CITATION-Standards from Ohio Department of Education:

Agriculture, Food and Natural Resources

Subject Code: 010105

Unit: Production Agriculture & Agribusiness

Students will be introduced to the vast operations and opportunities within the Food, Fiber and Natural Resources Industries. They will explore general agricultural topics such as top grossing commodities, career opportunities within the agribusiness field as well as terminology essential to the understanding of the agricultural world.

Outcome 1.1.

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:

1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 1.8.

Operations Management: Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

Competency:

1.8.3. Analyze the performance of organizational activities and reallocate resources to achieve established goals.

Outcome 1.11.

Principles of Business Economics: Examine and employ economic principles, concepts and policies to accomplish organizational goals and objectives.

Competency:

1.11.1. Identify the economic principles that guide geographic location of an industry's facilities (e.g., relative scarcity, price, quantity of products and services).

Unit: Sustainable Agriculture

This unit asks the question, what is sustainable agriculture? Students will learn which basic practices will allow the sustainability of life through one's own efforts in producing agricultural products in various climates and atmospheres.

Outcome 1.8.

Operations Management: Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

Competency:

1.8.2. Select and organize resources to develop a product or a service.

1.8.9. Develop a budget that reflects the strategies and goals of the organization.

Outcome 1.11.

Principles of Business Economics: Examine and employ economic principles, concepts and policies to accomplish organizational goals and objectives.

Competency:

1.11.1. Identify the economic principles that guide geographic location of an industry's facilities (e.g., relative scarcity, price, quantity of products and services).

Outcome 9.1.

Energy Sources: Identify energy sources according to their economic viability, sustainability and environmental impact.

Competency:
9.1.2. Identify, compare and contrast renewable energy sources and the technology used to generate energy.
9.1.4. Identify the social, economic and environmental drivers and barriers that influence the development and use of energy sources.

Unit: Industrial Technology & Safety
Students will explore engineering and structural principles utilized in the agriculture industry and the coordinating career opportunities. Topics could include an overview of estimating and building, fundamental principles of metal working and engine repair. Safety will be an essential underlying theme in all fields explored.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 1.12.
Site and Personal Safety Procedures: Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation and take corrective action.

Competency:
1.12.1. Use Occupational Safety and Health Administration (OSHA) defined procedures for identifying employer and employee responsibilities, working in confined spaces, managing worker safety programs, using ground fault circuit interrupters (gfcis), maintaining clearance and boundaries and labeling.
1.12.2. Interpret safety signs and symbols.
1.12.5. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (sdss), fire alarms and exits.
1.12.6. Identify procedures for the handling, storage and disposal of hazardous materials.
1.12.7. Select, use, store, maintain and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions and materials.
1.12.8. Identify safety hazards and take corrective measures.
1.12.9. Identify, inspect and use safety equipment appropriate for the task.
1.12.10. Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary.

Outcome 4.1.
Tool, Stationary and Mobile Equipment Maintenance: Inspect, clean, maintain and perform planned preventative maintenance on tools, machinery, implements and equipment.

Competency:
4.1.1. Identify the types of hand tools, power tools and stationary equipment and describe their functions.

Outcome 4.3.
Engines: Apply concepts to service components of both small and large internal combustion engines.

Competency:
4.3.5. Compare and contrast two-cycle and four-cycle engines and their operating principles.

Outcome 5.3.
Design and Estimate: Plan and design a basic site plan for a desired outcome.

Competency:
5.3.1. Identify, interpret and use symbols, lines, dimensions, views, sections, site plans, floor plans, specifications, common scales, detail drawings and abbreviations on drawings and prints.

5.3.2. Apply proportional reasoning and indirect measurement techniques.

Outcome 5.6.
Construction: Follow architectural plans to construct and repair simple outdoor structures and minor building additions.

Competency:
5.6.2. Lay out, cut, smooth, shape and bore construction materials.

Outcome 5.10.
Joining and Cutting Metals with Heat: Join and cut steel using heat in horizontal and vertical positions.

Competency:
5.10.3. Compare and contrast metal welding operating characteristics and performance (e.g., oxy-fuel, shielded metal arc, gas tungsten arc, braising, soldering).

Unit: Biotechnology
Learners will explore introductory principles in biotechnology, including microbiology and genetics to plant and animal research and product development. Students will apply genetic principles to determine genotypes and phenotypes and discover the career opportunities within these industries.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 3.1.
Handling, Preparation, Transportation, Storage and Disposal: Handle, prepare, transport, store and dispose of specimens using procedures that minimize disturbance to the test specimen. Monitor, record and maintain the integrity of equipment and instrumentation, environmental conditions of the facility and the inventory.

Competency:
3.1.7. Select personal protective attire for various laboratory protocols.
Outcome 3.4.
Molecular-Genetics Technology: Apply knowledge of nucleic acid structure and function, deoxyribonucleic acid (DNA) replication, transcription, translation, chromosome structure and remodeling and regulation of gene expression in prokaryotes and eukaryotes.

Competency:
3.4.1. Use a Punnet square to predict and explain Mendel's Laws, genotype and phenotype.

Outcome 3.6.
Culturing: Perform experimental techniques used in microbial biology to study cell growth, manipulation and evaluation.

Competency:
3.6.1. Identify the structure of cells and the functions of their components.

Unit: Food Science
Students will be exposed to careers in the research, marketing, processing and packaging techniques applied to the development of food products. Learners will be introduced to nutrient content in the development of food products.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking

techniques to develop and maintain professional relationships.

Outcome 7.2.
Quality Assurance: Inspect the food production process, locate potential sources of food quality and safety deviations in facilities and prepare a corrective action plan.

Competency:
7.2.2. Describe the internal and external quality attributes that a food product should possess.

Outcome 7.5.
Food Product Development: Apply principles of nutrition and human behavior to create a new food prototype that meets a specific dietary need or demand for consumption, design packaging and seek label approval.

Competency:
7.5.1. Conduct a sensory evaluation of food products.
7.5.4. Calculate nutrient values, serving sizes and nutrient variability for a food product.

Unit: Animal Science
Students will be introduced to the five main areas of animals: production, exotic, companion, wildlife and research. They will examine career opportunities in both the small and large animal sectors as well as learn basic terminology to understand the similarities and differences of each.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships

Outcome 2.3.
Care and Management: Apply animal care and management procedures to ensure animal husbandry and welfare, including managing environmental conditions to ensure animal health and performance.

Competency:
2.3.1. Identify species-specific terminology based on gender and age.
2.3.2. Identify, classify, evaluate and select animal species or breeds for a desired outcome.

Unit: Plant and Horticulture Science
Students will be introduced to the main areas of the green industry (e.g. floral, turf grass, crop production, greenhouse management). They will examine career opportunities in both the research and production sectors as well as learn basic terminology to understand the similarities and differences of each.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 8.1.
Plant Nutrition: Select and apply macronutrients and micronutrients based on deficiencies, identified using testing application methods and optimum management, that account for environmental factors.

Competency:
8.1.3. Determine the nutrient requirements of plants.

Outcome 8.4.
Growth and Management: Manage and manipulate plant development through the selection, planting and growing of seeds and plants, based on global demand, economic importance and growing conditions.

Competency:
8.4.1. Identify and classify plants using taxonomy.
8.4.4. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.

Unit: Natural Resources
Students will be introduced to the various career opportunities in the natural resources areas, including forestry and wildlife, natural resource and energy management and water quality control. They will be exposed to the relationships between organisms and their environment.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 6.1.
Soils: Apply knowledge of soil characteristics and soil information resources to overcome any existing soil use limitations while maintaining or improving soil quality.

Competency:
6.1.1. Identify soil forming factors and explain how they produce variability in soils.
6.1.3. Collect, test and analyze soil samples for physical and chemical properties.

Outcome 6.2.
Water Quality: Analyze, interpret and manage the biological, chemical and physical properties of water quality.

Competency:
6.2.1. Assess and explain the interactions between human activities and the Earth's hydrosphere (e.g., septic systems, desalinization, point and non-point source pollution).

Outcome 6.11.
Habitat Management and Restoration: Develop a plan for the management and restoration of a specific habitat.

Competency:
6.11.1. Differentiate the properties and characteristics of habitats.
6.11.2. Examine sites and place them into ecological classifications.
6.11.3. Explain the impacts of an increasing human population on habitats.

Outcome 9.1.
Energy Sources: Identify energy sources according to their economic viability, sustainability and environmental impact.

Competency:
9.1.1. Identify, compare and contrast fossil fuel sources and the technology used to generate energy.
9.1.2. Identify, compare and contrast renewable energy sources and the technology used to generate energy.
9.1.3. Identify, compare and contrast alternative energy sources and technology used to generate energy (e.g., fuel cells, hydrogen, nuclear).
9.1.4. Identify the social, economic and environmental drivers and barriers that influence the development and use of energy sources.

Unit: Supervised Agricultural Experiences and Record Keeping

Students will use technology such as word processors, databases, spreadsheets, and electronic mail to maintain accurate business records. They will explore entrepreneurial ventures as well as research, placement and exploratory work-based learning options.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 1.6.
Business Literacy: Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

Competency:
1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g., risk versus reward, reasons for success and failure).
1.6.3. Explain the importance of planning your business.
1.6.4. Identify types of businesses, ownership and entities (i.e., individual proprietorships, partnerships, corporations, cooperatives, public, private, profit, not-for-profit).
1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

Outcome 1.4.
Knowledge Management and Information Technology: Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

Competency:
1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).
1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).
1.4.4. Use system hardware to support software applications.
1.4.5. Use information technology tools to maintain, secure and monitor business records.
1.4.6. Use an electronic database to access and create business and technical information.

Outcome 1.7.
Entrepreneurship/Entrepreneurs: Analyze the environment in which a business operates and the economic factors and opportunities associated with self-employment.

Competency:
1.7.7. Create a list of personal strengths, weaknesses, skills and abilities needed to be successful as an entrepreneur.

Outcome 1.8.
Operations Management: Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

Competency:
1.8.2. Select and organize resources to develop a product or a service.
1.8.9. Develop a budget that reflects the strategies and goals of the organization.

Outcome 1.9.
Financial Management: Use financial tools, strategies and systems to develop, monitor and control the use of financial resources to ensure personal and business financial well-being.

Competency:
1.9.1. Create, analyze and interpret financial documents (e.g., budgets, income statements).
1.9.3. Review and summarize savings, investment strategies and purchasing options (e.g., cash, lease, finance, stocks, bonds).
1.9.8. Identify income sources and expenditures.

Unit: FFA

Students will demonstrate how FFA can make a positive influence in leadership skills. Students will lead group discussions, conduct business meetings using Robert's Rules of Order as well as demonstrate the professionalism needed to foster positive working relationships. They will be introduced to the structure, history, and opportunities within the organization and how these serve as foundational career skills.

Outcome 1.1.
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 1.2.
Leadership and Communications: Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

Competency:
1.2.1. Extract relevant, valid information from materials and cite sources of information.
1.2.2. Deliver formal and informal presentations.
1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
1.2.6. Use proper grammar and expression in all aspects of communication.
1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
1.2.13. Identify stakeholders and solicit their opinions.
1.2.14. Use motivational strategies to accomplish goals.

Applications of Food Science and Safety
Subject Code: 011030

Unit: Food Safety and Security & Quality Assurance
Learners will identify types of spoilage microorganisms as well as critical control attributes of food products. Learners will demonstrate methods of evaluating quality applied to food as well as describe the rationale for establishing valid quality assurance programs. They will also discuss and identify the physical, chemical, and microbiological hazards and their role in foodborne illness and the safety of the food supply. Learners will design and implement a Hazard Analysis Critical Control Point System in relation to food production and processing.

Outcome 1.12
Site and Personal Safety Procedures: Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation and take corrective action.

Competency:
1.12.5. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
1.12.7. Select, use, store, maintain and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions and materials.
1.12.8. Identify safety hazards and take corrective measures.

Outcome 7.2
Quality Assurance: Inspect the food production process, locate potential sources of food quality and safety deviations in facilities and prepare a corrective action plan.

Competency:
7.2.1. Describe the types of spoilage (e.g., oxidation, microbial), their sources and impact.
7.2.3. Test food quality through chemical, microbiological, sensory and physical methods.
7.2.4. Evaluate, inspect and select raw food products for manufacturing, based on raw ingredient specifications.
7.2.6. Describe types of quality systems (e.g., Global Food Safety Initiative [GFSI], International Organization for Standardization [ISO], Safe Quality Food [SQF], British Retail Consortium [BRC]).

Outcome 7.6

Food Safety and Sanitation: Develop a food safety and sanitation plan, addressing processing facility needs and contamination points.

Competency:

7.6.1. Identify, isolate, and monitor food product allergens.
7.6.2. Establish and implement procedures for preoperational inspection and cleaning.
7.6.3. Identify the sources and types of food-borne illness and pathogens and prevent their entrance into the food supply.
7.6.4. Develop and implement a pest control system.
7.6.5. Conduct a good manufacturing practice (GMP) audit, review the findings and implement corrective actions.
7.6.6. Identify and monitor hazards and critical control points and apply hazard analysis and critical control point (HAACP) corrective action procedures.
7.6.7. Determine critical safety parameters using government regulations for handling and storage.
7.6.8. Identify the key activities (e.g., recall exercise, regulatory notification) of a recall program.
7.6.9. Identify the government agencies involved in the production and regulation of food products.

<u>Outcome 7.7</u>

Biosecurity: Connect the sources and causes of contamination and develop the protocols to implement bio-security procedures.

Competency:

7.7.1. Investigate sources and origins of agents that can contaminate processed and unprocessed food products.
7.7.5. Implement biosecurity procedures to prevent cross-site contamination (e.g., proper use and disposal of personal protective equipment [PPE] from site to site, vehicle cleaning between farm and processing site).
7.7.7. Select bio-containment practices (e.g., quarantine, eradicate, showering into facilities) to manage pests and diseases.

Unit: Food Chemistry
Learners will examine the chemical aspects of food with an emphasis on the functional properties and chemical reactions of the major components during food processing and storage. Furthermore, learners will examine functions of key food additives and other ingredients.

Outcome 7.1
The Science of Food: Differentiate the structures, functions and sources of basic functional ingredients and the roles they play in the development and manufacturing of food products for human nutrition.

Competency:
7.1.1. Classify the matter in foods by elements, compounds, mixtures, chemical bonds, organic and inorganic properties and physical and chemical changes.
7.1.2. Distinguish the sources and forms of energy, the relationship between heat and temperature, how heat is transferred and the factors that affect the rates of reaction in food processing.
7.1.3. Measure the acidity, alkalinity and molarity of food products and describe the role of pH in food processing and storage.
7.1.4. Assess water's function in food processing, distinguish between moisture content and water activity and differentiate how water activity affects food functionality and storage.
7.1.5. Describe the composition, structure and sources of sugars, complex carbohydrates, lipids, vitamins, minerals and proteins (i.e., functional ingredients) and their nutritional contributions to dietary needs.
7.1.6. Relate the functions and physical properties of simple and complex carbohydrates, lipids, vitamins, minerals and proteins (i.e., functional ingredients) to the manufacturing of food products.
7.1.10. Identify the functions of food additives in food products.

Unit: Key Food Processing Operations
In this unit, learners will analyze unit operations in food processing technology that involve physical changes of raw materials.

Outcome 7.4
Food Production and Processing: Process a food product for distribution and consumption.

Competency:
7.4.2. Describe the process of dehydration and concentration, control the variables that affect the quality of dried foods and apply the methods.
7.4.4. Compare and contrast reduced oxygen packaging (ROP) processes (e.g., controlled and modified atmosphere packaging, desiccants) and use them to manufacture food products.
7.4.6. Identify the characteristics and properties of mixtures (e.g., solutions, colloidal dispersions and suspensions) and select and apply appropriate chemical or biological separation techniques.
7.4.7. Process raw materials and products and apply food grading systems and standards of identity.
7.4.8. Compare and contrast storage and distribution methods for shelf-stable and non-shelf-stable products.
7.4.9. Determine the environmental impact of processing a food product.
7.4.12. Manage processes for handling the solid and liquid waste from manufacturing food products.

Unit: Government Regulation in the Food Industry
Learners will summarize government statues/regulations that contribute to safe nutritious and wholesome food supply. Furthermore, learners will integrate regulation of manufactured and sale of food and supplements into food production and processing.

Outcome 1.3
Business Ethics and Law: Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

Competency:
1.3.1. Analyze how regulatory compliance (e.g., United States Department of Agriculture [USDA], Food and Drug Administration [FDA], United States Department of Interior [USDI], Ohio Livestock Care Standards, water quality standards, local water regulations, building codes) affects business operations and organizational performance.
1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.
1.3.4. Identify how federal and state consumer protection laws affect products and services.
1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.

Unit: Food Sensory Evaluation and Analysis
Learners will apply sensory evaluation methods used for food products based on flavor, odor, taste, color, and texture. This includes techniques for measuring sensory attributes, instrumental analyses of food and how sensory evaluation programs are utilized in the food industry. Furthermore, learners will identify principles and application of physical and chemical methods to the separation, characterization and quantitative analysis of food constituents.

Outcome 7.5
Food Product Development: Apply principles of nutrition and human behavior to create a new food prototype that meets a specific dietary need or demand for consumption, design packaging and seek label approval.

Competency:
7.5.1. Conduct a sensory evaluation of food products.
7.5.2. Identify consumer preferences, trends and opportunities affecting food product development.
7.5.3. Manipulate ingredients to meet a desired product goal.
7.5.4. Calculate nutrient values, serving sizes and nutrient variability for a food product.
7.5.5. Calculate the amounts of restricted ingredients in food products.
7.5.8. Create new uses for low value components of the food generation process.

Unit: Food Microbiology
In this unit, learners will differentiate between microorganisms (bacteria, molds, mycotoxins, and yeasts) in relation to food safety, spoilage, and production during production, processing, handling, and distribution of food products. Furthermore, learners will analyze the development and utilization of microbes as a resource for the food industry.

Outcome 7.1
The Science of Food: Differentiate the structures, functions and sources of basic functional ingredients and the roles they play in the development and manufacturing of food products for human nutrition.

Competency:
7.1.7. Describe the roles of enzymes as catalysts and the factors that affect enzyme activity.
7.1.8. Differentiate the metabolic processes and the factors that affect metabolic changes in the human body (i.e., anabolism, catabolism, basal metabolism).
7.1.9. Describe the structure of molds, bacteria, viruses, prions and yeast; how they reproduce; the factors that affect their growth and their roles in food production.

Animal and Plant Biotechnology
Subject Code: 012010

Unit: Agricultural Biotechnology in our Society
The learner will research and identify techniques, uses, and careers in biotechnology. They will utilize leadership and career skills to articulate how biotechnology is used in everyday society.

Outcome 1.1
Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competency:
1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.
1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.
1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.
1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, resumé writing, interviewing skills, portfolio development).
1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.
1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.
1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.

1.1.9. Give and receive constructive feedback to improve work habits.
1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.
1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.
1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

Outcome 1.2
Leadership and Communications: Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

Competency:
1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.
1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
1.2.6. Use proper grammar and expression in all aspects of communication.
1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audience, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).
1.2.11. Write professional correspondence, documents, job applications and resumés.
1.2.13. Identify stakeholders and solicit their opinions.

Unit: Agricultural Biotechnology Issues
The learner will research, identify and explain standards, guidelines, and implications for biotechnology.

Outcome 1.2
Leadership and Communications: Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

Competency:
1.2.1. Extract relevant, valid information from materials and cite sources of information.
1.2.2. Deliver formal and informal presentations.
1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
1.2.12. Use technical writing skills to complete forms and create reports.

Outcome 1.5
Global Environment: Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

Competency:
1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.
1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.

Unit: Safety and Laboratory Procedures
Students will demonstrate proper safety procedures and protocols in the laboratory. Students will administer first aid and demonstrate a proper respond to an emergency when necessary. Students will perform inspections, lubricate and maintain equipment while following the manufacturer's recommended operating procedures and adjustment specifications.

Outcome 1.12
Site and Personal Safety Procedures: Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation and take corrective action.

Competency:
1.12.2. Interpret safety signs and symbols.
1.12.7. Select, use, store, maintain and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions and materials.
1.12.8. Identify safety hazards and take corrective measures.
1.12.9. Identify, inspect and use safety equipment appropriate for the task.
1.12.10. Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary.

Outcome 3.5
Laboratory Standard Operational Procedures: Perform methods and techniques using protocols to conduct an experiment.

Competency:

3.5.1. Use an aseptic technique to collect, prepare and test samples.
3.5.2. Prepare and dispense stock reagents, buffers, media and solutions by calculating concentrations, adjusting factors such as pH and selecting purification techniques and containers.
3.5.3. Test and maintain the integrity of stains, reagents, chemicals and mounts.
3.5.4. Select and apply sterilization methods for reagents, buffers, media and solutions.
3.5.5. Perform laboratory measures by calculating and preparing a serial dilution, calculating quantities needed to perform a test analysis and calculating unit conversions and concentrations (graphing results).
3.5.6. Monitor physical properties of reagents, buffers, media and solutions for conductivity and resistivity, pH and turbidity and explain the significance of each.

Outcome 4.1

Tool, Stationary and Mobile Equipment Maintenance: Inspect, clean, maintain and perform planned preventative maintenance on tools, machinery, implements and equipment.

Competency:

4.1.1. Identify the types of hand tools, power tools and stationary equipment and describe their functions.
4.1.2. Ensure the presence and functionality of safety systems and hardware.
4.1.3. Identify potential hazards and limitations related to the use of hand tools, power tools and stationary equipment.
4.1.4. Maintain machinery, equipment, instrument and facility cleanliness, appearance and safety.
4.1.11. Calibrate metering, monitoring and sensing equipment.

Outcome 4.2

Equipment Operations: Operate and maintain mechanical equipment and power systems.

Competency:

4.2.1. Follow manufacturer's recommended operating procedures and adjustment specifications.
4.2.2. Differentiate among the functions, limitations and proper use of equipment, equipment controls and instrumentation.
4.2.3. Perform pre- and post-operation inspections and adjustments and report malfunctions.
4.2.4. Perform appropriate start-up, operating and shut-down procedures.
4.2.5. Select and operate the equipment and attachments needed to complete the task including levers, pedals or valves.

Outcome 7.7

Biosecurity: Connect the sources and causes of contamination and develop the protocols to implement bio-security procedures.

Competency:

7.7.5. Implement biosecurity procedures to prevent cross-site contamination (e.g., proper use and disposal of personal protective equipment [PPE] from site to site, vehicle cleaning between farm and processing site

Unit: The Raw Materials of Biotechnology

Students will differentiate components of a cell and describe anabolic and catabolic reactions.

Outcome 3.6

Culturing: Perform experimental techniques used in microbial biology to study cell growth, manipulation and evaluation.

Competency:

3.6.1. Identify the structure of cells and the functions of their components.
3.6.10. Describe how vectors (e.g., plasmids, transposons, viruses) are used to transform host and microorganisms.