

Death by Food or Foe?

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Abstract

This action plan's main target group is Food Science and Technology students in 11th and 12th grade. The focus of this module is to immerse the students in science and reinforce and build on prior knowledge of the pathogens through the study of these microorganisms as well as genetically modified organisms. The rationale for this action plan is to help biology teachers cover material that they have been forced to skim or overlook due to state standardized testing. This lesson used technical text and focuses on the use of common core as well as multimodal learning techniques geared to include all learning styles. After completion, the students will have a deeper understanding of microorganisms as a whole and food borne illnesses that affect their daily lives.

Rationale

This teaching module will immerse mainly 11th-12th grade students in a Food Science and Technology elective course. This class is one of three science electives offered to upperclassmen; marine, anatomy or food science. Many students view this class as the easiest science elective and in past years it has been treated mainly as a food preparatory course with science highlights. This science elective should help reinforce and strengthen the student's prior knowledge as well as build their experience, in their home; at the consumer level. Due to previous years of this class being overlooked as a mainstream science elective the students who have been placed into this class are looked upon as lower level students. The goal of this module is to get lower level students excited about science through inquiry and hands on experimental science that hits home and relates easily to their daily lives through food. Who doesn't love food?

The module I am presenting in this proposal, "Death by Food or Foe?" will cover a variety of multimodal learning activities including; hands on activities with simulated microbe stuffed animals, inquiry based bacterial growth culture plates, informative videos, simulated genetic modification of PCR, and a project about industrial farmed food and food borne diseases.

These activities will catch the attention, of the students, early in the school year and continue throughout the first semester. The students will be engaged by the use of biotechnology techniques that help them explore the world of microorganisms. This module's main focus is to

reinforce laboratory techniques and prior scientific knowledge as well as expand and challenge them to think like a scientist. I plan to push my students out of their comfort zone and get them to love science, not just tolerate it. This module uses CPET’s equipment as well as technical reading of science articles as a form of technical text to align with common core. Incorporating more common core activities early on, in an elective, will hopefully make the blow less harsh when the students are exposed to it in their core classes. I hope to maximize my time as an elective teacher and utilize this time to help these students grow.

In recent years, science teachers have been scrambling to teach their student’s massive amount of information post spring break. Our year actually ends when our students take our Biology End of Course test. I want to be able to help all core teachers by taking a little bit of stress off their shoulders.

Description of Teaching Unit including Expected Outcomes:

The teaching unit will cover a total of 4 weeks of instruction that will focus on the following standards for the Food Science and Technology elective:

05.0 Identify and explain the effects of microorganisms on food--The student will be able to:
05.01 Compare the beneficial and detrimental effects of microorganisms on food.
05.02 Identify the characteristic of selected microorganisms and related food borne diseases.
05.03 Describe the environmental conditions necessary for the growth of selected microorganisms.
05.04 Explain and demonstrate the cause and effect relationship between using accepted food handling procedures and preventing food borne diseases.
05.05 Conduct and appraise scientific experimentation of the biological magnification of certain classified microorganisms, such as yeast, mold and bacteria.

The students learning objectives are as follows:

Students will differentiate between beneficial and detrimental microorganisms. Students will identify characteristics and conditions necessary for growth of microorganisms. Students will describe compare and demonstrate the relationship between acceptable food handling techniques and procedures and prevention of food borne diseases. Students will create and evaluate scientific experimentation of biological magnification in microorganisms

The students learning outcome will be acquired upon completion of the following course activities and assignments:

Part A: First 9 weeks

Lesson: create and design safety poster to go with classroom safety chart. Pre-Survey of bacterial knowledge. Paper lab: “Meet the Menacing Microbes” including *Salmonella*, *Acidophilus*, *Shigella* and *E.coli* (*The Alimentaries*). Lab: Use Microbial Food Poisoning Pictomicrograph to pick a species for research use “speed reporting” in jigsaw groups to discuss microbes. Video: “Alton Brown does Eggs” to enforce discussion of salmonella. Video: View *Food, Inc.* with pre and post discussion questions using this website:

http://www.activevoice.net/pdf/IFC_Community_Action_Guide_final_low_res.pdf

Project “Death by Food or Foe”: industrial risks, handling of food etc., create and record a commercial about food borne disease using hand held camcorders. Lab: “Death by Foe?” create bacterial cultures of *salmonella* and *E.coli* on prepared agar plates. Class presentation of results from inquiry findings. Compare mold on 3 loaves of bread, hypothesize about ingredients. Post survey of bacterial knowledge. Lesson: macronutrients and enzymes. Lab: Why did our plates change color? “How do enzymes work” why did the plates change.

Part B: Second 9 weeks

Lesson: introduction to Biotechnology. Micro pipetting and designer plates from CPET. Organic food, greening & GMO reading and discussion. Lesson: GMO’s: Death by Food? Lab: GMO immunostrip assay lab testing of GMO foods. Show the students video: contaminated food, mini mass spec; <http://www.youtube.com/watch?v=o88FMvVvdMU>. Discussion of related organics, *salmonella*, *E. coli*, GMO’s, citrus greening, mini mass spec and present poster to the class of findings. Use “speed reporter” format to discuss which topic is “most important”. Guest speaker from local farm on MI.

Data Collection

The following assessments will be used to measure student's engagement; Pre and posttests or surveys on microbes, lab report for menacing microbes, hands on project("Death by Food or Foe"), class presentation of bacterial cultures, lab report for bacterial cultures, writing prompt about articles discussed in class ("speed reporter") and a lab report for GMO ImmunoStrip assay.

Equipment Lockers & ICORE Applications:

I will be using all of the following throughout the implementation of my action plan; menacing microbes kit/locker, micropipetting and designer plates locker, positive *salmonella* and *E.coli* cultures, GMO ImmunoStrip assay information, topics from Dr. Chen's lecture on mass spectrometry, lectures about GMO's, information learned about citrus greening information learned about food borne illness and pathogens.

New Pedagogies:

I learned many new techniques that I would like to incorporate into my action plan including; "Speed reporting" using articles from topics covered (learned during best practices), jigsaw groups for reporting about microbes. This is all new to me! This will be my first time teaching food science, I can't wait!

Literature Cited:

Morris, Dr. Glenn. Emerging Pathogens. 2013.

Simmonne, Amy H. "Food Borne Pathogens. 2013.

Budget & Justifications

Item	Vendor/Source	Cost
Alimentary microbes (salmonella & E.coli)	http://www.giantmicrobes.com/us/main/alimentaries/	\$18.85
RAPID' <i>E.coli</i> 2 Agar, ready to use 355-5299 100 ml x 6 bottles	http://www.bio-rad.com/prd/en/US/FSD/PDP/2611b802-04d7-43f5-a63e-e2dca473f65f/RAPIDE.coli-2-Medium	\$26.00

RAPID' <i>Salmonella</i> Agar, ready-to-use 356-3961 90 mm x 20 dishes	http://www.bio-rad.com/prd/en/US/FSD/PDP/3ecfb140-cd5d-48c4-9a44-f1ca7630ab8f/RAPIDSalmonella-Medium	\$63.00
Vivitar® DVR426HD Digital Video Recorder With Camera, Red (x2)	http://www.officedepot.com/a/products/323206/Vivitar-DVR426HD-Digital-Video-Recorder-With/?Channel=Google&mr:trackingCode=7DFBCCDE-54D6-E111-A306-001517384FBA&mr:referralID=NA&mr:adType=pla&mr:ad=22395426956&mr:keyword=&mr:match=&mr:filter=20224360076&cm_mmc=Mercent--Googlepla--Technology+Cameras_Camcorders--323206#firstTab	\$60.00
Roundup Ready® ImmunoStrip® STX 74000/0050 (x50)	https://orders.agdia.com/InventoryD.asp?loc=IN&collection=STX%2074000&attribute_Size=50	\$110.00x.5=\$55 Share half with other teacher
Extraction buffer SEB4 powder Accessory ACC 01958/005.7	https://orders.agdia.com/InventoryD.asp?attribute_Size=5.7&collection=ACC+01958&loc=IN	\$8.50
Microcentrifuge tube	https://orders.agdia.com/InventoryD.asp?attribute_Size=500&collection=ACC+00340&loc=IN	\$27.50x.5=\$13.75 Share half with other teacher
Microbial Food Poisoning Pictomicrograph	http://www.carolina.com/bacteria/microbial-food-poisoning-pictomicrograph/154668.pr?catId=&mCat=&sCat=&ssCat=&question=salmonella	\$25.95
Shipping Costs		\$~87.45
Total Cost		\$350.00

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Content Topic Target: Microorganisms and Emerging Pathogens

Grade Level: 11th and 12th grade

Specific Subject: Food Science and Technology

OBJECTIVES

1. Students will differentiate between beneficial and detrimental microorganisms
2. Students will identify characteristics and conditions necessary for growth of microorganisms
3. Students will describe compare and demonstrate the relationship between acceptable food handling techniques and procedures and prevention of food borne diseases
4. Students will create and evaluate scientific experimentation of biological magnification in microorganisms

MATERIALS

Flip camera

Articles and supplemental sources; GMO's, Greening, Kevin's Law, Monsanto, Food Inc. guide

PROCEDURE AND DISCUSSION QUESTIONS

Part A: Pathogens

Day one: Meet the Menacing Microbes (45 minutes)

- Introduction: "hook": pictures of MRSA
- Students will be given a worksheet to follow and turn in at the end of the class period.
- Students will be given a question or an answer. They need to find the person that their question or answer matches up with and then find their stuffed animal
- Jigsaw groups will be used to discuss the different pathogens, student should take notes
 - *Salmonella* and *E. Coli* will be focused on as a class

Day two: View Food Inc. (45 minutes)

- Teacher will pause and read quotes to students
- Discussion questions:
 - What is the relationship between corn fed cattle and *E.coli* and traditional grass fed cattle?
 - What are potential issues with the way these animals are treated?

Day three: finish video follow up with questions

Day four- five: project "Death by Food" (60 minutes)

- Pass out grading rubric
- Students will create their own commercial of documentary about industrial risk, safe food handling or food borne illness.

Day Five & Six: present commercial to the class (45 minutes)

Day Seven: “Death by Foe” Laboratory use of cultured plates. (45 minutes, 5 minutes x 10days)

- Students will swab their hands and keep a journal of how many times/ how long they washed
- Students will also bring in samples from their refrigerator to test for *e.coli* and *salmonella*
- They will watch their cultures grow over a 2 week period, writing in their journal daily

Day Eight: Class presentation of inquiry findings.

ASSESSMENT SUGGESTIONS

Objective 1 and 2 & 4: the bacterial culture lab findings reported and lab write up and class presentation.

Objective 3: the project will be used to assess if students can create a commercial displaying proper food safety and handling techniques.

RESOURCES/REFERENCES Cite all print or web-based resources used to prepare your lesson plan. Complete bibliographic citations and/or website addresses must be included. Resources can consist of education or science content books, journals, and newspaper articles, or websites of reputable and recognized education or science-related agencies or organizations. Lesson plans must be your ORIGINAL work, not the work of others! If you copy prepared lesson plans from websites or other educational resources and turn them in as your own, you will receive a grade of “0.”