

SCIENCE AND OUR FOOD SUPPLY

Food Safety from Farm to Table – High School

Education Standards by Activity																
	The Big Picture	Bacteria Everywhere	12 Most Unwanted Bacteria	Chain of Food	Blue's the Clue	Mystery Juice	Irradiation Web Quest	Ultra High Pressure Treatment	Fast Food Footwork	Cooking Right	A Chilling Investigation	Don't Cross Me	Coliform Counts	Outbreak Alert	Beef Blasters	Lose a Million Bacteria – The Game
NGSS - Physical Science: Structure and Properties of Matter			✓				✓	✓						✓	✓	✓
NGSS - Physical Science: Chemical Reactions					✓					✓						✓
NGSS - Physical Science: Waves and Electromagnetic Radiation							✓							✓	✓	✓
NGSS - Life Science: Structure and Function				✓					✓					✓		✓
NGSS - Life Science: Matter and Energy in Organisms and Ecosystems		✓		✓	✓	✓				✓	✓	✓	✓	✓		✓
NGSS - Life Science: Interdependent Relationships in Ecosystems				✓												✓
NGSS - Life Science: Inheritance and Variation of Traits	✓			✓												✓
NGSS - Life Science: Natural Selection and Adaptations	✓			✓												✓
NGSS - Earth and Space Sciences: Human Sustainability				✓										✓		✓
NGSS - Engineering Design				✓					✓							✓
NGSS - Nature of Science	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NSFCSE 3.0 - Food Production & Services	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NSFCSE 3.0 - Food Science, Dietetics, & Nutrition	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NSFCSE 3.0 - Nutrition & Wellness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CCSS - ELA-Literacy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

See next pages for full standards: NGSS, NSFCSE and Common Core ELA-Literacy. ▶

EDUCATION STANDARDS – HIGH SCHOOL

Science and Our Food Supply: Food Safety from Farm to Table aligns with the following current education standards:

NGSS – Next Generation Science Standards Arranged by Topic

Physical Science

Structure and Properties of Matter

- HS-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the process of fission, fusion, and radioactive decay.
- HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Chemical Reactions

- HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends on the changes in total bond energy.
- HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Waves and Electromagnetic Radiation

- HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
- HS-PS4-4 Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

Life Science

Structure and Function

- HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
- HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Matter and Energy in Organisms and Ecosystems

- HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- HS-LS 2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Interdependent Relationships in Ecosystems

- HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- HS-LS2-6 Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

- HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Inheritance and Variation of Traits

- HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Natural Selection and Evolution

- HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Earth and Space Sciences

Human Sustainability

- HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Engineering Design

- HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS 1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Nature of Science

- Science investigations use diverse methods and do not always use the same set of procedures to obtain data.
- New technologies advance scientific knowledge.
- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.
- The discourse practices of science are organized around disciplinary domains that share exemplars for making decisions regarding the values, instruments, methods, models, and evidence to adopt and use.
- Scientific investigations use a variety of methods, tools, and techniques to revise and produce new knowledge.
- Scientific knowledge is based on empirical evidence.
- Most scientific knowledge is quite durable but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence.
- Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.

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- Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise, and extend this knowledge.
- Science is a unique way of knowing and there are other ways of knowing.
- Science distinguishes itself from other ways of knowing through use of empirical standards, logical arguments, and skeptical review.
- Science knowledge has a history that includes the refinement of, and changes to, theories, ideas, and beliefs over time.
- Scientific knowledge is a result of human endeavor, imagination, and creativity.
- Individuals and teams from many nations and cultures have contributed to science and to advances in engineering.
- Technological advances have influenced the progress of science and science has influenced advances in technology.
- Science and engineering are influenced by society and society is influenced by science and engineering.

National Standards for Family and Consumer Science Education 3.0

8.0 Food Production & Services

- 8.1.1 Explain the roles, duties, and functions of individuals engaged in food production and service careers.
- 8.2.1 Identify characteristics of major foodborne pathogens, their role in causing illness, foods involved in outbreaks, and methods of prevention.
- 8.2.3 Use knowledge of systems for documenting, investigating, reporting, and preventing food borne illness.

9.0 Food Science, Dietetics, & Nutrition

- 9.1.1 Explain the roles and functions of individuals engaged in food science, food technology, dietetics, and nutrition care.
- 9.2.1 Analyze factors that contribute to foodborne illness.
- 9.2.2 Analyze food service management safety and sanitation programs.
- 9.2.3 Implement industry standards for documenting, investigating, and reporting foodborne illness.
- 9.5.7 Conduct testing for safety of food products, utilizing available technology.
- 9.6.9 Utilize Food Code Points of time, temperature, date markings, cross contamination,

14.0 Nutrition & Wellness

- 14.4.1 Analyze conditions and practices that promote safe food handling.
- 14.4.2 Analyze safety and sanitation practices.
- 14.4.5 Analyze foodborne illness factors, including causes, foods at risk, and methods of prevention commercially and by individuals and families.
- 14.4.6 Analyze current consumer information about food safety and sanitation.
- 14.5.1 Analyze how the scientific and technical advances in food processing, storage, product development, and distribution influence nutrition and wellness.

Common Core State Standards, ELA-Literacy

- RL.9-10.1 Cite strong and thorough textual evidence to support an analysis of what the text says explicitly as well as inferences drawn from the text.
- RL.9-10.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone, (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
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- RI.9-10.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone, (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).

- W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- W.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- W.9-10.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- W.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- W.9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- W.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
- SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 9-10 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively.
- SL.9-10.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
- SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
- SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
- SL.9-10.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
- L.9-10.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.9-10.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- L.9-10.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
- L.9-10.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.