



Biotechnology, Who Knew?

Middle School Food and Agricultural Literacy Curriculum

Precepts

- N. Decision Making
 - N1. Choose a career based on passion, abilities and aptitudes

National Standards

- CS.02.03.01.a. Explore various career interests/ options.
- CS.02.03.03.a. Identify the skills required for various careers.
- NL-ENG.K-12.4 – Communication Skills
- NL-ENG.K-12.12 – Applying Language Skills
- NT.K-12.5 – Technology Research Tools

Student Learning Objectives

- As a result of this **unit** the students will...
 - Explore the eight pathways of the Agriculture, Food and Natural Resources (AFNR) career clusters.
- As a result of this **lesson** the students will...
 - Research the career preparation requirements for biotechnology.
 - Identify five career options related to biotechnology.

Content Outline

- I. **Research the career preparation requirements for biotechnology. Envision your life as a biotechnologist in 10 to 15 years.**
 - A. Review facts that have made a significant difference in history related to **biotechnology**.
 - B. Discuss factors to consider while selecting a career.
 - C. Select five careers in **biotechnology** to further research.
- II. **Identify five career options related to biotechnology**
 - A. Create a hanger mobile describing the following information related to careers in **biotechnology**

Time

Instruction time for this lesson: 45 minutes.

Resources

A Zillion uses for corn. (2009). Retrieved from <http://www.ontariocorn.org/classroom/products.html> — Anderson, C. (2009). Count on canola for your biodiesel. Retrieved from http://www.biodieselmagazine.com/article.jsp?article_id=2063 — Career explorer search results. (2009). Retrieved from <http://www.ffa.org/index.cfm> — Graff, S. (2009). Rubric for mobile. Retrieved from http://its.guilford.k12.nc.us/webquests/mgmt/mobile_rubric.htm — National FFA Organization. (2009). LifeKnowledge Precepts and Signs of Success — Toenniessen, G. H., O'Toole, J. C., & DeVries, J. (2003). Advances in plant biotechnology and its adoption in developing countries. Retrieved from <http://croplife.intraspin.com/Biotech/advances-in-plant-biotechnology-and-its-adoption-in-developing-countries/> — Turning fry oil to fuel. (2009). Retrieved from <http://www.fryoiltofuel.com/> — Weise, E. (2006, July 4). Dolly was world's hello to cloning. Retrieved from http://www.usatoday.com/tech/science/genetics/2006-07-04-dolly-anniversary_x.htm

Tools, Equipment, and Supplies

Hangers – one for every two students
Colored or plain paper for mobiles – various sizes and shapes or allow them to be creative
Scissors – enough for class to share
Yarn/string – enough for class to hang papers from mobiles
Clear tape – enough to hang papers on mobiles
Computer lab or library resources related to biotechnology careers
MS.CAS.1.3.AS. A – one per student
MS.CAS.1.3.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Biotechnology

1. Career name
2. Description
3. Salary range
4. Environment
5. Training

Interest Approach

Take a piece of scratch paper and write a big T on one side of the paper and a big F on the other side of the paper. You will need this sample for an activity coming up.



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Biotechnology, Who Knew?

Welcome to class. I'm glad you are here. Today we are going to shift gears and discuss **biotechnology**.

Close your eyes and picture yourself 15 years from now. Think about your spouse if you are married and your kids if you have any, where you are living, what your house looks like and now think about your career.

Pause

There is one stipulation on this one; you are employed in the **biotechnology** industry. Take the next minute and think about what that job would be like, what you would be doing on a daily basis, where you would be working – in a lab, in a field, as a salesperson, in a white coat with a controlled environment or in a field or on a ranch. What kind of training would you need to work in this area?

When you hear the word GO, open your eyes, turn to your neighbor, and tell them three things: what your job was, what you had to do to prepare for the job, and why that is what came to mind while we were envisioning **biotechnology**. What questions are there? GO.

Great discussion! Next we are going to play a game called true or false. Please take a piece of scratch paper and write a big T on one side of the paper and a big F on the other side of the paper.

Take your sample and hold up the paper to show the class as you describe the true/false game.

In a moment, I am going to read some newspaper headlines and then I will say True or False. At that time in unison hold up your paper with the T facing me if you believe it is true and the F facing me if you think it is false. What questions are there?

Grab a newspaper and pick it up before reading the following headlines. Keep a tally on a writing surface as you get their answers or just keep a running total in your head. All statements are true.

1. Scientist successfully cloned the first sheep named Dolly.
2. Plant breeders lowered the number of growing days needed to grow corn by 40-70 days.
3. A family collects used frying oil from the local fast food restaurants and turns it into biodiesel to be used in their vehicles.

4. Farmers grow canola and other oil seed crops to produce biodiesel.
5. Plant breeders increase crop yields through genetic selection.
6. Insect-protected cotton containing a natural insecticide protein from *Bacillus thuringiensis* (Bt cotton) is providing millions of farmers with increased yields, reduced insecticide costs, and fewer health risks.
7. Corn has hundreds of uses developed through **biotechnology**.

After reading the headlines, debrief with the students.

Thank you for participating. Believe it or not, every one of those headlines was true and proves the need for people ready and willing to work in the **biotechnology** field.

Summary of Content and Teaching Strategies

Objective 1. Research the career preparation requirements for **biotechnology**.

Now that we understand the potential for **biotechnology**, we are going to identify five careers in the **biotechnology** field and the career preparation requirements. Please pay special attention to selecting a career that matches your passions and abilities.

Facilitate a discussion about what to consider when selecting a career.

So I wonder how we know when we've found the right career for us. In other words, what things should we consider when choosing a career?

Allow students to answer by making this a very informal class conversation. Draw students to consider things other than money, sports, etc. Focus the conversation so that the following points are discussed:

- Working conditions (in/outdoors, exposed to weather, sitting all day, working in a "cube," etc.)
- Hours
- Travel requirements
- Relocation



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Biotechnology, Who Knew?

- Talents
- Job outlook
- Values
- Enjoyment

What a great discussion! Be sure to consider all of these factors as we continue to talk about careers.

When you hear the word GO, take 30 seconds to partner up with somebody you haven't worked with this week, and quietly have a seat next to them. GO!

Hand out MS. CAS. 1. 3. AS. A.

Objective 2. Identify five career options related to **biotechnology**

As you can see on the worksheet, there are a ton of careers in **biotechnology**. In fact, there are more than just the 24 listed on our papers. Working with your partner, circle five careers that the two of you would like to learn more about. We have 45 seconds, GO.

The teacher may want to make a hanger mobile in advance or just hold up the hanger or a picture and tell them what the expectations are. Use a computer lab if available or a library but help students to identify several resources if using a library without computers. Pass out **MS.CAS.1.3.ASSESS.A** to students, or write the five requirements on the board.

Take the next 20 minutes to create a **biotechnology** mobile with following information about your chosen career:

- Career name
- Description
- Salary range
- Environment
- Training

Work quietly as investigators with your partner to find all of the necessary information.

Review/Summary

Hang the mobiles around the room, from the top of the whiteboard, chalkboard, or anywhere they will hang, as students complete them. If time permits use the Me-You-Us e-Moment® or a gallery walk to review. Another option would be to allow students to tell the rest of the class about their mobile. Draw students' attention back.

What a great looking room we have! We have learned some great information about the career that we researched; however, let's learn about others' chosen careers. Let's take a gallery walk to learn about other **biotechnology** careers.

Application

Extended classroom activity:

Invite a guest speaker in to present on how **biotechnology** is used in their work.

FFA activity:

Participate in the Agriscience fair.

SAE activity:

Choose a research-based SAE with your agriculture science teacher or biology teacher and report the findings to the class.

Evaluation

The mobiles should be evaluated using MS.CAS.1.3.ASSESS.A.

Answers to Evaluation

Use Rubric, MS.CAS.1.3.ASSESS.A.

Step 1:

Directions – Go to http://www.ffa.org/index.cfm?method=c_job_CareerSearch and search for some of the biotechnology careers. Select five from the list and briefly describe what the career entails.

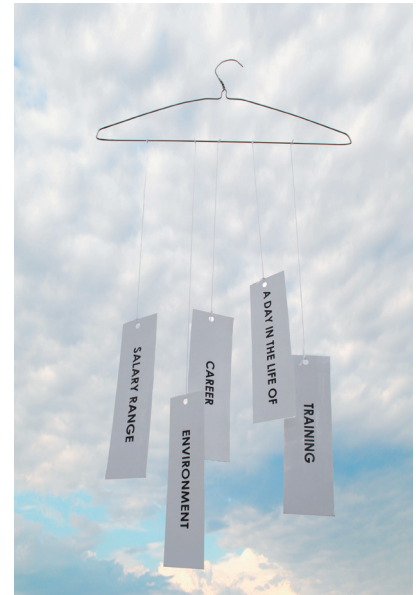
Handout – Five careers in **biotechnology**

1. Career 1 _____
Briefly describe. _____
2. Career 2 _____
Briefly describe. _____
3. Career 3 _____
Briefly describe. _____
4. Career 4 _____
Briefly describe. _____
5. Career 5 _____
Briefly describe. _____

Step 2:

Select one of the five careers from above and answer the detailed questions. Each of the following will be a heading on the mobile. After the questions are completed create a hanger mobile like the one pictured above.

- Career I picked for further research and my reference** _____
- Training Needed** _____
- Salary Range** _____
- Inside or outside work/Work environment** _____



CAREERS IN BIOTECHNOLOGY:

- Biotechnology Patent Agent
- Biotechnology Regulatory Affairs Specialist
- Agricultural Scientist
- Biotechnology Product Development Engineer
- Biotechnology Quality Control Engineer
- Biotechnology Research Assistant
- Biotechnology Research Associate
- Biotechnician
- Biotechnology Assay Analyst
- Biotechnology Documentation Specialist
- Biotechnology Glass Washer
- Biotechnology Laboratory Assistant
- Biotechnology Library Assistant
- Biotechnology Manufacturing Technician
- Biotechnology Media Prep Technician
- Biotechnology Patent Administrator
- Biotechnology Technical Recruiter
- Biotechnology Validation Engineer
- Biotechnology Validation Technician
- Food Inspector
- Lab Technician
- Molecular Biologist
- Poultry Scientist
- Agricultural Research Engineer



Rubric for Mobile

Group Members: _____

Career Chosen: _____

Appearance: 4- Excellent; 3- Above Average; 2- Average; 1- Below Average; 0- Poor

Mobile is:
Neat
Readable
Balanced
Creative
Colorful
Comments:

Content: 4- Excellent; 3- Above Average; 2- Average; 1- Below Average; 0- Poor

Content is:
Required information is present
• Career Name
• Description
• Salary range
• Environment
• Training
Fully explains topic
Comments: