

Secondary Curriculum Maps



Cumberland Valley School District
Soaring to Greatness, Committed to Excellence

Food Science and Safety

CASE Food Science and Safety provides learning experiences in food science and safety, which allows students to apply scientific knowledge and processes to the development and preservation of food products. Issues of food science and safety are examined from a scientific and technological perspective. Students critically analyze information to evaluate and draw conclusions on the appropriate use of technology in food science and safety practices. Units of instruction include: principles of food preservation, food processing, biochemistry, food selection, and consumer health. Students develop personal viewpoints on societal issues concerning the development and preservation of food products, and make career plans in the food industry.

Food Science and Safety Course Description

Food Science and Safety is a specialization course in the CASE Program of Study. Students will complete hands-on activities, projects, and problems that simulate actual concepts and situations found in the food science and safety industry, allowing students to build content knowledge and technical skills. Students will investigate areas of food science including food safety, food chemistry, food processing, food product development, and marketing.

Students will maintain a research level Laboratory Notebook throughout the course documenting their experiences in the laboratory. Research and experimental design will be highlighted as students develop and conduct industry appropriate investigations.

In addition, students will explore connections between the Food Science and Safety lessons, Supervised Agricultural Experience, and FFA components that are important for the development of an informed agricultural education student. Students will investigate, experiment, and learn about documenting a project, solving problems, and communicating solutions to their peers and members of the professional community.

Food Science and Safety includes the following units of study:

- Introduction to Food Science
- Chemistry of Food
- Safety of Our Food
- Food Processing Preservation and Packaging
- Food Health and Security
- Preference and Product Availability
- Food Product Development

Prerequisites

Due to the pace and rigor of the course, certain prerequisites are necessary for student success. The preferred method of student acceptance into *Food Science and Safety* is through a CASE Sequence of Courses. Students should take *Introduction to AFNR* followed by either *Principles of Agricultural Science – Animal* or *Principles of Agricultural Science – Plant* prior to registering for this course. An alternative route could be Biology, Chemistry, foundational agricultural science for plants and animals and a strong background in student-directed, project-, and inquiry-based learning.

FSS Detailed Course Outline

Unit 1 Introduction to Food Science

Lesson 1.1 Exploring Food Science

1. Sensory properties of food influence consumer preference and acceptance.
2. Discoveries about food have driven advances in food processing and preservation.

Lesson 1.2 Science, Safety, and Inquiry

1. Good laboratory procedures and safety ensure the quality and integrity of laboratory data.
2. Sanitation and cleanliness are critical for safety in food handling and preparation.
3. Foods are chemical systems comprised of lipids, simple and complex carbohydrates, proteins, vitamins and other molecules.
4. Rigorous, scientific research methods, including qualitative and quantitative analysis are standard in the food industry.

Unit 2 Chemistry of Food

Lesson 2.1 Influence of Nutrients in Food

1. The amounts of lipids, carbohydrates, proteins, and water in a food product influence sensory characteristics.
2. Ingredients have varying functionalities in food products.
3. Different ingredients can be used to produce the same product.

Lesson 2.2 Food Chemists

1. Physical changes can cause foods to crystallize, gel, and otherwise change over time.
2. Chemical reactions such as Maillard browning, oxidation and others can change food over time because food is a non-equilibrium system.
3. Foods change over time due to enzymatic activity.
4. pH influences the way a food reacts chemically as well as influencing the foods sensory characteristics.

Unit 3 The Safety of Our Food

Lesson 3.1 Good Manufacturing Practices

1. Personal hygiene is a critical GMP that is easily controlled.
2. Good manufacturing practices can promote safe preparation and handling of food.
3. Allergens are food safety concerns and need to be addressed with proper food preparation and handling.

Lesson 3.2 ABC's of Food Safety

1. HACCP utilizes seven basic principles to assure potentially hazardous products do not reach the consumer.
2. HACCP concepts are used in all phases of food production and processing.
3. HACCP is a framework for assessing and/or preventing risks associated with physical, chemical, and biological hazards in food design and manufacturing systems.

Lesson 3.3 Pathogen Pathways

1. Microbiological organisms can have positive and negative effects on foods and people.
2. Microbial growth can be manipulated using temperature, pH, water activity, competitive exclusion, and chemical agents.
3. Pathogens can cause illness or death when present in food.

Unit 4 Food Processing and Preservation

Lesson 4.1 Processing for Consumption

1. Processing is a system that physically or chemically changes the inherent characteristics of agricultural products prior to consumption.
2. Specific unit operations are dependent upon the chemical and physical properties of the raw food commodity.
3. Processing methods are dependent upon the end uses of the agricultural products.
4. Agricultural commodities are processed and separated into components used for further processing or for consumption.

Lesson 4.2 Processing for Preservation

1. The five basic food-processing principles that achieve preservation are moisture removal, heat treatment, low-temperature treatment, acidity control, and non-thermal processes.
2. Food preservation controls microbial growth and enzymatic reactions, extending the shelf life of a food while changing its quality and usability.

Lesson 4.3 Processing for Quality and Safety

1. A variety of federal, state, and local agencies govern the manufacture and sale of food.
2. Agricultural commodities are graded based on their quality and usability, triggering some food products to have quality grading standards.
3. Certain food products must meet legal standards of identity.

Unit 5 Food Health and Security

Lesson 5.1 Nourishing Nutrition Labels

1. Food labels provide required and useful information such as, ingredients, nutrition, claims, traceability, warnings, and proper food handling for consumers.
2. Recommended dietary allowances provide guidelines for proper intake of macromolecules for health, depending upon gender and different life stages.
3. Foods are analyzed and labeled based on their composition of various molecules.

Lesson 5.2 Safe, Secure, and Accessible

1. Safe and nutritious food, necessary to maintain health, is not equally accessible to everyone.
2. U.S. food supply needs protection from intentional adulteration.

Unit 6 Preference and Product Availability

Lesson 6.1 Consumer Preferences

1. Consumers choose food based on lifestyle factors including price, availability, convenience, culture, and nutrition.
2. Sensory evaluations must be carefully constructed and executed to reduce factors or biases that are not relevant to the test objective.
3. Different sensory evaluation techniques determine consumer preference and acceptance.

Lesson 6.2 To Protect and Sell

1. Food marketing uses technology and media to influence consumer behavior.
2. Food packaging both protects food and attracts consumers.
3. Food retailers position products based on shopping behaviors and consumer trends.

Unit 7 Food Product Development

Lesson 7.1 Decide, Design, Develop

1. Food product development moves through a series of processes to transform from an idea to a tangible food product.
2. Finished food products must be validated against the original concept.

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