**The connection between agriculture and technology**

Pillar 5 B. Discover how technology has changed over time to help farmers provide more food to more people (Grades 4th – 8th)

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| **Website**: <http://www.foodspanlearning.org/_pdf/lesson-plan/unit1/lessonb-industrialization-lessonplan.pdf>  **Hands On**: <http://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=21&grade=6&author_state=0&search_term_lp=technology> |

Activity: High-Tech Food

Digital Activity: <http://video.nationalgeographic.com/video/magazine/food-by-the-numbers/ngm-precision-agriculture> (Double check this video … didn’t load all the way, want to be sure link isn’t broken)

High-Tech Food

Purpose

This lesson plan introduces the high-tech aspects of agricultural production and explores the related careers.

Materials

* *Science in Your Shopping Cart* booklet (PDF)
* *Science in Your Shopping Cart* PowerPoint Presentation
* *Science in Your Shopping Cart* video
* *Agricultural Science and Technology* Worksheet, one for each student
* *[Modern Marvels: Harvesting Technology](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=33&search_term_cr_cr=harvesting" \t "_blank)*[, video/DVD](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=33&search_term_cr_cr=harvesting" \t "_blank)

Essential Files (maps, charts, pictures, or documents)

* [Science in Your Shopping Cart booklet](http://naitc-api.usu.edu/media/uploads/2014/06/18/shopcart.pdf" \t "_blank)
* [Agricultural Science and Technology Worksheet](http://naitc-api.usu.edu/media/uploads/2014/06/18/High-tech_Food.pdf" \t "_blank)

Vocabulary

**DNA:** deoxyribonucleic acid, a self-replicating material present in nearly all living organisms as the main constituent of chromosomes; the carrier of genetic information

**genetically modified food:** genetically modified (GM) foods are foods derived from organisms whose genetic material (DNA) has been modified in a way that does not occur through a normal reproductive process (e.g., through the introduction of a gene from a different organism)

Did you know? (Ag Facts)

* Thanks to GPS tractors, combines, sprayers and more can accurately drive themselves through a field. The GPS guidance is great because it removes human error from overlap, saving fuel and equipment hours.
* Telematics allows a farmer's equipment (machines) to talk to the farmer, equipment dealers, and even other equipment. Depending upon a problem, a farmer might not even have to speak to a mechanic to find out what is wrong. The machine would diagnose the problem and order the part from an equipment dealer.

Background Agricultural Connections

There really is science in your shopping cart! If we abide by the familiar saying “you are what you eat,” it is understandable that people may be concerned with the incredible advances in food science technology and their possible impacts on human health. For example, in recent years high-tech scientific processes such as genetic modification, irradiation, and cloning have all been used to increase the safety of the food supply, create foods that are more appealing to eat and easier to produce, and increase crop yields. This article will summarize a few hot topics in food science, address what is currently known about the safety of these processes, and present resources on the subject to use with your students.

Interest Approach – Engagement

1. Begin introducing the lesson by asking the following questions and holding a class discussion:
   * How do science and technology solve agricultural problems?
   * What role does the consumer have in determining what items are found on supermarket shelves?
   * Are more career opportunities related to being a food producer or a consumer? Explain your answer.
2. In this lesson students will learn the answers to these questions and begin to understand the high-tech nature of our food production and the careers related to it.

Procedures

**Activity 1:**

1. Assign each pair or small group of students one of the products listed on the *Agricultural Science and Technology Worksheet.* You may want to provide each group with a picture of the product they have been assigned. Alternatively, a “real” food or nonfood product on the list may be used to add interest.
2. Review the *Science in Your Shopping Cart* PowerPoint presentation, slides 1-5, and discuss the scientific changes that are sometimes used to change particular crops, animals, and resulting foods.
3. Ask each pair/group to write down, on their *Agricultural Science and Technology Worksheet,*the scientific changes they think have been applied to the development of the product they have been given (there may be more than one).
4. View with your students the video *[Science in Your Shopping Cart](https://www.youtube.com/watch?v=kudtlgMlgO8" \t "_blank)*(streams from the Internet or purchase the DVD). Ask students to write down the actual scientific changes all the products shown in the video have undergone to get that product to the consumer.
5. After viewing the video, ask students if they guessed the scientific changes correctly. Students will notice that not all the products were shown in the video. Provide each group with a copy of the *Science in Your Shopping Cart* booklet (order or view online) to complete the worksheet.
6. Show students slides 6 and 7 in the PowerPoint presentation for a few other examples of food science.

**Activity 2:**

1. Technology is the application of science. To further demonstrate science and technology used in agriculture, view with students the video/DVD *Modern Marvels: Harvesting Technology*(order online from the History Channel).
2. Students can then complete the last column on the *Agricultural Science and Technology Worksheet*. This video details harvesting technology for the following: GPS/GIS wheat, cotton, rice, sugar beets, tomatoes, walnuts, olives, lettuce, grapes, and oranges.

**Activity 3:**

1. Review with students the*Concerns About Food Science*, the last five slides in the *Science in Your Shopping Cart* PowerPoint presentation. Here are some questions for discussion:
   * Are the food products safe to eat?
   * Do the benefits of GMO foods outweigh the risks?
   * What is on the horizon in food science?
   * What is left to invent?
   * What are some career opportunities in the area of food science and food technology?
   * How many people have really made a loaf of bread or a gallon of milk?
   * From farm to fork: how much science is in your shopping cart?

**Concept Elaboration and Evaluation**

After conducting these activities, review and summarize the following key concepts:

* The production of our food uses high tech science.
* Science and technology has enabled farmers to produce more food on less ground and with fewer inputs.
* As science and technology advances, some consumers resist which can serve as a disadvantage.

Essential Links

* [Science in Your Shopping Cart PowerPoint Presentation](http://www.agclassroom.org/teacher/science/science_shopping.ppt" \t "_blank)
* [Science in Your Shopping Cart video](https://www.youtube.com/watch?v=kudtlgMlgO8" \t "_blank)

Suggested Companion Resources

* [An Agricultural Interview](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=264) (Activity)
* [Endless Options](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=6) (Activity)
* [GMO Case Study](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=262) (Activity)
* [Have a Ball](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=86) (Activity)
* [Agricultural Research Magazine](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=159) (Book)
* [Living Science Career Cards (posters or mini-posters)](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=93) (Poster, Map, Infographic)
* [Agricultural Engineering Video](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=148) (Multimedia)
* [Beetles, Crickets & Other Bugs: Your Next Dinner?](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=556) (Multimedia)
* [Drones and the Future of Farming Video](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=469) (Multimedia)
* [Genetically Engineered Crops Report](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=648) (Multimedia)
* [Modern Marvels: Harvesting DVD](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=33) (Multimedia)
* [Modern Marvels: Supermarkets](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=525) (Multimedia)
* [You're Hired!](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=586) (Multimedia)
* [Science in Your Shopping Cart](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=32) (Booklets & Readers)
* [Garden Genetics: Teaching With Edible Plants](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=718) (Teacher Reference)
* [Gourmet Lab: The Scientific Principles Behind Your Favorite Foods](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=717) (Teacher Reference)
* [Agricultural Biotechnology Questions and Answers](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=34) (Website)
* [Crop Science Career Profiles](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=65) (Website)
* [Feed, Nourish, Thrive (Careers Website)](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=643) (Website)
* [Food Dialogues](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=523) (Website)
* [GMO Answers](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=244) (Website)
* [Genetic Science Learning Center](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=255) (Website)
* [Mandarin Oranges: Protecting the Flavor of This Popular Fruit](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=526) (Website)