

South Dakota Agriculture, Food and Natural Resources

June 6-8, 2016

Brookings

Participants:

Daniel Smith, Lead Consultant, Chaska, MN
Kathy Haugan, Consultant, Brookings, SD
Erin Larsen, South Dakota Department of Education, Sioux Falls, SD
Michelle Nelson, South Dakota Department of Education, Brookings, SD
Jamie Brown, Double Arrow Fencing, Buffalo, SD
Gary Elsinger, Rutland Public School, Brookings, SD
Jacob Englin, Parkston High School, Parkston, SD
Cayla Graves, Platte-Geddes School, Platte, SD
Shane Gross, Sanborn Central School District, Woonsocket, SD
Dani Herring, Wall School District, Wall, SD
Amanda Hoover, Lake Preston Schools, Lake Preston, SD
Todd Marks, Harrisburg School District, Harrisburg, SD
Ann Price, South Dakota Ag in the Classroom, Miller, SD
John Rist, Viborg-Hurley & Valley Ag Supply, Centerville, SD
Benjamin Whiting, Todd County School District, White River, SD
Thomas Wolff, Dell Rapids School District, Dell Rapids, SD

Participants introduced themselves stating name, location, and curricular area of expertise.

An introductory video, *Success in the New Economy* written and narrated by Kevin Fleming and produced by Bryan Y. Marsh, was shared. This video (available on the Internet at <https://vimeo.com/67277269>), describes a fallacy in the traditional “college for all” model of education and encourages individuals to select career paths based on interests and skills.

It was noted that the purpose of the work was to develop South Dakota’s state standards for Agriculture, Food, Natural Resources to ensure that they:

- Are aligned with industry needs
- Prepare students to be successful in employment and in postsecondary training
- Establish a sequence of courses leading to completion of a program of study.

It was clarified that standards describe “what” is to be learned, not “how” it is to be learned.

Information was provided regarding the importance of the federal Carl D. Perkins Career and Technical Education Act to the work and an update on progress toward reauthorization of the Act, last authorized by Congress in 2006.

The role of the standards committee was clarified to show that the standards committee members were selected because they were subject matter experts who would:

- Take the suggestions of industry
- Utilize personal expertise about how students best learn, and
- Write a standards draft.

It was further clarified that the work of the committee will go through industry validation and multiple public hearings before consideration for adoption by the State Board of Education.

Program of study was defined as:

- A non-duplicative sequence of both academic and technical courses
- Beginning no later than grade 11 and continuing for at least two years beyond high school
- Culminating in a degree, diploma or certification recognized as valuable by business/industry partners.

A program of study was viewed as the bridge connecting preparatory and advanced work in high school with further study at the postsecondary level through a collegiate program or advanced training through work.

A summary of a recent labor market analysis for South Dakota was presented, with separate slides shown identifying the 20 largest industry clusters, the fastest growing industry clusters by percentage growth and increase in employment demand, and the occupations with a projected demand of 50 or more.

Participants were asked to identify industry trends by describing what was new in the industry, what is emerging in the industry but not yet routinely practiced, and what is no longer done in the industry. It was intended that this information would guide discussion about where new standards were needed and where existing standards could be deleted. For agriculture, food and natural resources the discussion suggested:

New

- Genetically Modified Organisms (GMO)
- Food Science/Consumerism/Prep
- Global Positioning System (GPS) Technology
- Need for soft skills
- Social media
- Digital world
- Consumer education
- Biotechnology
- Organics
- Flavor enhancements
- Logistics
- Bio-fuels/ethanol

Emerging

- Alternative commodities
- Drones
- Apps
- Industry collaborations and diversification/vertical integration
- Trans-Pacific Partnership
- Global markets
- Land ownership – from family farms to corporate
- Need to keep up with new knowledge and how to apply
- Ag equipment technology
 - New industry technology
 - Greater specialization
- Robotics (ever-changing)
- Digital currency

- Communications – what will it be like in 15 years (will people use complete sentences?)

No longer done

- Balancing livestock feed rations
- Equipment repair (now too specialized to do one's own)
- Engine overhaul
- Hand-written knowledge sharing
- Overall "farm hand"
- Use of currency
- Marketing (hedge, margin calls)

Results of a recent survey of employers were shared. The survey was designed to ascertain if employers were having hiring difficulties, if applicants were deficient in either soft or technical skills, and options for a state response. Forty six survey responses were included in the results with largest participation from hospitality and tourism (8), architecture and construction (6), business management (6), agriculture, food and natural resources (5), manufacturing (5), and marketing (4). In general:

- Four out of five employers noted having hiring difficulties in the previous 12 months.
- Primary reasons for this hiring difficulty were:
 - Low number of applicants (29)
 - Lack of work experience (21)
 - Lack of technical or occupational skills (21)
 - Lack of soft skills (14)
 - Unwillingness to accept offered wages or work conditions (9)
- Occupational areas noting the greatest hiring difficulties were hospitality (8), and marketing (6) though these results are skewed by the response rate from the individual sector.
- The most highly noted soft skills lacking were:
 - Initiative (33)
 - Attendance/dependability (30)
 - Communications (25)
 - Customer service (24)
 - Problem solving (23)
- Similarly, employers noted the highest needs for additional training in:
 - Attendance/timeliness/work ethic (73%)
 - Customer service (68%)
 - Problem-solving (50%)
 - Teamwork (41%)
- Slightly over half of employers noted that applicants lacked technical skills.
- Employers asked that the state response focus on:
 - Work ethic (8)
 - Communications (8)

The current state program of study in agriculture, food and natural resources was reviewed and participants were asked to chart out a new program of study incorporating course titles for which standards would be developed. The process involved placing course titles on post-it notes on the wall with an open process to place courses where deemed appropriate, remove courses not considered appropriate, and add courses deemed necessary. The resulting structure is shown in the chart on the next page and includes foundation courses, four cluster courses (one for which standards are

established as part of a national curriculum), three levels of pathway courses in six separate pathways (animal systems, food product and processing systems, power systems, natural resources and environmental science systems, agribusiness systems, and plant systems), and five capstone experience options if the state accepts the proposal to incorporate the supervised agricultural experience (SAE) into its structure of capstone experiences. The structure gives students latitude to move from cluster courses to any of the six pathways. Early pathway course options are generally considered prerequisite for the advanced pathway course options within the pathway.

Members were also asked to look at their Program of Study to make certain that students would be ready to make the transition from middle school to high school and from high school to the postsecondary level. To do so, postsecondary partners were asked what they would want students to know and be able to do upon entry into their programs, not as hard prerequisites, but general expectations for students to be ready to participate fully and effectively. Similarly, high school partners were asked what they would want students to know and be able to do upon entry into their programs, and to reflect upon whether those expectations were included in the courses available at the middle level or in the foundational courses. For agriculture, food and natural resources the following skills were identified:

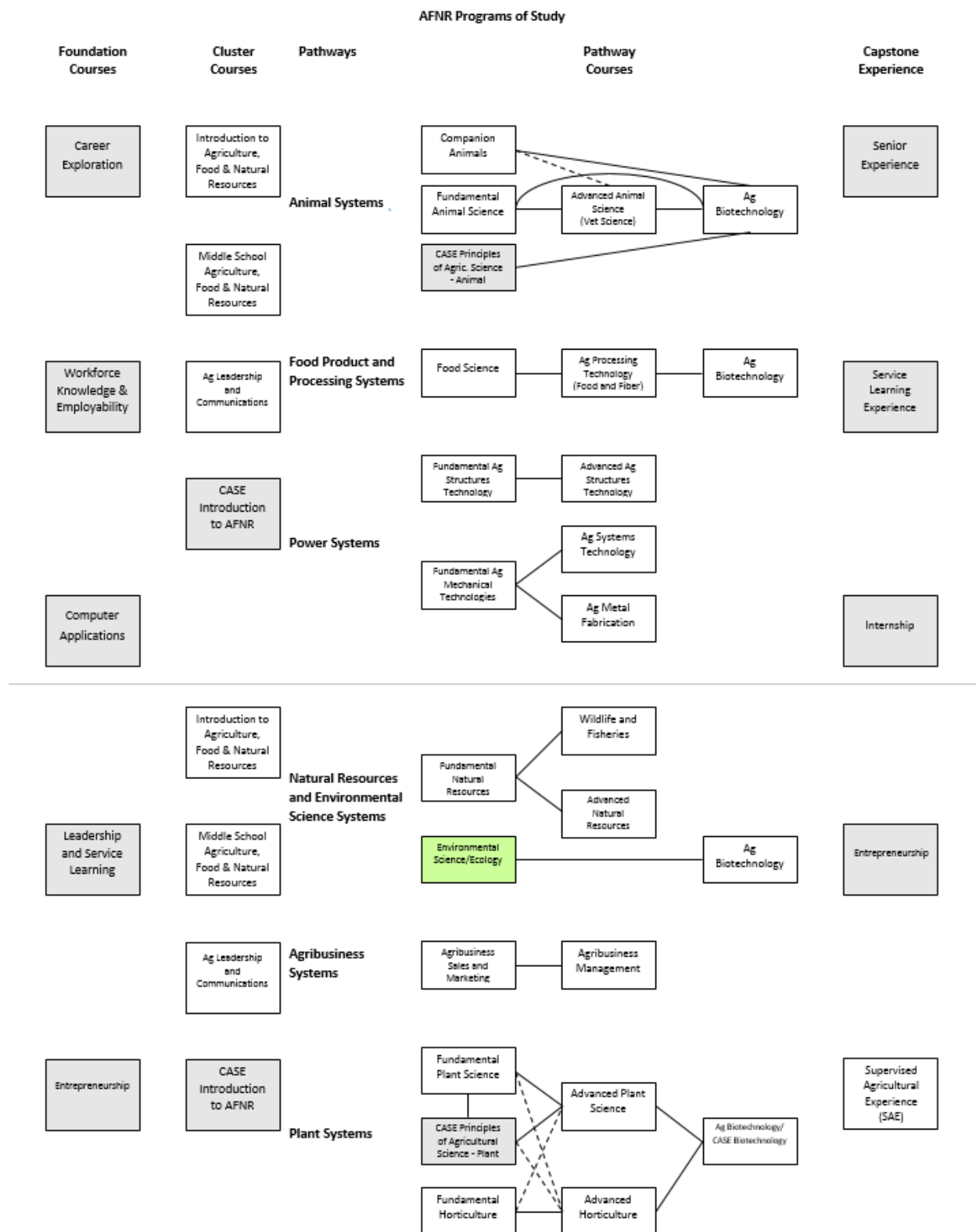
Middle School to High School

- Address an envelope
- Computer skills including Publisher and Word
- Keyboarding
- Critical reading skills
- Read out loud
- Agriculture pathways/career opportunities
- Learning management system
- Basic soft skills
- Tools – general knowledge in content area

High School to Postsecondary Program

- Work ethic
- Soft skills
- Basic academic understandings
- Statistics
- Research

Participants were encouraged to identify a “big picture” concept statement describing what was to be accomplished within each course before developing standards. This “big picture” statement would eventually be revised to be an executive summary statement at the time that the standards had been drafted.



Information was provided about what makes good standards. These criteria included:

- Essential – does it define knowledge and skills that an individual must have to participate fully and effectively in programs that prepare them to enter careers with livable salaries, and to engage in career advancement in growing, sustainable industries?
- Rigorous – does it ask a student to demonstrate deep conceptual understanding through the application of knowledge and skills to new situations?
- Clear and specific – does it convey a level of performance without being overly prescriptive? Is it written in a way that the general public would understand?
- Teachable and Learnable – does it provide guidance to the development of curricula and instructional materials? Is it reasonable in scope?
- Measurable – Can it be determined by observation or other means that the student has gained the knowledge and skills to be demonstrated to show attainment of the standard?
- Coherent – Does it fit within the progression of learning that is expected for the program of study?
- Sequential – Does it reinforce prior learning without being unnecessarily repetitive? Does it provide knowledge and skills that will be useful as the student continues through the program of study?
- Benchmarked – Can the standard be benchmarked against industry or international standards? Does it prepare the student to be successful in the regional, state and global economies?

State agency staff met in May of 2015 to review the processes to be used for standards review. During that session the staff identified other criteria to be considered when writing standards:

- Connections to postsecondary programs
- Relevant across the content area
- Compatible with virtual learning
- Reflects business/industry input
- Adaptable to change over time
- Allows for instructional creativity
- Appropriate for the target audience
- Aligned with relevant academic content
- Applicable to student organizations
- Recognizes unique features of CTE

These additional criteria were shared with participants for their consideration during standards development, and an exercise was conducted in which participants individually, and then as a group, reviewed four sample standards.

Brief mention was made of resources available in the Dropbox in which members shared information. Because an introductory video regarding the Dropbox had been prepared and reviewed by participants prior to participation in the standards review team, the Dropbox review conducted here only showed categories of information provided in the general section and note that a Working Drafts folder would be created in which participants would store their work.

A Standards Template was shared with the participants and reviewed:

- The course title was inserted at the top.
- A grid of administrative information was completed to the extent the information was known. This grid included:
 - The Career Cluster [Agriculture, Food & Natural Resources]
 - The Course Code [to be added by state staff if not known]

- Any prerequisites or recommended prior coursework
- Credits [generally established by the individual school district]
- Graduation requirement [generally established by the individual school district]
- Program of study and sequence [a listing of the components of the program of study]
- Student organization options
- Coordinating work-based learning appropriate for the course
- Industry certifications [if appropriate for the course]
- Dual-credit or dual enrollment options if available
- Teacher certification requirements [to be completed by state staff]
- Resources
- Course description. Eventually this will be an executive summary describing the course, but in the process participants were encouraged to develop a “big picture” statement about the course to serve as a reminder when developing standards.
- Program of study application: a more detailed description of the elements within the program of study and where the particular course fits within a sequence.
- Course Standards and prods
 - “Prods” is a list of topics to keep in mind when developing standards to see that related topics are included. The prods identified by state staff include:
 - Safety
 - Soft skills
 - Reinforcing academic concepts in math, language arts, science and social studies
 - Addressing all aspects of the industry
 - Trends [so that students are thinking of the direction that an industry is moving]
 - Indicators – the main topics written in terms of a demonstration of knowledge and skills
 - Sub-indicators – statements identifying in more detail how the indicator will be demonstrated
 - Integrated content – A space that allows for examples, explanation, reference to credentials, alignment with other academic standards or other useful information to bring clarity to the understanding about the intent of the sub-indicator
 - Notes – a place for additional information to clarify the intent and expectations of the indicator.

An example was shared to ensure understanding.

Working teams were then established to write the standards. Teams were grouped generally by pathway. Each team selected a course to begin their work. Early drafts were reviewed by the consultants and participants were led with guiding questions so that they could refine their own work. Eventually, when standards had been developed for all courses, the participants did a final group review of all standards to give their approval. Final documents were then reviewed by the consultants for format and structure, and saved to the shared Dropbox. Participants were given two weeks to make any final comments or suggestions, at which time the Dropbox was put into a “read-only” status.

For Agriculture, Food and Natural Resources the following course standards were developed:

Cluster Courses

Introduction to Agriculture, Food & Natural Resources

Examine the role of FFA in agricultural education programs.

Summarize the history and organization of FFA

Explore opportunities in FFA

- Demonstrate proper use of parliamentary procedure
- Describe the types of Supervised Agricultural Experiences.
 - Evaluate the benefits and types of SAE programs
 - Develop a profile within Ag Career Network or Ag Experience Tracker
- Discuss the concept of natural resources.
 - Classify different types of natural resources in order to enable protection, conservation, enhancement, and management in a particular geographical region
- Describe the animal science industry.
 - Examine the animal science industry
 - Analyze historic and current trends impacting the animal science industry
- Describe plant structure and function.
 - Examine the plant science industry
 - Analyze historic and current trends impacting the plant science industry
- Summarize basic economic principles.
 - Apply management planning principles in the AFNR business
- Discuss basic food science technology.
 - Illustrate how raw commodities become table-ready food products
- Use basic principles of agricultural systems technology.
 - Execute basic principles involved in agricultural systems technology
- Develop employability skills related to the AFNR cluster.
 - Develop soft skills to enhance employability

Middle School Agriculture, Food & Natural Resources

- Examine agriculture industries of the past, present, and future.
 - Appraise fundamentals of the agriculture industry and its impact on the world
 - Explore the animal science industry including large and/or small animals
 - Explore the plant science industry including agronomic and/or horticultural crops
- Use basic principles of agricultural systems technology.
 - Identify and demonstrate safe use of shop equipment
- Develop employability skills related to the AFNR Cluster.
 - Develop soft skills to enhance employability

Ag Leadership and Communications

- Act as a responsible and contributing citizen and employee in the AFNR sector. (National AFNR CRP.01)
 - Model personal responsibility in the workplace and community
 - Demonstrate soft skills for career success
 - Apply appropriate academic and technical skills
- Apply and model teamwork and leadership skills in work groups.
 - Employ leadership skills to accomplish a team goal
 - Model proper use of basic parliamentary procedure
 - Exhibit a cooperative spirit when working in a group situation
 - Contribute to team-oriented projects and build consensus to accomplish results using cultural global competence in the workplace and community
- Model integrity, ethical leadership and effective management. (National AFNR CRP.09)
 - Model characteristics of ethical and effective leaders in the workplace and community
 - Implement personal management skills to function effectively and efficiently in the workplace
 - Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community

Communicate information relevant to agriculture clearly, effectively, and with reason. (National AFNR CRP.04)

- Demonstrate basic information research skills and techniques

- Produce clear, reasoned, and coherent written, verbal, or visual communication for formal or informal settings

- Communicate using strategies that ensure clarity, logic, purpose, and professionalism in formal or informal settings

Use technology to enhance productivity. (National AFNR CRP.11)

- Research, select, and use new technologies, tools, and applications to maximize productivity in the workplace and community

- Utilize technology to advocate for agriculture and the FFA

- Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community

Animal Systems Pathway

Companion Animals

Examine the anatomy and physiology of small animals.

- Use classification systems to explain the anatomy and physiology of companion animals

- Differentiate between species' reproductive cycles

- Analyze elements between male and female reproductive systems

Evaluate an animal's diet to provide proper nutrition and optimal performance.

- Evaluate an animal's developmental stage to comprehend differences in nutrient requirements throughout the animal's life cycle

- Analyze a feed label/ration to determine whether it fulfills a given animal's nutrient requirements

Demonstrate techniques for optimal care of an animal.

- Recognize optimum performance for a given animal species

- Evaluate an animal's behavior to safely work with it

- Design a program to develop an animal to its highest potential

Develop employability skills related to the Animal Systems Pathway.

- Develop soft skills to enhance employability

Fundamental Animal Science

Examine animal anatomy and physiology.

- Recognize animals by species, gender or use

- Identify the parts of an animal's anatomy

Examine animal health.

- Evaluate a subject animal to determine the nature of its health

- Understand proper usage and effects of animal health products

Describe practices for safely working with animals.

- Judge an animal's behavior to safely work with it

- Examine animal housing, equipment and handling facilities for the safety of animals and handlers

- Select management practices to reduce the effects of animal production on the environment

Distinguish elements of proper animal nutrition.

- Compare an animal's differing nutritional needs throughout its life cycle

- Prepare a feed ration to fulfill a given animal's nutrient requirements

Study the reproductive system of animals.

- Examine male and female reproductive systems

- Discuss reproductive cycles and breeding techniques
- Evaluate an animal to determine breeding soundness and readiness
- Identify factors that affect an animal's performance.
 - Predict genetic outcomes
 - Determine optimum performance levels for a given animal species
 - Assess an animal to determine if it has reached its optimum performance level
- Examine animal industry issues.
 - Compare and contrast consumer concerns related to animal food products
 - Analyze consumer concern related to animal welfare
- Develop employability skills related to the Animal Systems Pathway.
 - Develop soft skills to enhance employability

Advanced Animal Science

- Select proper health care practices for animals.
 - Choose prevention and treatment programs for animal diseases, parasites and disorders
 - Discuss how to provide biosecurity for animals, people, and facilities
- Develop proper nutrition management practices to optimize animal performance.
 - Assess nutritional elements as they affect animal performances
 - Assemble feed rations to provide for animals' nutritional needs
- Select reproductive practices to optimize animal production.
 - Identify management practices in breeding that account for high quality animals
- Articulate medical terminology as it relates to animals.
 - Recognize relevant medical terminology related to animals
 - Apply medical terminology in the correct context
- Classify, evaluate and select animals based on anatomical and physiological characteristics (National AFNR AS.06).
 - Apply principles of anatomy and physiology to uses within various animal systems
 - Identify and explain the relationships among the various systems of the body
- Utilize principles of surgical techniques.
 - Identify surgical tools and supplies
 - Apply proper surgical techniques to medical situations
- Develop employability skills related to the Animal Systems Pathway.
 - Develop soft skills to enhance employability

Ag Biotechnology

- Assess factors that have influenced the evolution of biotechnology in agriculture. [National AFNR BS.01.
 - Investigate and explain the relationships among past, current and emerging applications of biotechnology in agriculture
 - Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests
 - Analyze the relationships and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture
- Illustrate the functions and importance of biotechnology at the cellular level.
 - Recognize components of cells and their application to genetic improvement
 - Illustrate the role of cell structures in genetic theory
- Safely apply appropriate skills to complete tasks in a biotechnology research and development environment.

- Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results
- Implement standard operating procedures (SOP) for the biotechnology sector
- Analyze the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems. National AFNR BS.03
- Investigate biotechnology principles, techniques and processes to enhance plant systems
- Investigate biotechnology principles, techniques and processes to enhance animal systems
- Investigate biotechnology principles, techniques and processes to enhance food products and processing systems
- Investigate biotechnology principles, techniques and processes to enhance natural resources and environmental service systems
- Develop employability skills related to the Animal, Food Product and Processing, Plant, and Natural Resources and Environmental Science Systems.
- Develop soft skills to enhance employability

Food Product and Processing Pathway

Food Science

- Examine the makeup of the food industry.
 - Investigate advancements in food science techniques
 - Identify organizations and their impact on the food industry
- Apply safety and sanitation procedures for food production.
 - Describe proper safety and sanitation practices when working with food products
 - Apply safety and sanitation practices used in the food industry
 - Identify origins of food borne pathogens and effective prevention and control methods
- Apply principles of science to producing safe, wholesome and nutritious food products.
 - Apply fundamental chemistry to food science
 - Differentiate the makeup of food products
 - Develop a food product that meets the standards of regulatory agencies
- Develop employability skills related to the Food Product and Processing Systems.
- Develop soft skills to enhance employability

Ag Processing Technology

- Examine the makeup of the food processing industry.
 - Investigate the evolution of the food processing industry
 - Discuss how food safety is addressed in the food processing industry
 - Explain how regulatory agencies in the food industry work to protect consumers
- Demonstrate operational procedures used in the food industry.
 - Translate regulatory procedures as they apply to food processing
 - Demonstrate worker safety procedures for food processing equipment
- Process foods for storage, distribution and consumption.
 - Classify processed food products
 - Utilize industry harvesting, selection and inspection techniques
 - Describe the steps involved with producing various food products
 - Process food safely
- Develop employability skills related to the Food Product and Processing Systems.
- Develop soft skills to enhance employability

Ag Biotechnology

[See Animal Systems pathway]

Power Systems Pathway

Fundamental Ag Structures Technology

Use safe practices associated with agriculture structures.

- Demonstrate safe use of tools and equipment while constructing agriculture structures

Develop plans for an agriculture structure project.

- Use computer skills or drafting tools to develop sketches and plans for an ag structure

Examine various materials required for an agricultural structure.

- Investigate the differences in materials needed to assemble an ag structure

- Demonstrate knowledge of structural materials by developing a supply list, along with cost estimates for a given project

Construct an agriculture structure.

- Assemble components of a structure

- Create a complete agriculture structure by combining individually constructed components

Demonstrate electrical principles.

- Explain basic electrical terms and principles

- Use applicable instruments to demonstrate knowledge of basic electricity

- Demonstrate wiring and electrical applications

Analyze properties and conditions of building site prior to construction.

- Explain legal land descriptions and plat maps

- Examine geographical characteristics of building site

- Operate surveying equipment

Analyze various concrete and masonry concepts.

- Identify tools and materials used in concrete and masonry projects

Explore career opportunities in agricultural structures and mechanics.

- Investigate career opportunities that pertain to agricultural structures

- Develop soft skills to enhance employability

Advanced Ag Structures Technology

Use safe practices when planning, maintaining, and constructing agricultural structures.

- Demonstrate safe use of tools and equipment while constructing agriculture structures

- Demonstrate understanding of tool repair and maintenance

Service and repair mechanical equipment and structures.

- Analyze schematics to service various systems in an ag structure

Utilize a structural plan that meets specifications and building codes.

- Examine blueprints and local codes that identify required components of an ag structure

- Design a construction plan for an agricultural structure

Use plans to guide construction of agricultural structures.

- Use architectural and mechanical plans to construct agricultural buildings or facilities

Apply a variety of concrete and masonry concepts to various projects.

- Demonstrate concrete and masonry procedures

Investigate a variety of plumbing tools and products.

- Identify tools and materials used for plumbing

- Demonstrate various plumbing techniques

Develop employability skills related to the Power, Structural, and Technical Systems Pathway.

- Develop soft skills to enhance employability

Fundamental Ag Mechanical Technologies

Apply safety practices in mechanical applications.

- Explain the safe operation and servicing of machinery and equipment

- Demonstrate safe operation of construction/fabrication tools

Identify maintenance procedures & schedules for mechanical equipment, power and agricultural technology.

- Identify parts and explain functions of various mechanical systems

- Investigate common maintenance schedules and practices for equipment

- Troubleshoot problems in mechanical systems

Demonstrate basic skills in project planning and metal fabrication.

- Create sketches of metal projects

- Demonstrate basic welding principles and techniques

- Employ metal fabrication principles to create a metal project

Apply electrical principles in agricultural applications.

- Recognize the components and functions of electrical systems

- Demonstrate fundamental principles of electricity

Investigate emerging agricultural technologies.

- Investigate new and/or existing technology in agriculture

Develop employability skills related to the Power, Structural, and Technical Systems Pathway.

- Develop soft skills to enhance employability

Ag Systems Technology

Apply engineering principles to mechanical equipment, power utilization and technology.

- Compare power generation from various energy sources

- Investigate various properties of lubricants needed in ag mechanics

Apply principles of operation and maintenance to mechanical equipment, power utilization, and technology.

- Explain the importance of scheduled service routines to maintain machinery and equipment

- Demonstrate suggested inspections on machinery and/or equipment

Examine principles of service and repair to mechanical and electrical equipment, power utilizations and technology.

- Evaluate internal combustion engines to assess needed service and repair

- Investigate service and repair specifications for operating systems

- Diagnose problems associated with operating systems

- Explore electric motor types, operation and maintenance

Analyze emerging agriculture technologies.

- Analyze how emerging agriculture technologies have affected AFNR industries

Develop employability skills related to the Power, Structural, and Technical Systems Pathway.

- Develop soft skills to enhance employability

Ag Metal Fabrication

Demonstrate the basics of metal fabrication.

- Demonstrate knowledge of metal fabrication techniques and related technologies

- Prepare various metals for welding

- Create plans for metal project construction

Demonstrate the principles of Shielded Metal Arc Welding (SMAW) and the correct operation of SMAW equipment.

- Perform Shielded Metal Arc Welding (SMAW) techniques
- Demonstrate the principles of Metal Inert Gas (MIG) welding, also known as Gas Metal Arc Welding (GMAW), and the correct operation of MIG equipment.
- Perform metal inert gas (MIG) welding techniques
- Understand the correct operation of oxyacetylene equipment.
- Explore oxyacetylene welding, cutting, and brazing
- Explore advanced welding processes.
 - Investigate and explain principles of advanced welding processes (e.g. Tungsten Inert Gas (TIG) welding, plasma cutting)
- Develop employability skills related to the Power, Structural, and Technical Systems Pathway.
 - Develop soft skills to enhance employability
 - Investigate careers related to metal fabrication

Natural Resources and Environmental Systems Pathway

Fundamental Natural Resources

- Examine the importance of resource and human interrelations to conduct management activities in natural habitats.
 - Explain resource management components to establish or enhance relationships in natural resource systems
 - Apply Geographic Information Systems (GIS) skills to natural resource activities
 - Examine planning data to determine natural resource status
 - Discuss weather and other criteria to recognize dangers related to work in an outdoor environment
- Interpret scientific principles of natural resource management activities.
 - Identify and classify plant- and animal-based natural resources
 - Identify natural cycles and related phenomena to describe ecologic concepts and principles
 - Describe soil compositions and properties
 - Examine wetland, watershed and groundwater properties, classifications and functions
 - Discuss forestry management techniques
- Describe production practices and processing procedures for natural resources
 - Describe how natural resource products are produced, harvested, processed and used
- Explain responsible practices to protect natural resources
 - Describe techniques and equipment needed to manage and conserve natural resources
 - Discuss animal and plant disease symptoms and prevention
 - Recognize insect types and available controls to prevent insect infestation

Wildlife and Fisheries

- Demonstrate the importance of fish and wildlife management, including their respective habitats. (National AFNR NRS.02)
 - Apply knowledge of natural resource components to the management of wildlife and fish
 - Identify fish and wildlife species
 - Identify healthy habitat for wildlife and fish
- Identify economic and social issues related to fish and wildlife (National AFNR NRS.03)
 - Discuss hunting/harvesting fish and wildlife species as a management technique
 - Demonstrate processing techniques to use game and fish as food sources
 - Distinguish safety practices related to hunting and fishing activities
- Compare life patterns of fish and wildlife.
 - Differentiate fish and wildlife function and form in their daily lives

- Identify seasonal rituals of fish and wildlife species
- Diagnose wildlife and fish diseases
- Investigate careers in wildlife and fisheries conservation.
 - Locate, identify, research and interpret career information
 - Compare and contrast characteristics of various careers

Advanced Natural Resources

- Explore soil composition and soil management.
 - Demonstrate techniques used to classify soils
 - Explain the reasons for, and importance of, soil conservation
 - Analyze soils for agricultural and homesite uses
 - Analyze existing soil surveys to develop effective management plans
- Apply ecological concepts and principles to rangeland conservation.
 - Summarize the interrelationships of rangeland management, the environment, wildlife management, and the livestock industry
 - Discuss practices used to improve rangeland quality
 - Analyze the carrying capacity in various rangelands for both wildlife species and domestic livestock
 - Identify plants important to quality rangeland and determine rangeland condition
- Understand forest management practices.
 - Identify trees and classify to species
 - Apply silvicultural practices: planting, thinning, and harvesting
 - Identify and classify Forest Site Indices as related to Sustained Yield concepts
 - Define and discuss Multiple Use management
 - Develop a Continuous Forest Inventory
- Apply ecological concepts and principles to fisheries and wildlife in natural resources.
 - Identify similarities and differences among wildlife and fish species, along with identifying the keystone species in a system
 - Investigate wildlife management and habitat
 - Differentiate among a variety of management practices used to manage wildlife populations for hunting and other recreational purposes
 - Enhance fish/wildlife habitat
- Understand air and water use, examine management practices, and develop conservation strategies.
 - Explain the government's role in regulating air and water management practices and conservation strategies
 - Define appropriate water conservation measures
 - Analyze the way in which water and air management affect the environment and human needs
 - Measure and assess water and air quality parameters using federal, tribal, state and/or local standards
- Develop plans to ensure sustainable production and processing of natural resources. (National NRS.03)
 - Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.)
 - Compare the various production methods of alternative energy sources, both renewable and non-renewable, and their relations to economic, environmental and social sustainability
 - Evaluate methods used to extract and process minerals for economic, environmental, and social sustainability

Ag Biotechnology

[See Animal Systems pathway]

Agribusiness Systems Pathway

Agribusiness Sales and Marketing

Demonstrate the skills necessary to obtain and keep gainful employment in agribusiness occupations.

- Use written and oral skills to seek and obtain an agricultural job

- Use marketable skills such as reliability and communications to improve self and to develop steps for systematic problem solving

Evaluate sales and marketing principles used to accomplish marketing objectives.

- Write a marketing plan for a product based on marketing objectives

- Merchandise products and services to meet the needs of a customer

Use technology and documents to manage agribusiness inventory.

- Apply reading comprehension, writing and math skills in inventory management

- Analyze inventory data to determine acceptable business inventory stocking levels to manage business efficiency

Evaluate opportunities for marketing of agricultural products throughout the world.

- Locate areas of agricultural importance and determine the competitive advantage for production of agricultural products

- Develop an awareness of food production and global needs to determine how those needs can be met

- Investigate the process in developing international trading partners

Use sales and marketing principles to accomplish AFNR business objectives (Nat #5).

- Analyze the roles of markets, trade, competition and price in relation to an AFNR business sales and marketing plan

- Assess and apply sales principles and skills to accomplish AFNR business objectives

- Assess marketing principles and develop marketing plans to accomplish AFNR business objectives

Agribusiness Management

Introduce the components of agribusiness management.

- Explain key business types and management principles and issues for the agribusiness enterprise

- Present an overview of the knowledge and skills needed to work effectively within the agribusiness enterprises

- Demonstrate leadership skills to accomplish goals and objectives in an agribusiness environment

Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations. (National AFNR.03)

- Distinguish key accounting fundamentals to accomplish dependable bookkeeping and associated files

- Analyze and interpret agricultural policies in relation to their effects on the agribusiness management and agribusiness enterprises

Plan a marketing program utilizing various methods for sales of agricultural products. (National AFNR ABS.05)

- Explore strategies for optimum marketing of agricultural commodities

- Analyze budget and forecast models to determine optimal business marketing, strategies, and performances

Manage cash budgets, credit budgets, and credit for an AFNR business using generally accepted accounting principles (GAAP). (National #3)

- Develop, assess and manage cash budgets to achieve AFNR business goals

- Analyze credit needs and manage credit budgets to achieve AFNR business goals

Plant Systems Pathway

Fundamental Plant Science

Explain principles of anatomy and physiology in plants.

- Describe functional differences in plant structures including roots, stems, flowers, leaves, and fruits

- Classify and identify plants

Manipulate the environment to promote optimal growth in plants.

- Determine nutritional requirements for optimal plant growth

- Examine data to evaluate and manage soil/media and nutrients

Evaluate fundamentals of production and harvesting of plants.

- Analyze a production plan for optimal plant production

- Compare the basic methods for reproducing and propagating plants

- Examine fundamentals to harvest, handle, store, and market crops

Explore employability skills within the plant science industry.

- Develop soft skills to enhance employability

Fundamental Horticulture

Explain horticultural plant classifications.

- Classify and identify horticultural plants

Define basic principles of plant physiology and propagation.

- Explain basic principles of plant physiology and growth

- Demonstrate the propagation of plants by sexual and asexual methods

Describe pest management in the horticultural industry.

- Identify principles of pest management

Analyze soil, environment, and fertility properties as they affect plant growth.

- Examine soil and planting media management

- Examine the growing environment and its effect on plant growth

- Identify plant nutrition practices for horticulture plants as they relate to plant growth and health

Examine horticulture industry sectors.

- Investigate the care and maintenance of vegetable/fruit crops

- Investigate the floriculture industry

- Investigate the nursery/landscape industry

- Investigate the care and management of turf grass

Develop employability skills related to the Plant Systems Pathway.

- Develop soft skills to enhance employability

Advanced Plant Science

Recognize principles of plant anatomy, classification, and physiology for the production and management of agronomic plants.

- Classify plants according to taxonomy, life cycles, and plant use

- Compare the benefits and risks of genetically modified plants (GMO)

- Apply knowledge of seed, fruit, and vegetative parts optimal for plant reproduction

Employ the principles and practices of sustainable agriculture in a plant-based operation.

- Incorporate the fundamentals of plant management and sustainable agriculture

- Evaluate a fertilizer plan for specific plants or crops

- Evaluate data to manage range and pastures

- Examine growth of a plant to determine when and how a crop should be harvested and stored

- Evaluate crop and harvest success for future planning

Analyze a pest management system.

Identify pest chemicals by formulation and use
Develop integrated pest management strategies to manage pest populations
Understand the safe handling, mixing and application of chemicals
Develop employability skills related to the Plant Systems Pathway.
Develop soft skills to enhance employability

Advanced Horticulture

Identify equipment and materials utilized in the horticulture industry.
Identify tools and equipment used in horticultural industries
Identify supplies and materials used in horticulture
Develop a plan for utilizing horticultural plants and materials.
Design a landscaping plan based on design elements and principles
Construct floral arrangements using basic principles and elements of design
Develop a greenhouse management plan
Demonstrate the importance of managing plant growth and use.
Select landscaping plants based on quality and function
Select and manage plant materials for the floricultural industry
Investigate methods for controlling greenhouse environment to meet plant growth needs
Demonstrate the relationships among growing media, plant nutrition, and environmental conditions as they relate to plant growth and reproduction
Discuss principles of specialized growing techniques
Manage and maintain horticulture plants and equipment.
Summarize the installation and maintenance of turf grass and necessary equipment
Manage and maintain nursery/landscape plants and equipment
Manage and maintain floral and foliage plants and floriculture equipment
Maintain controls for the greenhouse environment, structure, and plants
Develop employability skills related to the Plant Systems Pathway.
Develop soft skills to enhance employability

Ag Biotechnology

[See Animal Systems pathway]

A cover letter has been drafted to guide business/industry feedback to the standards developed through this process. The seven standards documents will be reformatted with three columns for business/industry feedback at the sub-indicator level utilizing a 1 (low) to 5 (high) scale:

- Is the sub-indicator essential?
- Is the sub-indicator clear and specific?
- Is the sub-indicator measurable?

Business/industry partners are also asked if the standards reflect the preparation necessary for a student to enter her/his particular occupational field. A sample of the reformatted document follows.

Course Standards

ITA 1 Examine the role of FFA in agricultural education programs.

			Essential 1 (low) – 5 (high)	Clear and Specific 1 (low) – 5 (high)	Measurable 1 (low) – 5 (high)
<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>			
One Recall	ITA 1.1 Summarize the history and organization of FFA.				
One Recall	ITA 1.2 Explore opportunities in FFA.				
Two Skill/Concept	ITA 1.3 Demonstrate proper use of parliamentary procedure.				

Notes

ITA 2 Describe the types of Supervised Agricultural Experiences.

			Essential 1 (low) – 5 (high)	Clear and Specific 1 (low) – 5 (high)	Measurable 1 (low) – 5 (high)
<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>			
One Recall	ITA 2.1 Evaluate the benefits and types of SAE programs.				
Three	ITA 2.2 Develop a profile within Ag Career Network or Ag Experience Tracker.				

Following business/industry review, state staff will revise the standards documents as necessary to incorporate business/industry suggestions. The revised documents will be shared with participants in the standards development process and, eventually, with teachers of agriculture, food and natural resources courses throughout the state for their feedback. Final documents will be taken through public hearings and delivered to the State Board of Education for adoption.