaking, listening, reading, and writing skills to communicate about agriculture with a target audience.

Review the RAFT writing strategy with your students (20 minutes). Here are some helpful sources:

1) Introduction to the RAFT strategy: This short video describes 2 different formats and the thorough process behind them. Includes science raft examples and differentiation techniques: https://www.readingrockets.org/strategies/raft
2) A sample grading rubric: https://www.edutoolbox.org/rasp/840 (See the document at the bottom of the website)

RAFT Rubric

Criteria	5	4	3	2	1
Accuracy					
How accurate is your information? Is it fully supported by the text, history, and/ or discovery documents?					
Comments:					
Perspective					
Did you stay in role? How effective were you at assuming your role and convincing your audience?					
	Comments:				
Focus					
Did you stay within the assigned format? Did you fully satisfy the chosen topic with sufficient details and examples?					
Comments:					
Mechanics					
Does your writing contain few mechanical errors? Does your writing contain no errors as identified in your grammar goals?					
Comments:					
Benchmark					

How is the overall quality of your work compared with both past work and ever-increasing expectations for improved work?					
Comments:					
Final Score/Overall Comments:					

3) Review additional raft examples for science and a graphic organizer for vocabulary: https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/3/1009/files/2015/05/Vocabulary-Story-Writing-Karen-Cook1.pdf

4) Students begin prewriting. (15-20 minutes) Students choose their role, audience, format, and topic to process and present information. Students can use the Vertical Garden Vocabulary List to identify key terms to include in their RAFT. We suggest:

   Agriculture
   Sustainability
   Food production
   Distribution
   Economy
   Poverty
   Population
   Hunger
   Scale
   Careers
   Skills

   POSSIBLE RAFT IDEAS:

Role	**Audience**	**Format**	**Topic**
Job Recruiter			
Parent			
Teacher			
Principal or Superintendent			
Newspaper reporter			
County Extension Agent			
Grocery Store Manager			
Dietician			

*Students can brainstorm their audience and format (formal letter/video/presentation/news

article, etc).

After students have completed and shared their RAFTs, ask them to complete a career reflection. They can use any resources from the unit, especially the **career glossary.**

Career Reflection

1) What are my soft skills?

2) What are my core values?

3) What skills and values do I need to be successful in agriculture?

4) Of all of the agricultural-related careers that I have learned about, which career am I best suited for? Why?

5) What are my next steps if I want to pursue a career in agriculture?

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Main topics teachers should know:

Learning about agriculture can connect students to broader issues such as food security, environmental sustainability, and community well-being. As they explore concepts like sustainable agriculture, profitability, and crop resilience, students can see the vital role agriculture plays in everyday life and understand the challenges and opportunities in feeding a growing population. Agricultural science educators and extension agents can help bridge the gap of misconceptions in agriculture while educating students about agriculture. Agricultural science educators teach students about various aspects of agriculture including Plant Science, Animal Science, Agricultural Mechanics, and economic aspects of agriculture. They help promote careers in agriculture to their students and prepare them for their future careers. Extension agents work with farmers, ranchers, and community members to educate them on new technologies, best practices, changing policies, crop varieties, and government regulations. They do this all while promoting sustainable agriculture to improve farm profitability, productivity, and environmental conditions.

Sustainable agriculture involves farming practices that meet current food needs without compromising the ability of future generations to meet theirs. It emphasizes efficient resource use, soil and water conservation, and reducing environmental impacts. Sustainable practices might include crop rotation, organic fertilizers, reduced pesticide use, and conservation tillage. By learning about sustainable agriculture, students can appreciate how we can balance productivity with environmental stewardship to ensure long-term food security. Sorghum is a versatile grain crop grown in many parts of the world, especially in arid regions where other crops may struggle. It's drought-resistant, highly nutritious, and used as food for humans, feed for livestock, and raw material in biofuel production. Sorghum's resilience makes it an important crop in regions vulnerable to climate change, helping communities maintain food supplies under challenging conditions. By studying crops like sorghum, students can understand the value of crop diversity and the role different plants play in resilient food systems. Profitability in agriculture is the difference between the costs of farming (like seeds, labor, and equipment) and the income generated from selling crops. Profitable farming sustains farmers' livelihoods, supports rural economies, and enables reinvestment in agricultural development. For students, learning about the economics of farming, including factors that influence profitability, is key to understanding the challenges and decisions farmers face, such as choosing which crops to grow or which technologies to adopt. Famine refers to extreme food shortages that lead to widespread hunger, malnutrition, and even death. Often triggered by natural disasters, political instability, or economic issues, famine is a global challenge that agricultural science seeks to address. Advances in crop science, sustainable practices, and resilient crops are essential in the fight against famine, helping to ensure communities have reliable food sources even in times of crisis. Crop varieties are different types or strains of plants within a species, each with unique traits such as resistance to pests, tolerance to drought, or faster growth. Developing and using a range of crop varieties increases biodiversity and helps farmers adapt to changing conditions, like disease outbreaks or climate shifts. Educating students about crop varieties highlights the importance of agricultural diversity in creating stable, productive, and adaptable food systems.

- What is Sustainable Agriculture?.
- IS MY FARM PROFITABLE? THE DRIVERS OF FARM PROFITABILITY
- What is famine? Causes and effects and how to stop it | Oxfam
- https://www.ars.usda.gov/research/annual-report-on-science-accomplishments/fy-2021/developing-new-crop-varieties-with-enhanced-traits-and-disease-resistance/#:~:text='Yorizane'%2C%20a%20new%20self,for%20adoption%20by%20almond%20growers.

Suggestions for instruction:

When students are creating their lesson plans, have them practice their lessons with other groups prior to teaching elementary students. Make sure students have included all their needed materials and have their materials ready for the day of the lesson. Encourage students to include an activity for the elementary students to do that is engaging and helps them remember the concepts taught in their lesson. Have students work with the elementary teachers to determine what supplies will need to be provided by either the teacher or the students presenting. Students can have elementary students fill out a survey to use as their feedback to build their proposals.

Sustainable Agriculture in Kansas and Kansas Agricultural Literacy Efforts

Kansas is also adopting innovative farming practices to address sustainability and efficiency. Hydroponic systems and tower gardens are being used in urban areas, such as Kansas City, to grow fresh produce in compact spaces. These methods increase biomass production while reducing water and land use compared to traditional farming. Urban farming initiatives have gained traction, helping address food insecurity in underserved areas.

Education programs in Kansas schools promote agricultural literacy and sustainable practices. For example, the Kansas Department of Agriculture's "Farm to School" program integrates locally grown foods into school meals and teaches students about scalable garden design. These efforts include developing models of traditional garden beds and tower gardens to meet local food demands.

Kansas' agricultural industry demonstrates the importance of balancing large-scale production with innovative practices to ensure sustainability while addressing food insecurity. This dual focus helps strengthen the state's role as a national leader in agriculture while meeting local community needs.

Careers:

Agricultural Science Educator

Description: An Agricultural Science Teacher is responsible for the education of agriculture, food science, and natural resources students. Using these topics, agricultural science teachers can give students vital skills that are important in the ag industry. These skills include math, science, leadership, technology, communications, and management. They can also go the extra step in providing strong agricultural education by advising their school's FFA Chapter. An ag teacher conducts an instructional program to educate students about career pathways in agriculture that can be used as a guide to achieving necessary skills for continued education and employment, which includes preparing materials such as syllabi, homework assignments, and handouts. Enhancing youth leadership and FFA is an integral part of instruction and providing students with the knowledge and skills necessary to compete in a global economy. They inform students about agriculture and agricultural literacy, Initiate, facilitate, and moderate classroom discussions, create lesson plans that conform with school policy for all courses offered, and provide instructional materials and instructional methods used to make teaching and learning effective. Agricultural Science educators oversee Supervised Agricultural Experience (SAE) programs of all students who receive instruction by assisting students in selecting a program that fits their interests and abilities; maintaining records, locating training stations, and making supervisory visits during the school year and during the summer months. They may supervise and maintain the school laboratory (farm, feeding center, greenhouse, meats laboratory, etc.) used for students' supervised agricultural experience, plan and conduct an organized program of instruction and/or community involvement with adults.

Education: Bachelor's degree in agricultural education or other agricultural-related field when coupled with appropriate state teaching licensure.

Salary: The average Agriculture Teacher salary in Kansas is $44,177 as of July 25, 2023, but the range typically falls between $36,888 and $53,879.

Links:
https://www.agcareers.com/career-profiles/agriculture-science-teachers-secondary.cfm#:~:text=Overview%3A,important%20in%20the%20ag%20industry.

https://www.salary.com/research/salary/posting/agriculture-teacher-salary/ks#:~:text=How%20much%20does%20an%20Agriculture,falls%20between%20%2436%2C888%20and%20%2453%2C879.

Extension agent

Description: Extension Agents are employed by land-grant universities and serve the citizens of that particular state by serving as experts or teachers on a topic relating to economics, community development, agriculture, family, animal production, diet, and nutrition. County extension agents will actively work with team local, regional, and state teams to identify issues in the interest area you work in, develop and execute educational programs on your interest area for the community, and provide learning experiences that will empower people to improve their lives around critical issues. Some positions in the academic setting will require you to conduct research and may teach more formal courses to students enrolled at the land-grant university. Extension agents investigate, develop, and refine value-added content to a variety of delivery platforms, create and utilize assessments to evaluate the impact of the programming, answer questions of local/state residents regarding your field of expertise, speak at industry events on topics that you may specialize in or even at local civic organization meetings, develop volunteer networks to sustain programs. Extension agents also work with local 4-H clubs by leading or teaching programming, maintaining a high level of visibility, and facilitating communications with a wide range of clientele including traditional and non-traditional learners, elected officials, agricultural and non-agricultural stakeholders, and environmental and special interest groups to promote the understanding of agriculture and natural resource issues.

Education: Primarily a bachelor's or master's degree is required in either your subject area or agriculture and extension education. Those doing research and teaching at the university level may have a doctorate.

Salary: The salary range for a County Extension Agent job is from $42,020 to $51,324 per year in Kansas.

Links:
https://www.agcareers.com/career-profiles/extension-agent.cfm#:~:text=Extension%20Agents%20are%20employed%20by,animal%20production%2C%20diet%20and%20nutrition.

https://www.salary.com/research/salary/hiring/county-extension-agent-salary/ks#:~:text=The%20salary%20range%20for%20a,%2451%2C324%20per%20year%20in%20Kansas.

Take a look at the Career Glossary to find other related careers!

Ayers Institute for Learning and Innovation. (n.d.). *Raft: Role, Audience, Format, Topic*. eduTOOLBOX. https://www.edutoolbox.org/rasp/840

Cook, K. (n.d.). *Raft: Role, Audience, Format, Topic*. Background from Effective Teaching. https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/3/1009/files/2015/05/Vocabulary-Story-Writing-Karen-Cook1.pdf

Howe, D., Lester, A., Brown, J., Cronin, D., Bishop, N., Cobb, V., & Allsburg, C. V. (n.d.). *RAFT*. Reading Rockets. https://www.readingrockets.org/strategies/raft

Kansas Foundation for Ag in the Classroom. (2023, November 15). *Green Wall inside Throckmorton Hall at Kansas State University*. YouTube. https://youtu.be/TYCLLMYntBQ?si=S_La_uSuMpcJo36K

Name(s): _____

Subject: _____ Date: _____

Grade Level:	# of Students:	Teacher Name:
Objective:		Overview:
Detailed Explanation of Activities (include amount of time for each activity)		
Materials/Equipment Needed:		Assessment:

Aeroponic Tower Vertical Garden Output Calculation

Crop: _____

Average Weight of Harvested Plant: _____

Number of Plants of This Crop on Whole Tower: _____

____ plants x _____ average weight per plant = _____ weight of crop per tower each harvest

Harvest About Every _____ Weeks

52 Weeks per year ÷ _____ Weeks between harvests = _____ harvests per year

____ harvests per year x _____ total weight per harvest = ____ weight harvested per year