COURSE TITLE: Food Safety and Microbiology

Course Description:

Food Safety and Microbiology is a specialized area of study focusing on pathogens and spoilage microorganisms in foods, the conditions under which they grow, and conditions under which they are commonly inactivated, killed, or made harmless; principles involved in food fermentation; the role of food in immunology; effective sanitation practices to control pathogen and microbial growth in food; principles involved in food preservation; grade classifications of meat and produce; and microbial analysis to determine food quality.

Potential Certifications:

Landscape Design and Plant Materials Certification

Landscape Management Technician

Forestry Worker Certification

Integrated Pest Management Certification

Briggs and Stratton Technician

NCCER Core

Urban Forestry Technician

Adult Beef Quality Assurance

Construction and Skilled Trade Assessment (CAST)

Landscape Design (LD) Permit

Specialty Crops

Aquaculture Training and Online Learning (ATOLL)

Course Scope and Sequence

Unit #	Unit Title	Estimated Hours
1	Foundational Standards	
2	Introduction to Microbes in Food	
3	Food Virology and Microbial Spoilage of Foods	
4	Food Fermentation	
5	Food Immunology	
6	Control of Microorganisms in Foods	
7	Food Grading	
8	Microbiological Analysis	

Unit Plans of Instruction

Unit 1 Title Foundational Standards	
Content Standards	**Supporting – will be taught throughout the course as needed for the unit.** F1. Incorporate safety procedures in handling, operating, and maintaining tools and machinery; handling materials; utilizing personal protective equipment; maintaining a safe work area; and handling hazardous materials and forces. F2. Demonstrate effective workplace and employability skills, including communication, awareness of diversity, positive work ethic, problem-solving, time management, and teamwork. F3. Explore the range of careers available in the field and investigate their educational requirements, and demonstrate job-seeking skills including resume-writing and interviewing. F4. Demonstrate digital literacy by using digital and electronic tools appropriately, safely, and ethically. F5. Participate in a Career Technical Student Organization (CTSO) to increase knowledge and skills and to enhance leadership and teamwork. F6.Participate in Supervised Agricultural Experiences and/or work-based, experiential, and service learning
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can apply practical industry safety practices when completing a task. ● I can identify proper safety practices specific to my industry to accomplish a job. ● I can identify and safely use the equipment specific to my industry to accomplish my design problem. ● I can appropriately communicate in a variety of ways: writing, speaking, and listening as it relates to the agriculture industry. ● I can demonstrate excellent employability skills that are desired in the workforce. ● I can demonstrate professional behavior through arriving to class on time, collaborating with classmates, and persevering through difficult tasks. ● I can identify a variety of Food Safety and Food Science related jobs in the agriculture, human services, and hospitality and tourism industry. ● I can discuss specific careers within the industry. ● I can create and develop a well written cover letter, resume, and thank you letter. ● I can demonstrate the properties of a good interview. ● I can both lead and contribute to a collaborative team while solving the design problem based on skills acquired through FFA or FCCLA. ● I can use skills acquired through my involvement in FFA or FCCLA to better my everyday life.

	● I can grow personal and professional utilizing skills learned in FFA or FCCLA. ● I can use technology ethically and efficiently that aids the food industry. ● I can document my SAE using the AET system.
Unit Driving/Essential Question	● What careers are available to pursue in the Food Science and Food Safety field? ● How does safety affect the workplace? ● What is the most important aspect of safety in the workplace? ● What are the essential employability skills one needs to obtain a career in the agriculture, human services, and hospitality and tourism industry? ● How can participating in FFA or FCCLA make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education? ● What essential knowledge and skills can be obtained from FFA or FCCLA to help build a career in the agriculture, human services, and hospitality and tourism Industry? ● What are the benefits of accurate record keeping in the agriculture, human services, and hospitality and tourism industry? ● How does technology play a role in agriculture, human services, and hospitality and tourism careers?
Exemplar High Quality Unit Task	Students will work synergistically in groups through projects, officer teams, and skilled FFA or FCCLA events. Students will complete a resume, cover letter, and thank you letter utilizing templates if needed. Students will develop speaking skills by reciting the FFA or FCCLA Creed. Students will research, create, and deliver a presentation highlighting a career in agriculture that interests them.

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Incorporate safety procedures in handling, operating, and maintaining tools and machinery; handling materials; utilizing personal protective equipment; maintaining a safe work area; and handling hazardous materials and forces. I can apply industry safety practices when completing a task. I can identify proper safety practices specific to my industry to accomplish a job. I can identify and safely use the equipment specific to my industry to accomplish my design problem.	Formative: Grades could include creating a presentation on safety procedures and hazards in the industry. Summative: Grades could include a safety test.	Students will make a presentation on safety rules and procedures and present it to the class. Students will create a 1 minute elevator pitch for why safety in the lab is most important. Students can demonstrate safety procedures.		Computer, Internet Access
Demonstrate effective workplace and employability skills, including communication, awareness	Formative: Grades could include a weekly employability check-off. Students are graded on	Students will create a skit on Soft Skills in the workplace.		Computer, Internet Access

of diversity, positive work ethic, problem-solving, time management, and teamwork. I can appropriately communicate in a variety of ways: writing, speaking, and listening as it relates to the agriculture industry. I can demonstrate excellent employability skills that are desired in the workforce. I can demonstrate professional behavior through arriving to class on time, collaborating with classmates, and persevering through difficult tasks.	punctuality, teamwork, and task completion and given a grade at the end of every week. Summative: Grades could include a job shadow field trip.	Students will be given an employability grade at the end of each week. Items that are under review could include: punctuality, behavior, preparedness and work ethic.		
Explore the range of careers available in the field and investigate their educational requirements, and demonstrate job-seeking skills including resume-writing and interviewing. I can identify a variety of Food Safety and Food Science related jobs in the agriculture, human services, and hospitality and tourism industry. I can discuss specific careers within the industry.	Formative: Grades could include completion of the career exploration in AET. Summative: Grades could include a resume. Summative: Grades could include a mock interview. Each student will build a resume, dress professionally and attend a mock interview.	Students will use the AET program to take an interest assessment for their future career goals. Students will create a resume. Students will participate in mock interviews with a follow up thank you note.		Computer, Internet Access, a student AET Account

I can create and develop a well written cover letter, resume, and thank you letter. I can demonstrate the properties of a good interview.				
Demonstrate digital literacy by using digital and electronic tools appropriately, safely, and ethically. I can use technology ethically and efficiently that aids the food industry.	Formative: Grades could be given on completing Everfi.com modules. Summative: Grades could include a test on digital literacy.	https://everfi.com/courses/k-12/digital-literacy-wellness-safety/		
Participate in a Career Technical Student Organization (CTSO) to increase knowledge and skills and to enhance leadership and teamwork. I can both lead and contribute to a collaborative team while solving the design problem based on skills acquired through FFA or FCCLA. I can use skills acquired through my involvement in FFA or FCCLA to better my everyday life. I can grow personal and professional utilizing skills learned in FFA or FCCLA.	Formative: Grades could be given on a CTSO meeting participation and summary. Students will attend a CTSO meeting and submit a meeting agenda and a short summary of the meeting. Summative: Grades could be given on the CTSO history and interesting facts.	Students will attend one CTSO meeting each month. After visiting each club they will turn in a summary of the meeting and an agenda for that meeting. Students will learn about the history of their respective CTSO. They will then be given a quiz.		Computer, internet access

Participate in Supervised Agricultural Experiences and/or work-based, experiential, and service learning. I can document my SAE using the AET system.	Formative: Grades could be given on a complete profile in AET. Summative: Grades could be given on a certain number of SAE entries in AET.	Students will log SAE hours in AET.		Computer, internet access, a student AET account

Key Vocabulary

AET, CTSO, digital citizenship, digital literacy, fire triangle, OSHA, resume, SAE

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Students will:
create a resume, cover letter, and job application.
research and share information about career opportunities in the forestry industry.
apply safety practices to real world situations.
identify tools and equipment.
explain safety standards and regulations
practice various communication skills. (non-verbal, verbal, written, oral, digital)
complete project and present on digital literacy
Supervised Agricultural Experience
Career Development Events
Talent Development Events

Leadership Development Events

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 2 Title Introduction to Microbes in Food	
Content Standards	1. Compare and contrast early developments in food microbiology to current practices. 2. Obtain, evaluate, and communicate information about the positive and negative effects of microorganisms on food products and their implications for the food processing industry. 3. Formulate evidence-based solutions to American and global food safety concerns.
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can identify when microorganisms were first discovered. ● I can compare and contrast the differences in how food spoilage was handled in early developments of microbiology and how food spoilage is currently handled. ● I can organize a timeline to identify the growth of science in the area of food microbiology. ● I can identify positive effects of microorganisms on food. ● I can identify negative effects of microorganisms on food. ● I can articulate the effects of microorganisms on food to others. ● I can identify the food safety concerns of microorganisms in America and globally. ● I can develop solutions for the food processing industry to combat the negative effects of microorganisms on food. ● I can develop solutions to global food safety concerns.
Unit Driving/Essential Question	● What role do microorganisms play in the food industry?
Exemplar High Quality Unit Task	Students will provide credible scientific research data Students will research best food handling practices Students will research global food production and trade Students will identify potential hazards in the food industry

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Compare and contrast early developments in food microbiology to current practices. I can identify when microorganisms were first discovered. I can compare and contrast the differences in how food spoilage was handled in early developments of microbiology and how food spoilage is currently handled. I can organize a timeline to identify the growth of science in the area of food microbiology.	Formative: Grades could be given on a timeline of important dates in the food processing history in America. Summative: Grades could be given on a unit test.	Give students a picture of an outline of a body from the waist up with thought bubbles at the top of the head and a rectangle at the bottom. Have them draw what they think the individual that discovered microorganisms looks like. In the thought bubbles, have students research microorganisms and write when and how microorganisms were discovered in the voice of the person they created. Have students write the name of the individual that discovered microorganisms in the rectangle at the bottom. Students work in groups to create a timeline to show major happenings in the area of food microbiology.	Using Alabama Virtual Library, students will find peer-reviewed journals that discuss microorganisms and when they were first discovered.	Copy of upper body sheet for each student. Computer or other device to research. If no device is available, page 21 can be printed from the follow text http://nuristianah.lecture.ub.ac.id/files/2014/09/fundamental-food-microbiology.pdf Copy of Timeline for each student. Could also use a computer to allow students to create using Google Drive. Device with internet.
Obtain, evaluate, and communicate information about the positive and	Formative: Grades could be given on research papers written on data	Students will complete a Venn Diagram comparing and contrasting methods of	MATH: Use tables and graphs to compare the food spoilage handled in	Copy of Venn Diagram for each student.

negative effects of microorganisms on food products and their implications for the food processing industry. I can identify positive effects of microorganisms on food. I can identify negative effects of microorganisms on food. I can articulate the effects of microorganisms on food to others.	collected on common microorganisms found in food. Summative: Grades could be given on a unit test.	controlling food spoilage in early development of microbiology and today. What's in my lunch activity. I am a poem activity. *Students will utilize an I am poem *Teacher assigns a microorganism that affects food to each student *The students research the microorganism and use what they find out to complete the I am poem as the microorganism would. *Present the I Am Poem to the class. *Create a poster with the I Am Poem and picture of something affected by the microorganism to be posted in the hallway for others to view.	early developments to that of the current development of microbiology. ELA: Writing: Using either the point-by-point or subject-by-subject compare/ contrast format, write an essay detailing how food spoilage was handled in early developments of microbiology and how it is currently handled. Use this as a guide for the two methods of compare/contrast: NROC Developmental English Foundations ELA: Using Sutori, students can create their timeline identifying the growth of science in food microbiology. MATH: Use exponential growth to learn how fast microorganisms grow on a surface area. (Mathematical basics) ELA: Create an infographic articulating the effects of microorganisms on food to others using Canva.	Devices to allow students to research. What's in my lunch activity directions? Devices for students to use for research. Copy of I Am Poem for each student. Devices for student research. Large Construction paper to create poster

			ELA: Students can peer edit their I AM poems. SCI: Food Safety & Microbiology involves research to improve our understanding of how microorganisms survive in food. In addition, it is the study of how processing factories and plants can limit and extend shelf life and sterilization of common household foods. SCI: SWBAT to define the following vocabulary terms and use them in a sentence as an introduction to the course. SCI: Food Safety/Microbiology SCI: Introduction to Food Safety & Microbiology SCI: Adjusting the pH of food lab (learning is fun lab) https://virtuallabs.nmsu.edu/salsa.php	

Formulate evidence-based solutions to American and global food safety concerns. I can identify the food safety concerns of microorganisms in America and globally. I can develop solutions for the food processing industry to combat the negative effects of microorganisms on food. I can develop solutions to global food safety concerns.	Formative: Grades could be given on a presentation done to highlight food safety concerns throughout history. Summative: Grades could be given on an Agriscience Fair project researching microorganisms and food.	Hook students by playing the *Microbes Melody* as they are coming into class. Write a poem about the negative effects of microorganisms on food. Handwashing review. Have students create handwashing posters to hang in the restrooms at school. Utilize the Bread Experiment to show how bacteria is everywhere. Students will review multiple situations on personal hygiene and controlling food borne pathogens and identify correct actions and incorrect actions. Utilize World Food Prize resources and have students submit a research paper on global food security issues and enter it into the competition to get the opportunity to go to the Alabama Youth Institute.	ELA: Students can write a children's book detailing the negative effects of microorganisms on food. ELA: Students can peer edit children's books. SCI: Who's Hitchhiking your Food? activity (students will culture common foods, i.e. hamburger meat & bagged salad, for bacterial presence & ID; students will then brainstorm bioengineering inventions for rapid response biodetection systems) **This activity will cover multiple LOs in this unit** ELA: Students can work with a team to create solutions to global food safety concerns. After working with their own teams, they can discuss their findings through a Socratic Seminar format of discussion. MATH: Use tables and graphs to demonstrate the food safety concerns of microorganisms in America and globally as well as to compare the	Computer and internet with speakers to play music Poem directions Presentation software. Devices to research Bread Experiment Supplies World Food Prize Resources Devices for students to research Internet Access

			effectiveness of different solutions to global food safety concerns. MATH: Graph, map and order by applying linear, exponential, and logistic growth models of public health and sanitation problems, revisiting Snow's epidemiological map of cholera with computational geometry, and using interval graphs to do complementation mapping, deletion mapping, food webs, and microarray heatmaps;	

Key Vocabulary

bacteria, contaminants, decontamination, exponential growth, fermentation, food microbiology, foodborne pathogen, genetics, interval graphs, linear growth, logistic growth, microarray heatmaps, microbiologist, microorganisms, microorganisms, microscope, morphological characteristics, nanotechnology, pasteurization, pathogen, snow's epidemiological map of cholera, sterilization, virus

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Agriscience Fair research experiment on microorganism and food.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 3 Title Food Virology and Microbial Spoilage of Foods

Content Standards	4. Obtain, evaluate, and communicate information to explain how bacteria, yeasts, and molds are classified, using taxonomic classification and scientific nomenclature. 5. Using basic concepts of food virology, engage in an argument to justify the grouping of viruses in a category separate from living things. 6. Use models to compare and contrast the structures of microorganisms in foods. 7. Identify types of viruses, bacteria, yeasts, and molds in food processing; compare and contrast their characteristics and behavior in a variety of food products. *Examples: microbial spoilage of meat, eggs, milk, seafood, vegetables, fruits, and grains and products made from them* 8. Identify specific microorganisms which may cause food spoilage during preparation, processing, and storage. 9. Formulate an evidence-based explanation of methods to control food- and water-borne microorganisms in high risk foods. 10. Obtain, evaluate, and communicate information about how a host responds to food-borne viral and microbial infections. 11. Classify foods based on their perishability and risk level to public health, considering their acidity and water activity. 12. Use computer and mathematical modeling to estimate microbial growth in food products.
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can define the taxonomic classification system. ● I can define scientific nomenclature. ● I can find information on bacteria. ● I can find information on yeasts. ● I can find information on molds. ● I can define bacteria, yeasts, and molds. ● I can distinguish between bacteria, yeasts, and molds. ● I can communicate how bacteria, yeasts, and molds are classified using the taxonomic classification system and scientific nomenclature. ● I can define food virology. ● I can communicate the history of food virology. ● I can define viruses. ● I can compare and contrast a virus to a living organism.

	● I can justify viruses being grouped into a category different from living organisms. ● I can define all viruses, bacterias, yeasts, and molds that impact food processing. ● I can identify characteristics of all viruses, bacterias, yeasts, and molds that impact food processing. ● I can compare and contrast all viruses, bacterias, yeasts, and molds that impact food processing. ● I can compare and contrast the behavior of all viruses, bacterias, yeasts, and molds that impact food processing. ● I can create models of microorganisms in foods. ● I can compare and contrast the differences in the structures of microorganisms in foods. ● I can identify food borne illnesses. ● I can communicate the differences in the big six food borne illnesses. ● I can identify the structures of the big six food borne illnesses. ● I can create models of the structures of the big six food borne illnesses. ● I can identify microorganisms that cause food spoilage during preparation. ● I can identify microorganisms that cause food spoilage during processing. ● I can identify microorganisms that cause food spoilage during storage. ● I can identify high-risk foods. ● I can explain methods that are used to control food-and water-borne microorganisms in foods. ● I can use evidence-based methods to create an explanation on how to control food- and water-borne microorganisms in high risk foods. ● I can locate information on how a host responds to food-borne viral and microbial infections. ● I can identify food-borne viral and microbial infections based on host symptoms. ● I can communicate with others how a host responds to food-borne viral and microbial infections. ● I can define FATTOM. ● I can describe the risk level of foods based on acidity level. ● I can describe the risk level of foods based on water activity. ● I can research different software to estimate microbial growth in food products. ● I can use different software to estimate microbial growth in food products. ● I can calculate microbial growth in food products using mathematical modeling.
Unit Driving/Essential Question	● Why must we be concerned with food spoilage?
Exemplar High Quality Unit Task	Students will identify common food spoilage by the scientific name of the found bacteria Students will research how to prepare food in a way to prevent food spoilage Students will classify food based on their spoilage rates Students will create warnings for certain foods and their risks

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Obtain, evaluate, and communicate information to explain how bacteria, yeasts, and molds are classified, using taxonomic classification and scientific nomenclature. I can define the taxonomic classification system. I can define scientific nomenclature.	Formal Assessment	Classifying Critters Activity Compare and contrast taxonomic classification system and scientific nomenclature using a Venn Diagram	SCI: Taxonomy & Classification Practice activity ELA: Students can use Bubbl.us to mind map the taxonomic classification system.	computer, internet access
Using basic concepts of food virology, engage in an argument to justify the grouping of viruses in a category separate from living things. I can find information on bacteria. I can find information on yeasts.	Pre-assessment before molds and yeast. Yeast experiment	Students utilize a graphic organizer to locate information on bacteria, yeasts, and molds making sure to define each. Utilize EdPuzzle to create a lesson with the video on classifying bacteria inserting questions during the video. Lab: Create a sourdough starter.	SCI: Dichotomous Key Labs ELA: Research: Using the Alabama Virtual Library and EBSCOhost, students will find one peer-reviewed journal on bacteria, yeasts, and molds. Students will read and annotate the sources and write a summary of the article.	computer, internet access https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/3/1009/files/2015/09/Dichotomous-Key-Handout-STUDENT-CIBT.pdf

I can find information on molds. I can define bacteria, yeasts, and molds. I can distinguish between bacteria, yeasts, and molds. I can communicate how bacteria, yeasts, and molds are classified using the taxonomic classification system and scientific nomenclature.			ELA: Students can create a Google Slideshow discussing how bacteria, yeasts, and molds are classified using the taxonomic classification system and scientific nomenclature. Students can then present their information to classmates. ELA: After the presentations, students can peer evaluate their classmates' presentations.	
Use models to compare and contrast the structures of microorganisms in foods. I can define food virology. I can communicate the history of food virology. I can define viruses. I can compare and contrast a virus to a living organism. I can justify viruses being grouped into a category different from living organisms.	Formative: Grades could be given on completion of project activities	Create a "Ed Talk" (similar to Ted Talk) about Food Virology Video and share it with others. Utilize a Venn Diagram in the video comparing and contrasting a virus and living organism.	MATH: Use tables and charts to compare a virus to a living organism by comparing them quantitatively within a given period of time. ELA: Using Sutori, students can create a timeline communicating the history of food virology.	computer, internet access
Identify types of viruses, bacteria, yeasts, and molds in food processing; compare and contrast their	Formative: Grades could be given on Lab reports Formal Assessment	Create an interactive notebook to keep up with activities	SCI: What are Pathogens? activity	computer, internet access

characteristics and behavior in a variety of food products. Examples: microbial spoilage of meat, eggs, milk, seafood, vegetables, fruits, and grains and products made from them I can identify characteristics of all viruses, bacterias, yeasts, and molds that impact food processing. I can compare and contrast all viruses, bacterias, yeasts, and molds that impact food processing. I can compare and contrast the behavior of all viruses, bacterias, yeasts, and molds that impact food processing. I can identify food borne illnesses. I can communicate the differences in the big six foodborne illnesses. I can identify the structures of the big six foodborne illnesses.		Color a sick man and label with the most common symptoms of food borne illness Create a chart of the major 4 bacteria that cause foodborne illnesses with the source, food linked, and prevention measures. Create a chart of the major 2 viruses that cause foodborne illnesses with the name, source, food linked with the virus, and prevention measures. The 12 Most Unwanted Bacteria activity Blue's the Clue Science Lab The Science of Cooking a Hamburger Lab Outbreak Investigation Case Study activity Lose a Million (Bateria) Game Students create 3D models of assigned bacteria, virus, yeast, molds, fungi using a variety of materials. Students will use the models to compare and	SCI: Bacterial Culturing and ID Labs SCI: Outbreak! Disease transmission lab ELA: Writing: Using either the point-by-point or subject-by-subject compare/ contrast format, write an essay detailing the similarities and differences among all viruses, bacterias, yeasts, and molds that impact food processing. Use this as a guide for the two methods of compare/contrast: NROC Developmental English Foundations MATH: Count, measure, calculate using image analysis of bacterial colonies and viral infections on variegated leaves, measurement of fractal dimensions of beautiful colony morphologies, and counting vertices, edges, and faces on viral capsids and using graph theory to understand self assembly MATH: Conduct experiments to identify and compare how	

I can create models of the structures of the big six foodborne illnesses. I can identify microorganisms that cause food spoilage during preparation. I can identify microorganisms that cause food spoilage during processing. I can identify microorganisms that cause food spoilage during storage. I can identify high-risk foods.		contrast bacteria, virus, yeast, molds, and fungi. Use a microscope to look at a variety of bacteria, fungi, molds, and yeast. Create a circular graphic organizer that spins to show the big six food borne illnesses where they come from and what causes them.	microorganisms cause food spoilage differently during preparation, processing and storage quantitatively. MATH: Data analysis on how effective are different methods being used to control food- and water-borne microorganisms in high risk foods. ELA: Create an infographic articulating the structures of the big six foodborne illnesses using Canva. SCI: LessonPlan/Activities MicrobesandourFood	
Identify specific microorganisms which may cause food spoilage during preparation, processing, and storage. I can explain methods that are used to control food- and water-borne microorganisms in foods. I can use evidence-based methods to create an explanation on how to control food- and water-borne microorganisms in high risk foods.	Summative: Grades could be given for a Lab report	Students create a foldable on methods to control microorganisms in foods. Food Dehydration lab (Make jerky, apple/banana chips, etc.) More in depth activities in Unit 6.	ELA: Public Speaking: Students can write, perform, and evaluate classmates' presentations on methods used to control food and water-borne microorganisms in foods.	computer, internet access

Formulate an evidence-based explanation of methods to control food- and water-borne microorganisms in high risk foods. I can locate information on how a host responds to food-borne viral and microbial infections. I can identify food-borne viral and microbial infections based on host symptoms. I can communicate with others how a host responds to food-borne viral and microbial infections.	Formative: Grades could be given for ServSafe modules and course work.	Assign students to read through the organisms that cause foodborne illness in the ServSafe Coursebook. Foodborne Illness Patient Investigation Activity	SCI: Foodborne Illness (FBI) 'Most Wanted' poster activity ELA: Students can find a peer reviewed journal on how a host responds to food-borne viral and microbial infections using Alabama Virtual Library. Students will write a summary of the information they learned from their research and correctly cite their sources in a works cited page.	computer, internet access Foodborne Illness Patient Investigation Activity
Obtain, evaluate, and communicate information about how a host responds to food-borne viral and microbial infections.	Summative: Grades could be given on a scientific research paper. This paper should include correct formatting and references.	Create a foldable to show the different conditions of FAT TOM and describe each condition of FAT TOM. Print out a variety of pictures of foods and have students label which areas of FAT TOM the food is most susceptible.	MATH: Use a project to assess the students' knowledge on the risk level of some common foods based on acidity level and water activity by creating tables and graphs. ELA: Students create a one-pager assignment illustrating the risk level of foods based on acidity level or the risk level of foods based on water activity. Infographics can also be created digitally using Canva.	foldable computer, internet access

			SCI: Virtual Lab ControllingH2Oactivityinfood SCI: Foodborne Illness Worksheet	
Classify foods based on their perishability and risk level to public health, considering their acidity and water activity. I can define FATTOM. I can describe the risk level of foods based on acidity level. I can describe the risk level of foods based on water activity.	Formative: Grades could be given for the chart created on food products.	Search Google for different software that is available to estimate microbial growth in food products. Complete a chart listing the name of the software, URL it can be located at, and information about how it is used, etc. Students will use one of the free software programs they find in the research activity to estimate microbial growth in food products. Calculate Microbial growth in foods using mathematical modeling. See Math activity.	MATH: Students will calculate and graph the exponential growth of bacteria in culture. They will be asked to identify the lag, exponential, and stationary phase on the curve as they create the curve. MATH: Use projects that require students to calculate microbial growth in different food products using mathematical modeling to monitor processes ranging from temperature during distribution to inventory control. Let students make predictions about the possible shelf life based on the result. ELA: Students can create a T-Chart to compare and contrast the different software to estimate microbial growth in food products.	computer, internet access

Use computer and mathematical modeling to estimate microbial growth in food products. I can research different software to estimate microbial growth in food products. I can use different software to estimate microbial growth in food products. I can calculate microbial growth in food products using mathematical modeling.	Formative: Grades can be given on the use of computer programs that detail microbial growth in can and fresh food products.	https://data.nal.usda.gov/dataset/combase-web-resource-quantitative-and-predictive-food-microbiology		computer, internet access

Key Vocabulary

cross contamination, mathematical modeling, sanitation, clean, foodborne illness, (SCI)

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Students could spend a day job shadowing a couple of different careers in the food industry.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 4 Title Food Fermentation	
Content Standards	13. Use principles of fermentation to create fermented food products. 14. Identify and analyze microorganisms in fermented foods.
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can define fermentation. ● I can identify different fermented food products. ● I can identify steps to create fermented food products. ● I can create a fermented food product. ● I can identify microorganisms in fermented food. ● I can analyze the effects of microorganisms in fermented foods.
Unit Driving/Essential Question	● What are food preservation methods we can use to preserve food out of season? ● What is fermentation? ● What is happening during fermentation: Physical or a Chemical Reaction? ● What flavor does the fermentation process give to foods? ● How do temperature, pH, and time influence the outcome of fermented foods? ● What benefits or purposes does food fermentation offer?
Exemplar High Quality Unit Task	Students will create a fermentation lab to create sauerkraut. Students will identify parts in the fermentation process. Students will take samples from fermented food to study under the microscope.

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Use principles of fermentation to create fermented food products. I can define fermentation. I can identify different fermented food products. I can identify steps to create fermented food products.	Formative: Grades could be given on guided notes during class. Summative: Grades could be given on the Fermented Food Lab.	Define Fermentation using the Frayer Model graphic organizer Taste Test Fermented Foods Fermented Food Activity: Students will create a poster using the information from the graphic organizer, history timeline, and pictures of fermented food products. Use a foldable to describe the 6 types of fermented foods. Put the type of food on the outside and under the flap explain how the food is created.	SCI: Food Fermentation Lab MATH: Create a powerpoint to demonstrate mathematical models for fermentation processes. ELA: Students can write and perform how-to speeches detailing the steps to create fermented food products.	https://www.fermentedfoodlab.com/how-to-make-sauerkraut/ computer, internet access
Identify and analyze microorganisms in fermented foods. I can create a fermented food product.	Formative: Grades could be given in a lab for making Sauerkraut. Summative: Grades could be given on a unit test.	Fermented Food Lab: Sauerkraut, Kimchi, yogurt, etc. Use the article and create an anticipation guide for a pre reading activity. After		https://www.fermentedfoodlab.com/how-to-make-sauerkraut/ computer, internet access

I can identify microorganisms in fermented food. I can analyze the effects of microorganisms in fermented foods.		students complete the anticipation guide and read the article, have them participate in an inner/outer circle activity.		

Key Vocabulary

aerobic respiration, acid and bases, cultured, fermentation,, Louis Pasteur, lactobacillus, microbiome, probiotics

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Students could shadow a chef or caterer. Students could attend an Extension workshop on canning vegetables.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 5 Title Food Immunology	
Content Standards	15. Formulate an explanation of the immunology of food-related allergies, intolerances, and hypersensitivities. 16. Identify and communicate the role of foods in regulating host immune response, cancer immunology, and immunodeficiency diseases.
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can define food immunology. ● I can identify a scholarly article. ● I can locate research articles on food immunology. ● I can explain immunology of food-related allergies, intolerances, and hypersensitivities. ● I can identify the role of foods in regulating host immune response, cancer immunology, and immunodeficiency diseases. ● I can create a diet to help regulate host immune response, cancer immunology, and immunodeficiency diseases.
Unit Driving/Essential Question	● What biologically happens when a person with a food allergy has a reaction to that food? ● How can we prevent a reaction to a food allergy? ● How do products become contaminated with other foods that cause food allergies?
Exemplar High Quality Unit Task	Students will create an educational presentation on Food Immunology and present it to the class. Students will describe the biological response from the body to certain foods.

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Formulate an explanation of the immunology of food-related allergies, intolerances, and hypersensitivities. I can define food immunology. I can identify a scholarly article. I can locate research articles on food immunology. I can explain immunology of food-related allergies, intolerances, and hypersensitivities.	Formative: Grades could be given on the graphic organizer. Summative: Grades could come from students documenting all of the food labels in their own pantry. Write down all foods that contain: wheat, peanuts, or dairy.	Complete a graphic organizer to define Food Immunology. Video to learn how to read and understand scholarly articles. Discuss how to read a scholarly article. Students locate research articles on food immunology. Each student reads a different article using the strategies previously discussed. Pair up students and have them discuss the article they read. Each student will create a summary table of each article.	Using Alabama Virtual Library, students will find peer-reviewed journals that discuss food immunology, write a summary of the journal, and accurately cite the source.	computer, internet access
Identify and communicate the role of foods in regulating host immune	Formative: Grades could come from research articles.	Give students different research articles about the role of foods in regulating	ELA: Students can use Canva to create an Infographic detailing their	computer, internet access

response, cancer immunology, and immunodeficiency diseases. I can identify the role of foods in regulating host immune response, cancer immunology, and immunodeficiency diseases. I can create a diet to help regulate host immune response, cancer immunology, and immunodeficiency diseases.	Summative: Grades could come from a unit test.	host immune response, cancer immunology, and immunodeficiency diseases. Use an inner and outer circle to discuss the assigned article with each other. Using the knowledge learned from the research articles to create a diet to help regulate host immune response, cancer immunology, and immunodeficiency diseases.	diet that regulates host immune https://www.canva.com/response, cancer immunology, and immunodeficiency diseases. ELA: Students can make a TikTok video or a post in another form of social media that details the diet they created.	

Key Vocabulary

adrenaline, allergen, allergic reaction, inflammation, Immunology, immunity, macronutrients, micronutrients, microbiome, nutrition, life course, probiotic, prebiotic

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Create an Agriscience Fair on the topic of Food Allergies and present it to judges.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 6 Title Control of Microorganisms in Foods	
Content Standards	17. Select and use appropriate methods of sanitation, heat treatment, irradiation, modified atmosphere, antimicrobial preservative, and combinations of methods (hurdle concept) to control microbial growth in food products, explaining the principles underlying each method. 18. Develop and use a Hazard Analysis and Critical Control Point (HACCP) plan.
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can define methods of sanitation to control microbial growth in food products. ● I can define methods of heat treatment to control microbial growth in food products. ● I can define methods of irradiation to control microbial growth in food products ● I can define methods of modified atmosphere to control microbial growth in food products ● I can define methods of antimicrobial preservative to control microbial growth in food products ● I can define how to use a combination of methods to control microbial growth in food products. ● I can identify which method should be used to control microbial growth in food products. ● I can use the appropriate method of sanitation, heat treatment, irradiation, modified atmosphere, antimicrobial preservative, and combinations of methods (hurdle concept) to control microbial growth in food products ● I can define Hazard Analysis and Critical Control Point ● I can identify when a HACCP plan is necessary. ● I can create a HACCP plan. ● I can follow a HACCP plan.
Unit Driving/Essential Question	● How does the USDA regulate safe packaging standards for foods? ● How does the environment affect microorganisms and food? ● What type of packaging is most effective for protecting foods from external contaminants?
Exemplar High Quality Unit Task	Students will research common microorganisms found in foods. Students will identify a HACCP plan.

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Select and use appropriate methods of sanitation, heat treatment, irradiation, modified atmosphere, antimicrobial preservative, and combinations of methods (hurdle concept) to control microbial growth in food products, explaining the principles underlying each method. I can define methods of sanitation to control microbial growth in food products. I can define methods of heat treatment to control microbial growth in food products. I can define methods of irradiation to control microbial growth in food products. I can define methods of modified atmosphere to	Formative: Grades could be given on a handwashing lab. Summative: Grades could be given on the presentation "Microbial Growth".	Utilize a graphic organizer to define sanitation, heat treatment, irradiation, modified atmosphere, antimicrobial preservation, combination method. Irradiation webquest Ultra High Pressure Treatment Lab Create a presentation that discusses each of the methods to control microbial growth and why each is used. Canning foods lab: Have students can beans, jelly, etc. Create a lab report after the lab to discuss this method of controlling microbial growth.	SCI: Disinfectants, Antiseptics & Sanitizers Lab MATH: Experiment with different methods to control microbial growth in food products and record data using tables and graphs to compare the effectiveness of the methods. ELA: Students can use Vocabulary Quadrants to define the different methods of sanitation, of heat treatment, and of modified atmosphere. SCI: Students will conduct a kitchen exercise involving a HACCP plan TheKitchenExercise	computer, internet, Irradiation webquest, computer application (powerpoint)

control microbial growth in food products. I can define methods of antimicrobial preservatives to control microbial growth in food products. I can define how to use a combination of methods to control microbial growth in food products. I can identify which method should be used to control microbial growth in food products. I can use the appropriate method of sanitation, heat treatment, irradiation, modified atmosphere, antimicrobial preservative, and combinations of methods (hurdle concept) to control microbial growth in food products.				
Develop and use a Hazard Analysis and Critical Control Point (HACCP) plan. I can define Hazard Analysis and Critical Control Point I can identify when a HACCP plan is necessary.	Formative: Grades could be given on creating a brochure detailing a HACCP plan. Summative: Grades could be given on the Smoked Meat Lab.	Hazard Analysis Critical Control Point Story: The story compares HACCP to Speed Limits. Teacher presentation about HACCP. Students work with the school cafeteria to create a HACCP plan.	ELA: Students can peer edit their classmates' HACCP plans. ELA: Public Speaking: Students will present	https://www.fda.gov/food/hazard-analysis-critical-control-point-haccp/haccp-principles-application-guidelines computer with internet access

I can create a HACCP plan. I can follow a HACCP plan.		Smoked meat lab. Students create a HACCP plan and follow it for the lab.	HACCP plans created with the help of the school cafeteria.	

Key Vocabulary

cross-contamination, critical limit, hazard analysis, critical control point, active managerial control, foodborne illness, HACCP, pH, FDA, critical control points

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Students could job shadow a local butcher or grocery store that processes retail cuts of meat. Watch and assist with the sanitation of the processing area.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 7 Title Food Grading	
Content Standards	19. Grade meat and produce according to guidelines published by the United States Department of Agriculture (USDA).
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can identify the process in grading meat and produce as published by the USDA. ● I can use the guidelines published by the USDA to grade meat and produce.
Unit Driving/Essential Question	● Why do certain foods cost more than others of the same variety? ● What are food grading scales based on? ● Are higher grades more nutritionally beneficial to the consumer?
Exemplar High Quality Unit Task	Students will practice grading foods correctly based on scales created by the USDA. Students will judge classes of eggs and meat and place them in their class.

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Grade meat and produce according to guidelines published by the United States Department of Agriculture (USDA). I can identify the process in grading meat and produce as published by the USDA. I can use the guidelines published by the USDA to grade meat and produce.	Formative: Grades could be given on guided notes for the iCEV powerpoints on meat science. Summative: Grades could be given on tests.	Beef Labels Graphic Organizer Grading Beef Powerpoint USDA Quality Puzzle Grading Beef Lab Have students research USDA grading for produce and create a poster to share with others.	ELA: Students can use Canva to create their posters for the class.	iCEV account, Computer, USDA website

Key Vocabulary

concentrate, finishing weight, forage, grain, harvest, marbling, regulate, United States Department of Agriculture (USDA), USDA quality grade, weaning

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Students could job shadow a local butcher or grocery store that processes retail cuts of meat.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager

Unit 8 Title Microbiological Analysis	
Content Standards	20. Apply the principles of sampling and sample preparation in microbiological analysis. 21. Assess microbial activity in foods by qualitative and quantitative microbiological analyses.
Unpacked Learning Objectives	**Students will be able to (SWBAT)… (Know, Understand, and Do/Behave)** ● I can define the principles of sampling in microbiological analysis. ● I can define how to prepare a sample for microbiological analysis. ● I can collect a sample and prepare it for microbiological analysis. ● I can define microbial activity in foods. ● I can define qualitative and quantitative methods of microbiological evaluations of foods. ● I can identify the qualitative or quantitative methods the United States has approved for one type of food analysis. ● I can utilize a qualitative or quantitative method approved by the US to assess the microbial activity in a food.
Unit Driving/Essential Question	● How does cross-contamination occur? ● How do environmental factors cause microbial growth? ● How do scientists prepare samples for testing?
Exemplar High Quality Unit Task	Students are able to explain heat transfer through a product and can explain how surface-area-to-volume ratios and heat-transfer rates relate to cooking and cooling foods. Students are able to identify environmental factors required by microorganisms to survive and multiply, and to explain how these factors can be controlled to reduce or prevent the survival and growth of microorganisms. Students are able to differentiate between safe and unsafe food-handling and storage practices and to propose solutions to correct unsafe practices.

Map of Student Learning by Learning Objective

Unpacked Learning Objective SWBAT	Potential Subtasks for Assessments Formative/Summative	Potential Learning Activities Link to Differentiation Examples	Integrated and Related Math/Science Concepts & Activities	Equipment, Technology & Materials Link to Helpful Tech Tools
Apply the principles of sampling and sample preparation in microbiological analysis. I can define the principles of sampling in microbiological analysis. I can define how to prepare a sample for microbiological analysis. I can collect a sample and prepare it for microbiological analysis.	Formative: Grades could be given on the presentation on collecting samples. Summative: Grades could be given on The Science of Cooking a Hamburger Lab.	Presentation from instructor on how to collect samples. Students go around the school to collect a sample from different items. Use petri dishes with agar to grow the bacteria. Analyze what is grown as well as how it grows. Make sure to follow all guidelines to dispose of what is grown. The Science of Cooking a Hamburger Lab	SCI: Microbiological Culture Labs ELA: Students can use Bubbl.us to mind map the information learned from the study of the principles of sampling in microbiological analysis.	computer, ground beef, bubbl.us, petri dishes, cotton swabs
Assess microbial activity in foods by qualitative and quantitative microbiological analyses. I can define microbial activity in foods. I can define qualitative and quantitative methods of	Formative: Grades could be given on using a computer application to track a set of microbial data. Summative: Grades could be given on a unit test.	Students can research a set of data from recent microbial studies. They then will input this data into a computer application like excel and analyze. Then they can turn this into a graph or chart.	MATH: Divide students into groups to conduct qualitative and/or quantitative methods of microbiological evaluations of foods given different scenarios. ELA: Writing: Students will write a paragraph using the AEC format focusing on	Computer, computer applications (excel or numbers), usda website

microbiological evaluations of foods. I can identify the qualitative or quantitative methods the United States has approved for one type of food analysis. I can utilize a qualitative or quantitative method approved by the US to assess the microbial activity in a food.			the qualitative or quantitative methods in the U.S. that are approved for food analysis. SCI: Students will read the article section on food microbiology and give a summary on the pros and cons of the rapid and conventional methods used in food safety management. Microbial Analysis	

Key Vocabulary

aerobic, anaerobic, bacteria, celsius scale, cross contamination, fahrenheit scale, food safety, foodborne illness, germ, microorganism, Scientific Method, temperature, thermometer

Work-Based or Simulated Work Experiences:

As students begin to plan careers, they must have opportunities to visit, tour, and work at local industries and businesses. Real-world experiences such as cooperative education, internships, apprenticeships, job shadowing, and Supervised Agricultural Experience (work-based, service-based, and project-based learning) are beneficial to enhance classroom learning. Continuous feedback from students and supervisors provides further assessment of the program and facilitates changes necessary to satisfy industry needs. Students should begin to or continue to develop and enhance student SAEs throughout this course. Simulated workplace will also be utilized in the classroom to help develop knowledge of real-world work environments.

Experiential Learning Opportunities:

Students could job shadow a lab technician, food scientist or a Quality Assurance technician for a large food manufacturer.

CTSO Connection:

FFA or FCCLA can be utilized to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. All instruction should be enhanced utilizing FFA or FCCLA competitive events, FFA or FCCLA leadership and meeting procedures as it relates to employability skills.

Certification Connection:

ServSafe Manager