Designing a food science curriculum to build agricultural literacy in high school students

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Designing a food science curriculum to build agricultural literacy in high school students

by

Cassandra A. Forbush

A creative component submitted to the graduate facility
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Agricultural Education

Program of Study Committee:
Scott Smalley, Major Professor
Mark Hainline
Robert Martin

The student author, who’s presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this creative component. The Graduate College will ensure this creative component is globally accessible and will not permit alterations after a degree is conferred.

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Ames, Iowa
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CHAPTER 1. INTRODUCTION

Whenever people ask me what I do for a living, I prepare myself to provide an answer to two very different personnel: the first is someone who knows exactly what an agricultural educator is, which is always the dream response. The later, more likely scenario, is that they have no idea what that is or why I “teach farming to kids”. These individuals I come across are no different than the students in high school that I teach: a small percentage know what my agricultural classes are about and why they are important, but the majority thinks we are “hicks that drive big trucks and wear boots and shovel manure for fun”. Though it is always exciting to teach those who share a passion, knowledge, and love of agriculture like myself, my biggest goal in becoming an agriculture teacher was to teach that 90%, who don’t fully understand, how agriculture impacts them each and every day. To see them mold their narrow view into one that encompass all that agriculture is, and know more about it than the facts they find on social media sites, is very fulfilling to me. Most of my students don’t even realize how much of their daily lives depend on agriculture, and if they are aware, they cannot fully or confidently answer the question, “Where do you see agriculture in your daily life?” This is a question I strive to have my students be able to answer by the time they leave my classroom.

An aspect of agricultural education I enjoy teaching is the obvious sides of agriculture: such as raising animals and crops. However, I really like throwing my students curveballs to expand their knowledge on what “working in agriculture” could look like outside of a field or a barn. Many of my students don’t realize you can wear a lab coat or a suit and tie every day and be employed in agriculture. My goal as their teacher is to show them that and more. Most of the Corunna High School population isn’t directly from a farm, so many don’t see agricultural classes as a necessary or intriguing subject to take. I have had to use inventive strategies to draw
them in. One topic in particular which always gets my students attention is “food”: “How long until lunch?”; “Can we have cupcakes tomorrow? It’s a classmate’s birthday.”; “What did you have for dinner last night C4, anything good?” If it involves eating something, my students attention is immediately removed from their phones, computers or best friend and zoned in on the conversation, whether they like the food we’re discussing or not. I have always wanted to harness that love for something students have, and use the energy to teach them things about “something”. Plus, I love agriculture, so the concept of tying the two topics together into a separate course excited me. During the 2017-2018 school year, I taught two sections of a third-year biology course called Topics in Biology where I had creative expression to manipulate what we learned in the course. I saw this as a way to teach about the biology of the food we eat, covering topics such as gluten, hormones, Genetically Modified Organisms (GMOs), food labeling and food mongering. I mentioned to my Topics in Biology students on the first day of class that they are going to be in charge of deciding what they buy and what they eat; for the rest of their life, they are dependent on the food sources grown and processed all around them. I don’t care what they pick off the shelf to eat, but they need to be informed citizens; they need to understand what they are buying and how it is produced; they need to know what those labels are actually telling them. By the end of this course, I hope that my students will be able to make intelligent, fact-based decisions about their food, not ones based on the latest fad or post they saw on social media.”

Due to the needs of our student body, that course has now transitioned into a more all-encompassing science class called Topics in Science, covering instead a bit of physics, chemistry and biology. However, I really enjoyed working with those juniors and seniors teaching them
about the science of the food industry. I wanted these concepts to continue to be taught to the students in my high school, and thus, the idea behind the creating a new course was born.

According to the Institute of Food Technologists, food science is defined as, “…the study of the physical, biological, and chemical makeup of food; and the concepts underlying food processing” (Institute of Food Technologists, 2019). This is the basis I want to build my food science curriculum around. A course designed for juniors and seniors in high school that will give them valuable information about the food system around them, before they are on their own making decisions on what to buy, how to cook something, and what to eat. They’ll also learn about career opportunities within this avenue of agriculture. This course will offer students a different lens into the world of agriculture, the food industry.

CHAPTER 2. LITERATURE REVIEW

“The average American is now at least three generations removed from the farm. In fact, farm and ranch families make up less than two percent of the U.S. population” (American Farm Bureau Federation, 2019). With the ever rising world population, the need for those involved in agriculture is rising, even though the numbers of those directly involved in agriculture is quickly shrinking. Though we don’t need as many farmers as we used to(one U.S. farm feeds 165 people annually (American Farm Bureau Federation, 2019), we still have 9.7 billion mouths to feed by year 2050, which means farmers will have to grow about 70 percent more food than what we are now (American Farm Bureau Federation, 2019).

To help combat the lack of our population learning about agriculture directly, the need to create advocates through another medium is necessary. The next best way to do so is through
agricultural education. “Teachers and educators, who have the unique ability to reach this next generation of problem solvers…help society develop a certain level of agricultural literacy, which allows consumers to make decisions with science in mind. After all, agriculture is the foundation of our lives” (Monsanto, 2017).

“The basic core of agricultural education instruction consists of three intra-curricular components: 1) classroom instruction, 2) experiential learning through supervised experiences, and 3) leadership activities. When these three components are actualized through a well-designed integrated program, they provide a context for learning necessary content and life skills to prepare students for adulthood, regardless of their ideal career areas” (Dailey, Conroy, & Shelley-Tolbert, 2001, p. 11). Agricultural education not only helps to create advocates for the industry, but helps students become more skilled, self-driven leaders. Agricultural education covers a broad spectrum of topics, including basic agriculture, food and natural resource concepts (National Association of Agricultural Educators, 2019), thus it can also provide students with a working knowledge of two basic, necessary concepts of the industry: food and fiber systems.

“The U.S. agriculture sector extends beyond the farm business to include a range of farm-related industries. The largest of these are food service and food manufacturing,” (United States Department of Agriculture, 2018). They should be able to understand the job market and implications of food safety, technology and science to the world around them. Food is a part of each and every one of their lives, whether they work in that industry or not, which is why it is the largest sector of agriculture.
In a 2016 study, conducted by the Center for Food Integrity, it was found that “80% of people want to know more about their food and how it is produced, but lack a direct connection to agriculture” (Michigan State University AgBioResearch, 2019). Due to facts like this, Michigan State University AgBioResearch has a program called Food@MSU that’s initiative is to listen and provide scientific information to help individuals gain more knowledge on food and the food industry itself. To help this initiative gain a better understanding of what the public’s current knowledge and perception of food is, they created the Food Literacy and Engagement Poll, asking an array of easy to difficult questions about the industry and food knowledge in general. “Results provide an impartial and authoritative source of public perspectives on food to inform and guide discussion at Our Table and Food@MSU” (MSU Food Literacy and Engagement Poll: Wave 1, 2017). The study has been performed three times so far, starting with the first wave published August 17, 2017, and ending with the most recent wave published October 11, 2018. Plans are to continue to send out two waves of polls each year.

In August of 2017, the following statistics were determined from the first wave of the poll (MSU Food Literacy and Engagement Poll: Wave 1, 2017):

- Of those surveyed, roughly 86% would say food labels influence their food buying decisions, with 73% of those surveyed stated they rank their understanding of the global food system at a 4 or 5 out of 5, stating their knowledge is much higher than the average person.
- 52% of people rarely (less than once a month) or never seek information on how their food was grown or produced.
- 70% of people are concerned about the safety of the food available for purchase in their community compared to other communities.
In March of 2018, the following additional statistics were calculated from the second wave of the poll (MSU Food Literacy and Engagement Poll: Wave 2, 2018):

- When it comes to nutrition and health, 50% of individuals turn to family, friends, magazines, blogs, TV, social media vs their doctors or academic/scientific research to find answers to questions about these food issues.

Lastly, in October of 2018, the third wave of the poll was conducted (MSU Food Literacy and Engagement Poll: Wave 3, 2018). Based on this, the most recent survey to date, it was found “52% of consumers trust academic scientists for information about the health and safety of food. 45% trust government scientists and 30% trust industry scientists” (Tekip, 2018). “It’s notable the most popular terms consumers search for on food labels are also the most ambiguous,” said Sheril Kirshenbaum, co-director of the MSU Food Literacy and Engagement Poll. “Natural doesn’t necessarily imply something is healthy. For example, arsenic occurs naturally, but we shouldn’t eat it.” 59% of Americans always or sometimes purchase organic food. The most common reason is “organic food is healthier” (Tekip, 2018).

What the poll results point to is this simple fact: there is a need to educate people about the food industry. With more consumers turning to less reliable sources to answer their questions about these issues (MSU Food Literacy and Engagement Poll: Wave 2, 2018), there needs to be an intervention; agricultural education needs to step in and help combat these issues.

According to Claudia Fajardo-Lira, a teacher in the food science department at California State University Northridge, “The main purpose of food science is to keep our food supply safe and to offer options to our consumers that are healthy,” (Rosales, 2017). If we are to continue to
feed our growing population, then we need to find ways to not only raise and distribute food safely, but to increase consumer knowledge of the food industry around them. This will lead to a more stable level of trust between producer, manufacturer, and consumer, of which has slowly been diminishing.

According to The Journal of School Health, “students may be receiving less than an average of 4 hours of nutrition instruction per year,” (Carraway-Stage, Hovland, Showers, Diaz, & Duffrin, 2015, p. 231). This means students leave high school not fully understanding their body’s basic nutritional needs, let alone fully understanding what to purchase from the store and how to prepare and eat it safely.

To trust the future of our food supply is in good hands, we have to teach consumers a general food safety and nutrition information set before they are stuck doing it all on their own. If we just simply let them figure it out by trial and error, then we are not only doing our industry a disservice, but our students as well. In this fast-paced, technology driven world where information can be misinterpreted all too quickly, we need to ensure that they are getting factual information that quickly as well. On average, “Americans’ expenditures on food amount to 13% of household budgets,” (United States Department of Agriculture, 2018). With such a high percentage being spent on food, they should at minimum understand what they are purchasing to be able to justify that amount of money. Currently, it is a battle every day at the grocery store to navigate and comprehend food labels and products. In that moment, looking at two versions of the same product, consumers have to make a quick decision on what to purchase, more often than not, based on little or false background information. According to recent survey results from the company Label Insight, “39% of U.S. consumers say they would switch from the brands they currently buy to others that provide clearer, more accurate product information…68% say
they’re willing to pay more for foods and beverages that don’t contain ingredients that they perceive are bad for them,” (The Neilsen Company, 2017, p. 3). Pair this with information gathered in the Michigan State University Food@MSU poll results, and clearly, there is a huge push for products to disclose any and all information they can about their products on the labels to help make that split decision of which product to buy easier. However, this transparency aspect was taken far too literally in the food industry: “the marketing strategy in response to this (transparency) consumer demand has gone beyond articulating what is in a product, to labeling what is NOT in the food…So-called ”absence claims” labels – those that arbitrarily tell a consumer what isn't in a product, rather than what is – represent an emerging labeling trend that is harmful both to the consumers who purchase the products and the industry that supplies them,” (Vilsack, 2018). This begs the question of do consumers even know what the labels mean to discern what they want to buy?

CHAPTER 3. METHODS AND PROCEDURES

The concept for this course began last year, during the 2017-2018 school year. I had a course called “Topics in Biology” on my schedule, one section in the fall semester and another in the spring semester. This course had mainly juniors and a handful of seniors enrolled, and the curriculum outline for the outcomes of the course when taught previously was vague. Essentially, this was an elective third year science credit for students to take which had a base in Biology. Being an agricultural educator at heart, I took this opportunity to teach a portion of the course along a passion of mine had started to take shape during my college career: food science. In basic Biology class, students learn about hormones and genetics, but not many knew how to
apply them to the food production and consumption industries, so I decided to teach them about that.

During the first half of the class we talked about scientific research and the steps it takes to ensure published work is valid, and what happens if it is falsified etc., as well as how to find reliable sources and cite them properly in a written format. We also discussed marketing strategies, general ones, which were going to come into play when we started looking at labeling. We eventually worked our way through what gluten is, and how it works, and where we typically will find it. Then we looked at labels in the industry that use it to help those with health issues and those who are marketing towards a certain lack of knowledge. We did this research with hormones and GMO’s as well. This portion of the course ended with a scavenger hunt through the store and/or their cupboards at home to find labels related to all three (gluten, hormones and GMO’s). Students had to create visual aids to describe the labels they found: the marketing techniques, and if the label was used correctly and/or helpfully or if it was there to confuse the uneducated consumer, etc.. Throughout this portion of the class, we also did debates, argumentative writings, and a lot of research to find both factual and false information about all of these topics on the web and in social media sites.

I enjoyed immensely teaching this unit of the course, as I feel it really pushed students to think about how Biology is used in the world around them every day and how it can impact their lives, especially from a food perspective. Everyone has to eat, so it really hit home with them how they could apply this knowledge outside of class. I still have students from those two classes coming back to me and discussing ways they’ve implemented topics learned in that course, which is exciting to me as well.
When the course objectives switched to include more physics and chemistry, and the name was changed to “Topics in Science”, the idea of creating a stand-alone food science course was a must for me. I want my students to be able to understand food labels telling them both what is in the food and what is not in the food, and be able to know which is there for health reasons and which is there for marketing reasons. With the background knowledge of what things like gluten and hormones are, they can determine what food to buy and use the labels as guidelines versus as fear-driven decision factors. My students should be able to pick up any bag of dried cranberries off of the shelf and know they are gluten free, whether the bag says so or not.

In addition to navigating the food labeling world, they should also understand how and why foodborne illnesses occur to help themselves and others stay safe and healthy. “Food can become contaminated at any point of production and distribution, and the primary responsibility lies with food producers. Yet a large proportion of foodborne disease incidents are caused by foods improperly prepared or mishandled at home, in food service establishments or markets,” (World Health Organization, 2017). To help students understand their role in illness prevention, we have to teach them that. They need to be able to understand the most basic of food safety practices, such as why you wash your hands and cook things to certain temperatures and why you use different cutting boards for meat and vegetables. They should understand the reason why you can order your steaks medium rare, but not your chicken sandwich.

Lastly, I want my students to understand the connections of food science to the world of agriculture, and how they can be a bigger part of the food industry than simple consumption. I believe they should understand the most basic yet crucial aspects of an industry that affects so much of their daily lives, and this course is a great place to start.
I began to build the course outline and description to have a better outline to present to my administrators. I knew I wanted the course to be a semester long. I also knew the overall focus of the class was to provide junior and senior high school students a foundation for food science to assist them with basic food safety and purchasing information, as well as provide opportunities of further education and/or potential careers in this vital sector of agriculture. In addition, I knew I wanted this course to be an elective agriculture course to give my ag students more course choices. I also wanted my general education students to have an additional third year science elective to take, in case food science was of interest to them. All members would be in our FFA program if they were in the course, and would receive their third year science elective credit.

As a result, the topics covered in the Topics in Biology course I taught were considered in the curriculum, as well as the following sources:

- Kansas State University Food and Nutrition Science Curriculum (Kansas State University, 2018).
- Cornell High School Food Safety Curriculum (Cornell College of Agriculture and Life Sciences, 2017)
- FDA: US Food and Drug Administration (U.S. Food and Drug Administration, 2019)

The next step was to work with my administrators to get the ball rolling on getting a new course approved, which doesn’t happen overnight. In mid-October of 2018, I reached out to my principals and superintendent, and they directed me to our curriculum director. At this point, I had a pretty good idea of what I wanted to cover in the course, and what age group it was going
to be tailored to, but I didn’t have a name for the course or a way to pitch it to the students. My curriculum director and I met in the beginning of November, and she mentioned she liked the concept, in fact she asked if she could be in the class. However, she agreed: the name needed more zing, and I needed to find a way to draw in my students through my course description. She told me to survey all the students my teaching partner and I see throughout the day that semester and ask if this was a class they’d take. In addition, she wanted me to see if they had any name suggestions.

I drafted a more student-friendly description of the course, and my teaching partner and I pitched it to our students:

“Food Science” Pitch

11th - 12th graders

Have you ever wondered what goes into a food label? Not the typical “percent fat” or “protein amount” labels. But the “GMO Free” labels or “Gluten Free” labels? Have you ever wondered what those even mean? And why and how companies use those fancy labels to get you to buy their product over others? Then “Food Science” is the course for you! In this class, we will talk about those label types from a scientific perspective: what actually is gluten, hormones, and GMO’s? What does it mean to have food be raised organically? We will also discuss how and why companies label things the way they do too, by talking about “Fear Based Marketing” strategies. We will also cover the basics about food safety: how long do you have to grill that steak to eat it safely when you like it rare, or medium rare? What is cross contamination? How long do you really have to scrub your hands to be clean after handling raw meat? Lastly, we will cover job opportunities in the food science industry. This course is an elective agriscience class that can also serve as a general science elective credit. By being in “Food Science”, all students are dues paying members of the Corunna FFA Chapter. FFA activities and teaching units are integrated into all levels of the agriculture classes offered through the high school.
By mid-November, I sent the survey results back to my curriculum director. It looked like the following:

“Food Science” Pitch Survey Results

Of the 182 students surveyed, 109 were interested in taking the course (59.8%).

65% of the students interested were juniors or seniors in college (70.85%), which is a positive sign because it is a course geared for older students.

Name ideas they came up with were the following:

- Food and Health Science
- Nutrition Science
- Science of Eating Food
- Edible Chemistry
- Edible Science
- Science of Food
- Cuisine Chemistry
- Foodology
- Fear Marketing Food Science
- Food and Nutrition

In addition, the students provided me with ideas on what types of things they thought would be fun to learn about in the course based on the description provided to them.
My curriculum director really wanted me to take the lead on the final name choice, as the board wouldn’t be reviewing the course until the January meeting. By mid-December, with help from the ideas my students provided, I came up with the official name of the course: FoodSTUFF which stands for “Food Science: Turning Unfounded Fears to Facts”. Now all that was left to receive was an approval from the board in January.

CHAPTER 4. PRODUCT

On January 21, 2019, my course went before the board and was officially approved! The next step was to get the official write-up about the course into the course guide for next year’s classes so when students sign up in the next few months, they can see this as an option. Also, I made up a flyer that could be posted in both of our ag rooms to continue to encourage students to sign up for the class.

FoodSTUFF Course Description

(FoodScience: Turning Unfounded Fears to Facts)

- 11th - 12th Grade Students
- Fall or Spring Semester
- 1 Elective Credit
- Prerequisite: Two Science Credits: A life science credit (Biology or Zoology/Botany) and one additional science credit (Physics, Chemistry, Topics in Science etc.)

Have you ever wondered what goes into a food label? Not just the typical “percent fat” or “percent protein” labels. The “GMO Free”, “Gluten Free”, “Hormone Free” labels. Have you ever wondered what those statements even mean? And why and how companies use those fancy labels to get you to buy their product over other similar products? Then FoodSTUFF is the course for you! In this class, we will talk about those label types from a scientific perspective:
what actually is gluten, hormones, and GMO’s? What does it mean to have food be raised organically versus conventionally? These are the types of questions we will tackle in the course. In addition, we will also discuss how and why companies label things the way they do too, by talking about “Fear Based Marketing” strategies. We will also cover the basics about food safety: how long do you have to grill that steak to eat it safely when you like it rare, or medium rare? What is cross contamination? How long do you really have to scrub your hands to be clean after handling raw meat? Also, we will cover job opportunities in the food science industry, among other topics of discussion related to food science.

This course is an elective agriscience class that can also serve as a general science elective credit. By being in the FoodSTUFF course, all students are dues paying members of the Corunna FFA Chapter. FFA activities and teaching units are integrated into all levels of the agriculture classes offered through the high school. Through the FFA, students have the opportunity to compete in State Leadership and Skills Contests, personal projects, community service activities, and field trips. See FFA section for more details. Once again, this class could serve as an elective agriculture class as well as a third year general science elective course. Regardless, all students enrolled in the class are a junior or senior level student and a dues paying member of the FFA.
New FoodSTUFF Course!

Have you ever wondered what goes into a food label?

Coming Fall 2019!

Special points of interest:
- 11th - 12th Grade Students
- Fall or Spring Semester
- 1 Elective Credit
- Prerequisite: Two Science Credits
- See 2019-2020 Course Guide for more information!

The “GMO Free”, “Gluten Free”, “Hormone Free”, “Organic”, “Natural” labels?
What do these statements even mean?!
What even is “Fear Based Marketing”??
Do you know how long you have to grill that steak to eat it safely when you like it rare, or medium rare?
Or what cross contamination looks like?

Then FoodSTUFF is the course for you!

“Food Science: Turning Unfounded Fears to Facts”

Being in class, you’re in the FFA!

This course is an elective Agriscience class that can also serve as a general science elective credit. By being in the FoodSTUFF course, all students are dues paying members of the Corunna FFA Chapter.
This course is an elective, so the only way it can run is if people sign up for it. I am hopeful over the next few months we can encourage enough people to sign up for the course to allow it to run in the fall of 2019 semester! By covering basic food science concepts, I can hopefully increase not only my student’s knowledge on the food industry itself, but how to be better problem solvers and researchers when they don’t know the answer the complex questions.

On the following pages, I have inserted examples of some of the assignments the students will do as well as a general semester outline of what is to be covered in the course.

**Movie Reflection Questions: Concussion**

1. What does this movie tell you about scientific research? And its validity?
2. What is required of you to become a valid, published scientist?
3. What happens if someone retracts his or her research?
4. What does this movie do to help us understand how to do research for information on our own? (how do we know we can trust the experiments and research we find published?)
Gluten Poster/Flyer Rubric

Part 1: 10 points
- All of your gluten web search notes are submitted (what is gluten, the chemical structures and the photo of a gluten product with an explanation on misleading or appropriate labeling)

Part 2: 20 points
- Gluten Poster/Pamphlet (in pairs or solo) that includes the following information:
  - What should a person be told about gluten to be fully knowledgeable about it if they saw it on a label in the store?
  - What is it? Where do we find it? How does it affect you?
    - Use your video notes and gluten web search notes to help you!
    - Include a reference for someone to visit to find out more information on your facts about gluten

**Project can be made digitally (shared with me) or on a poster**
**Must fill all white space**
**Can use printed off pictures if you’d like**

Total: 30 points

MythBusters Assignment

Time to bust some myths! Or...prove them true!

You will be in groups and assigned one topic area in animal agriculture that you have spent time finding information on (poultry, dairy or beef). You need to look for the most abstract, random statements on the internet about hormone use with that animal species. Each group member will find a unique statement about hormone use about the topic.

Each group will collaborate to create one Google Slides document. In the document, each person will create one slide each, with their own unique statement or quote on hormones. After you find that statement, I want you to prove it true or false - use the websites I shared with you on Google Classroom, or locate other credible websites to help you prove it true or false. You MUST include the websites where you gathered your statement and your response to it.

Each person is required to have two different websites to prove the statement true or false for full credit!

Include pictures and colors on your slides….make it stand out!

You will have ____________ to complete your task - this is a lot of time, which means you have a lot of time to do a lot of digging to find your unique statement and evidence information! We will be sharing them out to the class on Tuesday.
GMO Argumentative Paper Assignment

Write a 2-page reaction paper single spaced, 12 point font on the provided Google Document on classroom (post called “GMO Paper”) about YOUR opinions on GMO's. Use the articles you have that we highlighted, and/or those you found during the corn chip project to help you. Think about the following as you write:

- Overall, what do you feel should be the most important aspect to consider when choosing which chips the school should sell? Why?
- How do you think the social and cultural issues surrounding the GMO debate could influence what chips people might choose? Explain
- Did your opinion about GMOs change from the beginning of the debate to the end? If so, how? If not, why not?
- What do you think influenced you most to pick the brand of chip you did? (It may have changed your mind, but it also may have made your decision firmer.)
- Pretend I am a consumer who knows nothing about GMO's -- explain fully to me what GMO's are, how they've changed over time, what the difference is between GMO and GM products, and state the positives and negatives of this type of biological change.
- Explain anything else you think is important about GMO's to get your point across.

See the rubric below for more details. This is what I will use to grade your paper. You will have the remainder of the week to work on your paper in class. *It is due by_____.*
**FoodSTUFF: Labels Project**

Your task: create a visual aid to outline your knowledge of labeling and marketing on food products. Take a trip to your local grocery store or to your cupboards and go on a labels search! You need to find three labels total:

1. One that mentions gluten
2. One that mentions hormones
3. One that mentions GMO’s

Take the following photos of each of your products:

- A close-up of the gluten/hormone/GMO portion of the label
- An overall photo of the food product

Could you accurately describe the labels to a consumer so they know exactly what they are buying? Could you provide detailed answers to questions like, “What does this part of the label mean?” and “Is this label appropriately used on this product?” That is your goal with this project: to fully describe the labels you found. In addition, you must include a website link for each area (one for gluten, one for hormones and one for GMO’s) that someone could click on to find out more information.

This is due by the end of the class on ______________. ______________ and ______________ we will spend time presenting the pictures you took with your explanations about them to the class. This project is worth a lot of points, so please use your time wisely to make the final product your best work.

You can create your project one of three ways:

1. On Google slides (one topic per slide)
2. On a standard sized poster board (24” by 36”) (split it into three sections)
3. On a tri-fold board (one topic per panel)
Food Science Career Development Event Guidelines

Group Project

1. Team Product Development Project (400 points)
   A. Each team will receive a marketing scenario describing a need for a new or redesigned product that would appeal to a potential market segment. This scenario will contain a description of the existing marketing situation, competition, and potential target market segment to be served by the new product. It is the task of the team to design a new or reformulated food product or reformulate an existing product. The team will be responsible for understanding and using the following concepts:
      ❖ Formulation of product to meet specified market requirements.
      ❖ New package design to reflect developed product.
      ❖ Nutritional label development and adjustments.
      ❖ Processes and equipment used to produce and package the product.
      ❖ Provide quality and safety control programs (i.e. quality tests, good manufacturing practices (GMP), and hazard analysis critical control point analysis (HACCP)).
   B. Each team will be provided with materials and necessary information to create the principal display panel and information panel of the product’s package.
   C. The team will have 60 minutes to respond to the marketing scenario and reformulate or develop a new product, calculate nutritional data, develop a label that includes the principal display panel, nutritional label, and ingredient statement. At the end of the time period, the team will turn in a written summary of answers to the questions asked in the scenario, as well as, portions of the label previously mentioned.
   D. The general topic of the product development activity will be provided to the eligible teams approximately one week prior to the state competition.
   E. The written answers to the questions are worth 300 points and will cover the following topics: formulation, marketing, nutrition, quality control, product processing/packaging, food safety, economics.
   F. The label components are worth 100 points and need to include:
      ❖ Principal Display Panel – includes all necessary elements, conveys information, and contains elements that appeal to the consumer.
      ❖ Information Panel – includes all necessary elements and correct calculations of nutrition facts (%DV not necessary for nutrients; vitamins and minerals should just be reported as weight (not %DV).
Individual Assignments

1. Objective Test
   A. The objective questions administered during the Food Science and Technology examination will be designed to determine each team member’s understanding of the basic principles of food science and technology. It will encompass the knowledge required of all of the other activities in the contest as well as material from *Food Science: The Biochemistry of Food and Nutrition*.
   B. Team members will work individually to answer each of the 50 questions. Each person will have 40 minutes to complete the examination. Each question will be worth 2 points. Points will only be awarded for correct answers. The total number of points possible for this activity will be 100 points per individual (400 points per team).

2. Practicums – Each team member will compete individually in all practicums.
   A. Food Safety and Quality
      ❖ Customer Inquiries
         Each participant will be given five (5) scenarios representing general consumer inquiries. Participants must determine if the consumer inquiry reflects a quality or safety issue (3 points each) and determine if the concern or hazard is biological, chemical, or physical in nature (3 points each). Refer to explanation document for additional information. Participants will be given approximately 10 minutes to complete this activity. The total number of points for this activity will be 30 points per individual (120 points per team).
      ❖ Food Safety/Sanitation Problem Identification
         Each participant will be shown six (6) pictures. The pictures may or may not show a violation of good manufacturing practices (GMPs), sanitation, food handling/storage and other pre-requisite programs. A list of violation categories including the option of no violation will be provided. Participants will identify which category best describes each picture. Participants will be given 15 minutes to complete this activity. The total number of points for this activity will be 30 points per individual (120 points per team).

      GMP Violation Categories
      • improper personal hygiene
      • improper sanitation
      • improper food handling
      • improper chemical use/storage
      • improper pest management
      • no violation
B. Problem Solving/Situational Math Practicum – Participants will answer a series of mathematical calculations based on common food science themes, totaling 25 points per individual (100 points per team). Questions may include nutrition calculations, ingredient quantity, cost benefit analysis, estimation of cost/margin of goods sold, conversions, processing conditions, etc.

C. Sensory Evaluation
   - Triangle Taste Tests
     Three (3) different triangle tests will be conducted. Participants are expected to evaluate the three samples provided and identify which one is different through flavor, aroma, visual cues and/or textural differences. Participants are not required to consume (swallow) samples. Samples may be any of the following: food, beverage, prepared solutions (sweet, sour, salty, etc.). Samples may contain food allergens, including but not limited to milk, eggs, peanuts, tree nuts, fish, shellfish, soy, and wheat. Participants will be given approximately 10 minutes to complete this activity. The total number of points for this activity will be 15 points per individual (60 points per team).
   - Aroma Identification
     Each participant will be asked to identify the aroma in each of the 5 sample vials. A list of all 31 possible aromas will be provided. Participants will be given approximately 10 minutes to complete this activity. The total number of points for this activity will be 25 points per individual (60 points per team).

<table>
<thead>
<tr>
<th>Aromas</th>
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<tbody>
<tr>
<td>Apple</td>
<td>Smoke</td>
<td>Banana</td>
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<tr>
<td>Chocolate</td>
<td>Cherry</td>
<td>Coconut</td>
</tr>
<tr>
<td>Maple</td>
<td>Butter</td>
<td>Strawberry</td>
</tr>
<tr>
<td>Oregano</td>
<td>Sage</td>
<td>Licorice (anise)</td>
</tr>
<tr>
<td>Basil</td>
<td>Grape</td>
<td>Peach</td>
</tr>
<tr>
<td>Lemon</td>
<td>Garlic</td>
<td>Onion</td>
</tr>
<tr>
<td>Lime</td>
<td>Peppermint</td>
<td>Raspberry</td>
</tr>
<tr>
<td>Orange</td>
<td>Clove</td>
<td>Molasses</td>
</tr>
<tr>
<td>Vanilla</td>
<td>Nutmeg</td>
<td>Watermelon</td>
</tr>
<tr>
<td>Coffee</td>
<td>Ginger</td>
<td>Wintergreen</td>
</tr>
<tr>
<td>Cinnamon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Materials Provided</td>
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<tr>
<td>Week 1</td>
<td>Introduction: welcome to the course; get to know you activities; pre-test on knowledge of the food industry and labeling; why is biology and science important essay question; scientific method introduction lab</td>
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<tr>
<td>Week 2</td>
<td>Nutrition and nutrition labels: what are the basics to understand on a nutrition and food label; requirements of basic food labels; basic food nutrition (necessary nutrient requirements) etc.</td>
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<tr>
<td>Week 3</td>
<td>Nutrition and nutrition labels: what are the basics to understand on a nutrition and food label; requirements of basic food labels; basic food nutrition (necessary nutrient requirements) etc.</td>
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<tr>
<td>Week 4</td>
<td>Other labels on food: fear-based / Marketing Techniques: marketing methods and techniques; bring in label of food you're confused about; show food labels I found; watch speech about fear-based marketing</td>
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<tr>
<td>Week 5</td>
<td>Other labels on food: fear-based / Marketing Techniques: marketing methods and techniques; bring in label of food you're confused about; show food labels I found; watch speech about fear-based marketing</td>
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<tr>
<td>Week 6</td>
<td>Credibility of Science: watch Concussion movie; talk about scientific credibility; learn about how to find credible sources</td>
<td>Movie Reflection Questions: Concussion</td>
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<td>Week 7</td>
<td>Gluten: What is it? What does it look like? Where can we find it? What is a gluten substitute? It's appearance on labels - fear-based or appropriate? Make a flyer/label for a food product to tell people about gluten.</td>
<td>Gluten Poster/Flyer Rubric</td>
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<tr>
<td>Week 8</td>
<td>Gluten: What is it? What does it look like? Where can we find it? What is a gluten substitute? It's appearance on labels - fear-based or appropriate? Make a flyer/label for a food product to tell people about gluten.</td>
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<td>Week 9</td>
<td>Hormones: What is a hormone? What is the difference between natural and added hormones? What is the purpose of hormones in the livestock industry (specifically poultry, dairy and beef) and what are the current practices? MythBusters project on hormones</td>
<td>MythBusters Assignment</td>
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<tr>
<td>Week 10</td>
<td>Hormones: What is a hormone? What is the difference between natural and added hormones? What is the purpose of hormones in the livestock industry (specifically poultry, dairy and beef) and what are the current practices? MythBusters project on hormones</td>
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<td>Week 11</td>
<td>GMO's: genetics basics - terms to know; applications of genetics in agriculture; grow and test GMO vs Non-GMO corn differences; difference between genetic modification and engineering; Bill Nye GMO video; what are the GMO's available in agriculture; purpose of GMO's; food labeling around GMO's; food taste - corn chips; pros and cons' -- GMO debate; GMO argumentative essay project</td>
<td>GMO Argumentative Paper Assignment</td>
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<td>Week 12</td>
<td>GMO's: genetics basics - terms to know; applications of genetics in agriculture; grow and test GMO vs Non-GMO corn differences; difference between genetic modification and engineering; Bill Nye GMO video; what are the GMO's available in agriculture; purpose of GMO's; food labeling around GMO's; food taste - corn chips; pros and cons' -- GMO debate; GMO argumentative essay project</td>
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<tr>
<td>Week 13</td>
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<td>Week 14</td>
<td>Labeling project - work days and presentations</td>
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<td>Week 15</td>
<td>Careers: look up different careers in the industry and create a poster board then share out; invite a guest speaker</td>
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<td><strong>This could be at the start of the course too</strong></td>
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<td>Week 16</td>
<td>Food Science CDE: food safety and quality topics; sensory evaluation</td>
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<td>Food Science Career Development Event Guidelines</td>
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<tr>
<td>Week 17</td>
<td>Food Science CDE: situational math calculations and objective test</td>
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<tr>
<td>Food Science Career Development Event Guidelines</td>
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<tr>
<td>Week 18</td>
<td>Final project (food product development project); post-test</td>
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<tr>
<td>Food Science Career Development Event Guidelines</td>
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In order to continuously make my course stronger each year, I plan to have multiple forms of course evaluations. During the course, I will survey the students in a simple, small way to determine if they like the way that the content was taught in each unit. A simple conversation with the class will work well to determine what went well and what could go better or be done differently throughout the unit. This type of evaluation will help me ensure that the way the content was taught is fresh in their minds when I survey how it went. In addition, I will survey them at the end of the course, asking them questions about their overall opinion of the course, things they will use into their future that they gained, etc. I also plan to always be posting and sharing out things that we are doing in the course to help spread the word about the course as it is
going on. This helps market the course to the rest of the student body as well as keep my administrators and community members following my social media sites for my class informed about what we are doing. In this way, I can always be evaluating how the course is going, and adjust on the fly or from year to year to ensure the course is always at its best for my students.

CHAPTER 5. REFLECTION

Something I am greatly looking forward to is changing my student’s perspectives on the food industry through this course. I really want them to be educated consumers, and if they don’t understand something, to know how to problem solve and find reliable information for themselves. Often, as mentioned in my literature review, people turn to social media or friends and family for answers versus going to more consistently reliable sources to find answers. I hope to instill in my students the ability to find facts versus fiction in this or any aspect of their lives, and make informed decisions with logical explanations on what food they purchase, not ones based on emotions or what someone else stated.

Many of the people I have interacted with throughout my college courses and throughout my early teaching career have been a big reason I wanted to teach a course like this one. Whether they knew what they were talking about or not, they helped me to see that this is a way that we can teach agricultural literacy and help to spread a more accurate message about agriculture, creating advocates for the industry regardless of the professions they go into.

Throughout the course, I hope to implement things like the scientific method, and have students grow crops both GMO based and non-GMO based and see firsthand how things like that can differ. I hope to have them go on scavenger hunts to look for the labels like I have in the past
and see where they are in their everyday life. Often, students don’t even look for these types of labels when they are shopping with their family, but they had opinions on all of the labels that we discussed. However, once they have been through the course, they start to be more cognizant and knowledgeable shoppers.

In addition, I hope to bring in some unique aspects of the food industry into the course as well, like the food safety side. Not many people understand how or why recalls are made, and I think having discussions on food contamination and food safety measures with students can be really helpful in their understanding of how complex it truly is. Also, students don’t really think of having a job in this field, but it is a vital one because everyone has to eat!

I have already begun discussing with other agricultural teachers some curriculum ideas to implement in the classroom, and I hope to be able to be able to implement more of the ideas they mentioned as well in my course. In addition, I hope to be able to provide any assistance to other agricultural teachers working on this type of course as well. There is a Facebook group that is strictly for agricultural educators around the nation to share out information or to ask for assistance from others in our profession. I believe this would be a great platform to get information out to others teaching or interested in teaching this topic, as well as potentially get more feedback for my course as well.

Through my graduate program, I have learned numerous things that I can implement in the future as an agricultural educator. The first thing that comes to mind is how much more I know about the breadth of agricultural education. I have always thought of it simply being in the classroom, and how many topics I can cover that are tied to agriculture that my students don’t even realize. However, there is so much more to agricultural education. It can be informal, like
extension programs, agricultural businesses, or cooperative education programs like conventions, seminars, and field days. It can also be formal, like the collegiate agricultural education programs utilizing experimental stations and teacher preparatory programs, as well as secondary education programs, like the one I am in. Knowing more myself about all of the constituents of agricultural education, I can instill this knowledge in my students, as well as work on bringing all of these forms of education together.

In addition, I have learned a lot about learning styles, teaching methods and motivation. Knowing about how students learn, and how that can evolve over their lifetimes based on numerous factors, is important when I am structuring my lessons. Knowing learning theories can help me see how I can be better in general as the leader of my classroom to help the atmosphere for learning be at its best. Knowing what motivates my students to be active learners is also important. Upon learning these topics, I could then take a step back and focus on how I learn best, and what motivates me to in turn motivate my students to want to learn. This lead me to create a personal teaching philosophy, which is an evolving document that helps me put into words what I believe in as a teacher, and help me stay motivated to be the best teacher I can be for my students. Learning how to create and implement my philosophy is something very valuable I gained in my graduate program.

From a lesson plan perspective, I have learned how to better design surveys to administer to my students, of which in each of my courses they take at least one throughout the semester course. Knowing how to create an effective one, I can then teach my students how to create their own, and utilize them in the food science course I created.
From a research perspective, I have learned more about how to locate and utilize scientific journals and literature to help support things that I am teaching. In addition, I can use these sources as reference points for my students to access as they do scientific research in my classes. In my current course, I am learning a lot more about how to perform research myself as well, and this has helped me immensely in knowing what ethical, significant research is and how to do so successfully, thus assisting me in my creative component as well.

CHAPTER 6. REFERENCES


Tekip, A. (2018, October). *Americans pay attention to food labels, but are confused by what information matters.* Retrieved from Michigan State University Food@MSU:

