Innovation in Agriculture
Lesson Plan

LESSON
A lesson in innovation and entrepreneurship for grades 7-10.

PREFACE
Students rely on agriculture every day, but do they ever wonder how agricultural innovations and entrepreneurs have directly impacted their lives? This lesson encourages students to investigate and share an agricultural invention that they research. Students will then be asked to start thinking about entrepreneurs by figuring out common characteristics. They will use innovation skills to brainstorm a solution to a challenge question, where they will create a mini sales pitch to help "sell" their idea.

EDUCATION STANDARDS ADDRESSED
Introduction to Agriculture, Food and Natural Resources
- IAFNR-7.2 Describe the meaning, importance, and economic impact of entrepreneurship
- IAFNR-7.5 Apply agribusiness management principles in real or simulated agribusiness systems
- IAFNR-9.1 Examine and categorize current applications and gains achieved in applying biotechnology to agriculture.
- IAFNR-9.3 Research and summarize the evolution of biotechnology in agriculture
- IAFNR-10.1 Apply physical science and engineering principles to design, implement, and improve safe and efficient mechanical systems in AFNR situations.
- IAFNR-10.2 Apply technology principles in the use of agricultural technical systems
- IAFNR-10.3 Investigate power, structure, and technological systems as they relate to the
- modern agriculture industry

Computer Science
- ICS-4.6 Investigate innovations in computing, including robotics
- ICS-5.3 Utilize a problem solving approach to develop a solution using technology.
- CSII-2.1 Design a solution to a problem by working in a team.
- CSII-2.2 Explore technologies that can be used to collaborate with others of various cultures and career fields.
- CSII-2.3 Utilize a problem solving approach to develop a solution using technology.
- CSII-2.4 Analyze the work of peers and provide feedback.

Economics

- E.2.2 Recognize that consumers ultimately determine what is produced in a market economy

Principles of Business Management

- PBM-4.1 Develop a vision, mission statement, and goals for strategic plans within a business
- PBM-4.2 Explore opportunities for business development based on trends in the global marketplace
- PBM-4.3 Apply the decision-making process to a business situation
- PBM-4.4 Outline specific ways in which a company can help its community

Entrepreneurship and New Ventures Capstone

- ENV-1.1 Establish entrepreneurship as a method to establish and operate a business
- ENV-1.2 Analyze the characteristics of an entrepreneur
- ENV-2.5 Evaluate the contribution of entrepreneurship to the economy
- ENV-4.1 Evaluate where innovation can be found within a organization, how to recognize it, and how it can be used as a competitive advantage
- ENV-4.2 Identify current trends in entrepreneurship
- ENV-4.4 Synthesize idea generation through case studies for cultivating the entrepreneurial mindset
- ENV-8.1 Understand and build the framework of a business plan

LEARNING OBJECTIVES

- Students will explain how innovation has revolutionized the agriculture industry
- Students will be able to apply basic principles of entrepreneurship to solve a challenge question
- Students will be able to create a persuasive sales pitch script and presentation

LESSON PLAN

Interest Approach/Bell Ringer:

- Using the Pair and Share technique, have all students brainstorm and list on a piece of paper as many things that come to mind to the question "How does Agriculture improve lives?" Set the timer for one minute.

Allotted Time – 8 minutes

- After the time is up, students will pair up with another student, and they will compare their lists and see if they can come up with any more examples in the allotted time. Set the timer for one minute.

- Each group will share one idea with the entire class until all ideas are shared. The teacher can ask for a volunteer to write answers on board or write them their selves. Let students know that they will revisit this list.

Teacher Notes:

Allotted Time –5 minutes

- Have students fill out the pre-test questions.

- Pass out the attached **Scavenger Hunt worksheet** for students to search the AgriNovus website. Consider giving a prize or extra credit for the first person or group with all of the correct answers. Once the first person gets all of the answers correct, go over each question with the class, calling on a different student for each question.

Allotted Time –20 minutes

- Lead into a discussion of what innovation means, tie in AgriNovus goals, and refer to the four areas the company focuses on.

Allotted Time –15 minutes

- There is a summary sheet titled **AgriNovus Major Sectors Quick Reference** attached that describes each sector. Write four areas on a large piece of paper (one per paper).

- Divide the class into four groups. Assign them one of the sectors from the **AgriNovus Major Sectors Quick Reference.** Have the students select a secretary to write while the rest of the group reads their assigned sector and summarizes it. The secretary will use bulleted points to summarize their sector on the large paper. Hang the papers around the room, giving each paper plenty of space.

Allotted Time –50 minutes

- Decide if you want students to work with a partner or individually. If they are working with a partner, they will need to sit together. Pass out post-it notes to all students. Set timers for 5 minutes to have them find as many different types of agriculture innovations as possible. Encourage students to also think beyond traditional production agriculture. Instruct them to write each innovation on its own post-it.

- When the time is up, have students figure out which category the innovation belongs to. Have them start placing their post-it notes into groups on their desks as you go around and read the Major Sector Summaries that the groups created earlier. This may be helpful to do in partners or combine two groups for a group of four. Once they have identified the appropriate sector, instruct the students to get up and place the post-it notes on the proper paper hanging in the room.

Allotted Time – 10 minutes

- Show Future of Farming Video. The Future of Farming

- Have students write down the name of each innovation the video talks about on a separate piece of paper. When they are finished, call on students to list those inventions. While students are sharing their findings, select a student to write each invention down on its own post-it note. Have the class discuss which AgriNovus sectors those inventions belong to. Have a student place those on the appropriate paper.

Allotted Time – 23 minutes

- Go through each sector page and talk about students' findings. Place any like innovations on top of each other. Revisit the list that the students came up with during the interest approach/bell ringer and add any ideas to each category if they are not already listed. Have the students figure out which sector they belong to. The teacher can add innovation ideas if needed depending on what students come up with.

Allotted Time – 20 minutes

- Have each student write the top three innovations they are interested in learning more about along with the sector they are the most interested in on a piece of paper. Collect the paper. Pair students together based on their interest, doing your best to give them one of their top picks without repeating a topic. If

Allotted Time –25 minutes

that is not possible, try to ensure they are researching an innovation from the sector they are most interested in learning more about.

- Review the requirements and rubric on the attached sheet titled **Innovation Presentation Directions and Rubric** with the students. Allow each group time to research their innovation.

*Allotted Time –*25 minutes- *Time will depend on the size of the class. Average time is 3 minutes per presentation.*

- Allow time for students to present. While each group presents, other students will create a timeline of when each invention was created and write one reason it has improved lives. Students can use the worksheet titled **Innovation Timeline** to create their timeline.

- After the Presentations, have students get a scrap piece of paper out. Let them know that you will be giving a series of clues. You want them to guess the person or term that you are talking about. They can change their answer as many times as they want as more clues are given. They can't shout out the answer but will write it down. Also, let them know that you are not looking for a specific person but a term representing a group of people.

Allotted Time –10 minutes

  - Clues:
    1. These people are creative.
    2. These people bring ideas to life
    3. These people have a passion for learning new things
    4. They are people of all ages
    5. They are resourceful
    6. They are imaginative and work hard
    7. They are innovative
    8. They take risks
    9. They can identify the need to create something new
    10. They own or create their own business

Answer: Entrepreneur

- After the clues have been read, ask students if anyone thinks they know the term you are referring to. Call on any students that might have their hand raised. Call on other students if the answer does not emerge right away. Even if someone guesses it correctly right away, have others share. If nobody has the answer, you can reveal the term you were searching for. Then ask the students if their term relates to the correct term of Entrepreneur. Have them explain how it does. You might have to guide the students through this or help them connect their ideas. There may be some student's answers that do not relate, and that is okay.

- Have students access AgriNovus Podcast. Assign or have students choose an entrepreneur interview to listen while using the worksheet titled **Entrepreneur Interviews** to fill out.
    - Entrepreneur Podcast List
        - Ellie Symes, Co-Founder & CEO, The BEE Corp
            - Entrepreneur-in-the-Agbiosciences
        - Scott Massey, Co-Founder & CEO, Heliponix
            - Start-Up-Journey-for-Food-Security
        - Nick Carter, Founder & CEO, Market Wagon
            - Startup-Innovating-the-Local-Food-Supply-Chain
        - Zack James, Founder, Rabbit Tractors
            - Developing-Swarm-Robotics-Autonomous-Farm
        - Evan Rocheford, CEO, NutraMaize
            - Orange-Corn-a-Father-Son-Start-Up

- Have students give a one minute overview of their interview. Students will write common themes they see in Entrepreneurs. They will then share those common characteristics that most Entrepreneurs possess.

- Using those common characteristics to lead students into answering a Challenge Question.

    - The Purple Plow, *brought to you by the American Farm Bureau Foundation for Agriculture and made possible through the support of Corteva Agriscience*, engages students in creating solutions for real-world, complex issues related to agriculture.

Allotted Time –*60 minutes. *Time will depend on which Challenge Question you decide to use. Purple Plow recommends about an hour for the puzzlers.

They have great long term and short term activities for students. You can access their lessons to use for challenge questions at https://www.purpleplow.org/.

- Recommended puzzlers that relate to this lesson:
  - Make-Something-Useful
  - Food-Drive-Action-Plan
  - Vertical-Garden
  - Mini-Aquaponic-System
  - Solar-Oven
  - Stop-the-Rot
  - Mini-Greenhouse
  - Egg-Carrier
  - No-Bake-Granola-Bars
  - Supply-and-Demand-Board-Game
  - Energy-PSA
  - Waterwheel
- Other quicker challenge question ideas include
  - How could you find a needle in a haystack?
  - How could you heat a bowl of soup without a stove or microwave?
  - How could you open a jar without touching it directly with your hands?
  - How could you move water up a hill?
- You can also make up your own challenge questions!

- Give students a challenge question. You may choose to have all the students complete the same question or give a few different options. Have students brainstorm as many solutions as they can think of in 2-3 minutes. They will write these down on a piece of paper. Tell them not to worry about if they feel it is a good idea. It just needs to be a possibility.

- Have students then find someone that had the same challenge question as them. Have them exchange ideas. They will then evaluate their list to pick one that they think is the best idea. They will focus on that idea for their sales pitch.

- Students will complete the attached worksheet titled **Mini Sales Pitch** to develop their thoughts. If students complete a Purple Plow Puzzler, they can actually create a model

or prototype to use for their sales pitch; otherwise, they can create a drawing of their solution.

*Allotted Time –*25 minutes- *Time will depend on the size of the class. Average time is 3 minutes per presentation.*

- Have students present their solution using the Mini Sales Pitch Template. Grade students using the **Sales Pitch Rubric.**
- While students are watching each sales pitch, have them fill out the worksheet titled **Sales Pitch Peer Evaluation.** When all presentations are complete, talk about what students learned about the sales pitches. Which products were they more willing to "buy" and why? Was it the product itself, the delivery of the sales pitch, or another reason? Discuss how a good product still must have a good sales pitch to do well.

Allotted Time – 5 minutes

- Have students fill out the post-test questions.

ADDITIONAL RESOURCE

- **Related Purple Plow Challenges**
  - Farm to Food Truck
    - Farm-to-Food-Truck
  - Growing your Community
    - Growing-Your-Community
  - Pollinators
    - Pollinator-Challenge
  - Room to Grow
    - Room-to-Grow

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AgriNovus Major Sectors Quick Reference

Plant science and crop protection

- This sector includes organizations and companies engaged in crop improvement and crop protection via the application of plant science, biotechnology, chemistry, and other scientific disciplines.
- These companies engage in seed genetics and development, crop hybridization, and the development and production of agricultural chemicals (fertilizers, herbicides, pesticides).
- A key goal of businesses in this sector is to enhance the productivity of production agriculture through creating crops with higher yields, resistance to stress (such as drought or frost tolerance), and resistance to pests and plant diseases.
- Enhancements may be generated through traditional breeding/hybridization techniques and advanced genomics technologies. Innovators in this sector may also work to introduce crop varieties with enhanced functional characteristics (nutrition content, color, flavor, shape, downstream processability characteristics, etc.).
- Chemistry is also an important area of activity in this sector, with companies engaged in developing targeted crop protection chemicals, fertilizers, soil inoculants, and other chemical and biologic inputs to production.

Animal health and nutrition products

- The animal health and nutrition market focuses on providing the therapeutics, diagnostics, biologics, and nutrition/feed products to maintain the health and productivity of the more than 3 billion livestock and more than 50 billion poultry found worldwide.
- It also focuses on ensuring the nutritional value of the food it produces, as well as the health and well-being of companion animals.
- Although the animal health and nutrition market is large in terms of the volume of livestock and poultry, it should be noted that the human healthcare market is 30 times larger monetarily than the combined market for all nonhuman species.
- On average, the world spends only about one-fortieth of the amount it devotes to human medicines on animal medicines. Still, animal health-related therapeutics and diagnostics must undergo similar testing and strict regulations found for human health products.
- The animal health and nutrition sector includes industries engaged in all aspects of animal health and nutrition, including medicines and vaccines, diagnostic and testing services, veterinary and breeding services, and animal nutrition products. In contrast to human blockbuster-oriented pharmaceuticals, animal health is dominated by a large

number of products with small revenues. Although there are hundreds of products offered in the animal health market, only a couple of dozen products have sales exceeding $100 million per year.
- In an increasingly risky environment for new product development, the difference between success and failure in the future usually lies in successfully identifying the next growth segment, developing the right product candidates, and being the first to market.

Value-added human food and nutrition products

- The value-added food and nutrition industry encompasses an entire food-related "value chain." This encompasses a holistic set of value-adding industry activities from research and development of new products and ingredients and other inputs, on through food processing and manufacturing, into packaging technologies related to food safety and shelf-stability as the food is distributed.
- The Value-Added Food and Nutrition Industry Businesses and innovators in this sector work to add value to basic agricultural commodities by changing or transforming a product from its original state to a more valuable, further-processed state.
- Many raw commodities have intrinsic value in their original state. For example, field corn grown, harvested, and stored on a farm and then fed to livestock on that farm has value. In fact, value usually is added by feeding it to an animal, which transforms the corn into animal protein or meat. In this sector, however, the focus is on downstream, post farm-gate processing of agricultural output into value-added food, nutrition, and health products, such as processing wheat into flour, soybeans, and milk whey into infant formula, and tomatoes into tomato paste.
- The application of biotechnology, the engineering of food from raw products to manufactured consumer goods, and innovations in packaging for distribution all provide opportunities for adding value.
- The value-added food and nutrition products innovation sector includes industries engaged in significant food processing activities and other value-added food products, as well as industries engaged in developing food processing equipment, both the machinery and equipment that is used to turn raw plant and animal inputs into goods for consumption, and the machinery and equipment used to package the food products.

Agricultural equipment technologies and systems

- Modern agricultural production is equipment and technology intensive. Large, midsize, and small companies are active in the U.S. in the design, engineering, and manufacturing of specialized agricultural production equipment and systems, while multiple major research universities are likewise engaged in R&D for production technologies (particularly within agricultural engineering departments at major Land Grant Universities).

- Agricultural equipment technologies and systems represent a highly diverse market, with distinctive products and technologies required for different crops, livestock, and materials handling. Individual farms need specialized equipment to handle field preparation, soil maintenance, planting, application of crop protection chemicals, irrigation, and harvesting.
- Similarly in livestock agriculture, specialized systems are needed for livestock feed handling, livestock watering, housing, and other applications, such as milking or egg handling.
- Materials handling and storage is also another major component of the farm equipment sector. Finally, because of the rugged construction and long service life of many farm machines, replacement parts represent a significant industry segment as well.

Website Scavenger Hunt

Name: _____

Directions: Using agrinovusindiana.com, answer the following questions.

1. What is AgriNovus' purpose?

2. Indiana is home to major seed companies that lead the Agbioscience industry. What are they?

3. Indiana ranks fifth in the nation in three agriculture areas. What are they?

4. Agribusiness is a $_____ billion industry in Indiana.

5. Indiana ranks number one in the nation in what type of agriculture production?

Website Scavenger Hunt ANSWER KEY

1. What is AgriNovus' purpose? Many acceptable answers but could include:
    - They promote and accelerate the growth of the Agbioscience community
    - Connect people and organizations
    - Promote Agbioscience career pathways and develop industry-relevant skills
    - Inspire an Agbioscience mindset and accelerate early-stage companies

2. Indiana is home to major seed companies that lead the Agbioscience industry. What are they?
    - Corteva Agriscience
    - Becks
    - AgReliant Genetics

3. Indiana ranks fifth in the nation in three agriculture areas. What are they?
    - Corn
    - Hogs
    - Soybeans

4. Agribusiness is a $_____ billion industry in Indiana.
    - $16 billion

5. Indiana ranks number one in the nation in what type of agriculture production?
    - Ducks

Innovation Presentation Directions and Rubric

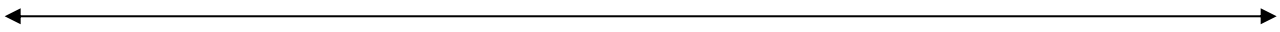
Most students realize that they need agriculture to eat, but how you ever wondered how agriculture impacts many other aspects of your lives? You will be assigned one of the innovations your class has come up with during the brainstorming activity. In this activity, you will research your innovation and create a Multimedia presentation answering the following questions:

- What is your innovation? Give a description.
- How does your invention work?
- What year was your innovation invented?
- How does your agriculture invention make life better or easier? Why was it developed?
- Did your invention change over time from the original idea/design? How?
- What is the cost of implementing your innovation?

Innovation Presentation Rubric	**Student Grade**	**Teacher Grade**
Presentation Requirements: Includes all required information. (3 points each) • What is your innovation? Give a description. • How does your invention work? • What year was your innovation invented? • How does your agriculture invention make life better or easier? Why was it developed? • Did your invention change over time from the original idea/design? How? • What is the cost implementing your innovation?		**____/18**
Visual Representation: Multimedia presentation was put together nicely. Words were not too small. Bullet points were used instead of large paragraphs of information.		**____/5**
Pictures: Several pictures included throughout the presentation. They were relevant to innovation**.**		**____/5**
Time Management: Student was productive with the time provided in class.		**____/5**
Presentation Delivery Presenter maintained good volume, appropriate body language, eye contact, and spoke loud and clear.		**____/7**
Comments:	**Total Score:**	**____/40**

Innovation Timeline

Directions: While each group presents, create a timeline of when each invention was created and write one reason it has improved lives.



Entrepreneur Interviews

Directions: Choose Podcast on AgriNovus YouTube Channel over an Entrepreneur. Answer the questions below. You will give a one minute overview of what you learned.

- Entrepreneur Podcast List
    - Ellie Symes, Co-Founder & CEO, The BEE Corp
        - Entrepreneur-in-the-Agbiosciences
    - Scott Massey, Co-Founder & CEO, Heliponix
        - Start-Up-Journey-for-Food-Security
    - Nick Carter, Founder & CEO, Market Wagon
        - Startup-Innovating-the-Local-Food-Supply-Chain
    - Zack James, Founder, Rabbit Tractors
        - Developing-Swarm-Robotics-Autonomous-Farm
    - Evan Rocheford, CEO, NutraMaize
        - Orange-Corn-a-Father-Son-Start-Up

1. What innovations or business did this Entrepreneur contribute to the world?

2. What was the inspiration for this person to become an Entrepreneur?

3. When and how did this person start their company?

4. What challenges and obstacles did this person face along the way?

5. Take brief notes on other entrepreneurs that your classmates researched and presented. What common traits or themes do you see?

Mini Sales Pitch

A sales pitch conveys what your business is about in a quick, polished, and engaging way. Complete the sentences below to create your own pitch for the product you created from the Challenge Question. You will practice and present this pitch. You will also need to develop an actual product or draw a picture of your idea.

Sales Pitch Template
Problem Statement of need for product (to hook audience):
I'd like to tell you about…
It's a…
It will improve consumer's lives by…
It costs consumers…
Consumers can get it by…

Sales Pitch Rubric

Sales Pitch Rubric	Student Check-off	Teacher Grade
Sales Pitch: Includes all required information. (3 points each) • **Problem Statement** • **I'd like to tell you about…** • **It's a…** • **It will improve consumer's lives by…** • **It costs consumers…** • **Consumers can get it by…**		**____/18**
Drawing or Prototype: Model the answer the challenge question or visual depiction that shows effort in solving the problem		**____/10**
Creativity: Invention or solution to the challenge question is unique. Clear thought was put into the project**.**		**____/5**
Time Management: Student was productive with the time provided in class		**____/5**
Sales Pitch Delivery Presenter maintained good volume, appropriate body language, eye contact and spoke loud and clear.		**____/12**
Comments:	**Total Score:**	**____/50**

Sales Pitch Peer Evaluation

On a scale of 1 (not likely) to 5 (very likely) to answer the two questions below:

1. How likely are you to buy or recommend this new product?
2. Give the presentation an overall score:

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Name of presenters/idea: _____
1.
2.

Innovation in Agriculture Pre-Test

Name: _____

1. How familiar are you with innovations in agriculture?

   Very Mostly Somewhat A little Not at all

2. On a scale of 1-10, what is your understanding of Agbioscience? (1=little, 10=a lot)

   1 2 3 4 5 6 7 8 9 10

3. Are you comfortable explaining a new technology in agriculture?

   Very Mostly Somewhat A little Not at all

4. Are you confident pitching your ideas to a group of people?

   Very Mostly Somewhat A little Not at all

5. Can you recognize the common characteristics of entrepreneurs?

   Always Usually Kind of A little Not at all

Innovation in Agriculture Post-Test

Name: _____

1. How familiar are you with innovations in agriculture?

   Very Mostly Somewhat A little Not at all

2. On a scale of 1-10, what is your understanding of Agbioscience? (1=little, 10=a lot)

   1 2 3 4 5 6 7 8 9 10

3. Are you comfortable explaining a new technology in agriculture?

   Very Mostly Somewhat A little Not at all

4. Are you confident pitching your ideas to a group of people?

   Very Mostly Somewhat A little Not at all

5. Can you recognize the common characteristics of entrepreneurs?

   Always Usually Kind of A little Not at all