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2006 Mississippi Curriculum Framework

Secondary Agricultural and Natural Resources Technology

(Program CIP: 01.0003 - Agricultural and Natural Resources)

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Standards in this document are based on information from the following organizations:

Proposed Standards for Mississippi Agriculture Education Programs	Adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*, National Association of State Directors of Career and Technical Education
Academic Standards	Mississippi Department of Education Subject Area Testing Program
Workplace Skills for the 21st Century	Secretary's Commission on Achieving Necessary Skills
National Educational Technology Standards for Students	Reprinted with permission from *National Educational Technology Standards for Students*: Connecting Curriculum and Technology, copyright © 2000, ISTE (International Society for Technology in Education), 1.800.336.5191 (U.S. & Canada) or 1.541.302.3777 (International), iste@iste.org, www.iste.org. All rights reserved. Permission does not constitute an endorsement by ISTE.

Foreword

Secondary vocational-technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act III, 1998; and No Child Left Behind Act of 2001).

Each secondary vocational-technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Suggested Objectives
  - A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies.
  - The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.
- Suggested Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Suggested Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

- Integrated Academic Topics, Workplace Skills, Technology Standards, and Occupational Standards - This section identifies related academic topics as required in the Subject Area Assessment Program (SATP) in Algebra I, Biology I, English II, and U. S. History from 1877, which are integrated into the content of the unit. It also identifies the general workplace skills as identified in the Secretary's Commission on Achieving Necessary Skills (SCANS) report as being critical for all workers in the 21st Century. In addition, national technology standards and occupational skills standards associated with the competencies and suggested objectives for the unit are also identified.
- References - A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

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Program Description

Agriculture and Natural Resources is a program to introduce the student to the broad field of agriculture and natural resources, including the production of plants and animals and the management of natural resources. The program includes instruction in the applied sciences related to plant and animal production and natural resource conservation and management, as well as introducing the student to agribusiness management practices and maintenance of facilities and equipment. Students in the program will participate in active learning exercises including integral activities of the FFA organization and supervised experiences. Students who successfully complete the competencies in this program will possess fundamental knowledge and skills that can be used to secure entry level employment or as a foundation for continuing their education.

Industry standards are adapted from the publication *Career Cluster Resources for Agriculture, Food, and Natural Resources*, developed by the National Association of State Directors of Career and Technical Education.

Course Outline

Agriculture and Natural Resources I
Course CIP Code: 01.0003

Course Description: Agriculture and Natural Resources I is designed to introduce the student to fundamental concepts and principles of the modern agricultural and natural resources industry. Emphasis is placed on career and leadership skills; basic principles of plant, animal, and soil science; and basic mechanical technologies in the field. (2 - 2½ Carnegie units depending on time spent in course)

Unit	Title	Hours*
1	Orientation/Careers/Leadership	23
2	Supervised Agricultural Experience (SAE) Programs	15
3	Animal Science	30
4	Plant Science	30
5	Soil Science	30
6	Agricultural Shop Operations and Safety	75

Agriculture and Natural Resources II
Course CIP Code: 01.0004

Course Description: Agriculture and Natural Resources II is designed to continue the exploration of fundamental concepts and principles associated with agriculture and natural resources. Emphasis is placed on the conservation and management of natural resources, agricultural business management practices, and mechanical technologies. (2-2½ Carnegie units depending on time spent in course)

Unit	Title	Hours*
1	Orientation/Careers/Leadership/	23
2	Natural Resources (Conservation and Management)	45
3	Agricultural Business Management and Processes	45
4	Agricultural Construction	45
5	Agricultural Equipment Operation and Maintenance	45

* Number of hours is an estimation of the amount of time that should be spent in the course on the unit of instruction. One week of instruction is equal to approximately 7.5 hours.

Agriculture and Natural Resources I
Unit 1: Orientation/Careers/Leadership **(23 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Describe the scope and importance of the agriculture and natural resources industry. a. Identify the major areas of the agriculture and natural resources industry and describe their importance from an economic and environmental standpoint. b. Compare careers available in agriculture and natural resources. c. Analyze careers according to the factors influencing career choices.	**Teaching:** • Using a PowerPoint presentation or other visual presentation, briefly define and discuss the economic and environmental importance of the following major areas of agriculture and natural resources: Agriculture Production, Agriculture Mechanics, Agriculture Processing, Forestry, Horticulture, Agriculture Business, Aquaculture, and Natural Resources. • Using career software, the Internet, and other sources, have students identify one area that is of interest to them and research an occupation or occupations within this area. (An interest inventory may be used for students who do not already have an area of interest.) Students will prepare a report showing important characteristics of their occupations, including factors such as educational requirements, working conditions, career ladders, etc. • Divide students into small groups and have them discuss the occupations that they have researched and draw conclusions based on their discussions. Have students prepare a presentation, poster, or newspaper ad illustrating their conclusions. **Assessment:** • Use a rubric to evaluate the individual student report. (See Sample Rubric on a Written Report in Appendix E. • Use a rubric to evaluate the group project. (See Sample Rubric for a Group Project in Appendix E.)
2. Identify basic safety rules and behavior. a. Identify safety rules and behavior for the classroom. b. Identify safety rules and behavior for the shop and laboratory areas.	**Teaching:** • Identify and discuss with the students basic safety rules and behavior for the classroom, shop, and laboratory areas using handouts, PowerPoint presentation, demonstrations, and videos. (Note: Instruction in safety is an ongoing process

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	throughout the school year. Safety will be stressed and monitored on a daily basis.) • Invite guest speakers to stress the need for safety in the workplace. (The Mississippi Farm Bureau and electric power associations are good sources.) • Have students prepare a safety poster or chart illustrating at least three major points related to safety. **Assessment:** • Give a written test on safety practices. • Use a rubric to assess student poster/chart on safety practices. (See Sample Poster Rubric in Appendix E.) • (NOTE: Assessment of safety will be included as part of the assessment of all shop and laboratory activities.)
3. Explore FFA career development events and other activities that promote student achievement. a. Describe the history of the FFA. b. Identify career development events and awards in the FFA.	**Teaching:** • Have students use the FFA Manual, Student Handbook, PowerPoint presentation, FFA organization web site, Local Program Success Guide, and LifeKnowledge lesson handouts and worksheets to identify and describe the different FFA events, programs, and degrees; and explore how each contributes to career advancement and individual achievement. • Have each student select one or more FFA activities to participate in the coming year(s). Have students keep an ongoing journal of preparation for FFA activities as part of their supervised experience program. **Assessment:** • Give a written test on FFA career development events and other activities. • Use a rubric to evaluate the student journal. (See Sample Rubric on a Student Journal in Appendix E.)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
4. Develop and present a three to five minute speech on an agriculture or natural resource topic. a. Discuss guidelines for preparing a successful speech, speech outlining, resource development, writing skills, and presentation skills. b. Present a three to five minute speech.	**Teaching:** • Discuss and demonstrate presentation techniques and guidelines with the student. Show videos of examples of speeches and have students evaluate the speaker and topic using the FFA scorecard. • Have students research, prepare, and deliver a three to five minute speech on their selected occupation. **Assessment:** • Students and teacher will evaluate the speeches using the scorecard found in the Mississippi FFA Contest Handbook. (See Prepared Public Speaking Scorecard in Appendix A.)
5. Apply the purposes and functions of parliamentary procedure. a. Identify the purpose of parliamentary procedure. b. Describe the methods of voting. c. Demonstrate how to receive and dispose of a main motion.	**Teaching:** • Discuss with the students the origin of parliamentary procedure and its purpose in society today. • Using a chart, PowerPoint presentation, or video, identify and describe the use of the different methods of voting and the procedure for receiving and disposing of a main motion. • Have students demonstrate by taking turns in receiving and disposing of a main motion using the different methods for voting. **Assessment:** • Give a written test on purpose of parliamentary procedure, receiving and disposing of a main motion, and methods of voting. • Use a scorecard on demonstration of parliamentary procedure skills. (See Sample Scorecard for Parliamentary Procedure Demonstration in Appendix E.).

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

LEA1 Use leadership skills in collaborating with others to accomplish organizational goals and objectives

LEA2 Use personal growth skills in collaborating with others to accomplish organizational goals and objectives

Academic Standards

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

E5 Complete oral and written presentations which exhibit interaction and consensus within a group.

E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.

Workplace Skills for the 21st Century

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Computer Software

Bridges Transitions. (2005). *Choices 2005* [Computer software]. Oroville, WA: Author.

National FFA Organization. (2005). Lesson HS.86: Developing speeches using the magic formula. In *LifeKnowledge-Real lessons for real life* [Computer software]. Indianapolis, IN: Author.

Textbooks and Other Publications

Cooper, E. L., & Burton, L. D. (2004). *Agriscience: Fundamentals and application* (3rd ed.). Albany, NY: Delmar.

National FFA Organization. (2005). *FFA manual*. Indianapolis, IN: Author.

National FFA Organization. (2005). *FFA student handbook*. Indianapolis, IN: Author.

Roberts, H. M., Evans, W. J., Honeman, D. H., & Balch, T. J. (Eds.). *Robert's rules of order newly revised* (10th ed). New York: HarperCollins.

Web Sites

Georgia Department of Education. (2002). *Basic parliamentary procedure*. Retrieved August 2, 2005, from http://aged.ces.uga.edu/2004cds/cd1/Lesson%20Plans/Agricultural%20Leadership%20&%20Personal%20Development-01012/01012-07.1%20Basic%20Parliamentary%20Procedure.doc

Mississippi Association of FFA. (2001). *Mississippi FFA career development event handbook: Rules and regulations.* Retrieved June 20, 2005, from http://www.mde.k12.ms.us/ovte/OSPD/FFA/MSFFARules.pdf

National FFA Organization. (2003). *Career development events handbook 2001-2005*. Retrieved June 20, 2005, from http://www.ffa.org/programs/cde/documents/cde_handbook.pdf

U.S. Department of Labor. (2005). *Occupational outlook handbook.* Retrieved August 2, 2005, from http://www.bls.gov/oco/home.htm

Agriculture and Natural Resources I
Unit 2: Supervised Agricultural Experience (SAE) Programs (15 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Identify the purposes, requirements, and types of the SAE programs. a. Explain the purposes of the SAE program. b. Identify the requirements of the SAE. c. Compare the types of SAE programs. d. Plan SAE activities for the coming year.	**Teaching:** • Provide examples of sound SAE's using PowerPoint presentation or other graphic presentations. • Discuss the purposes and requirements for having an SAE. • Discuss benefits and objectives of the SAE • Have students conduct research to determine suitable SAE programs. • Have students complete a plan of activities for their SAE over the coming year. **Assessment:** • Give a written test on SAE planning • Use a rubric to evaluate the SAE Plan. (See Sample Rubric for an SAE Plan in Appendix E.)
2. Maintain agriculture record keeping for the SAE. a. Maintain income and expense records. b. Prepare inventory records. c. Compute a net worth statement. d. Maintain records of supplementary and improvement activities and leadership development activities.	**Teaching:** • Discuss the income and expense records, inventory and depreciation methods, how to figure net worth, and maintaining records of supplementary and improvement activities, and leadership activities. • Have the students start filling in their recordbooks with their information. **Assessment:** • Give a written test on maintaining records. • Make monthly checks on progress in keeping accurate records of SAE experiences.

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

ABS2 Practice good recordkeeping to accomplish AFNR business objectives.
ABS3 Apply generally accepted accounting principles and skills to manage budget, credit, and optimal application of AFNR business assets.
ABS4 Employ AFNR industry concepts and practices to manage inventory.

ABS5 Utilize technology to accomplish AFNR business objectives.
ABS6 Use marketing and sales principles to accomplish an AFNR business objective.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Computer Software

National FFA Organization. (2005). *FFA proficiency award and degree* [Computer software]. Indianapolis, IN: Author.

National FFA Organization. (2005). SAE (Work-based learning): Providing hands-on experience and career exploration. In *A guide to local program success* [Computer software]. Indianapolis, IN: Author.

National FFA Organization. (2005). Lesson HS.126: Taking my trip. In *LifeKnowledge-Real lessons for real life* [Computer software]. Indianapolis, IN: Author.

National FFA Organization. (2005). Lesson HS.127: Choosing my vehicle. In *LifeKnowledge-Real lessons for real life* [Computer software]. Indianapolis, IN: Author.

National FFA Organization. (2005). Lesson HS.128: Managing my journey. In *LifeKnowledge-Real lessons for real life* [Computer software]. Indianapolis, IN: Author.

National FFA Organization. (2005). Lesson HS.129: Adjusting your journey. In *LifeKnowledge-Real lessons for real life* [Computer software]. Indianapolis, IN: Author.

Textbooks and Other Publications

Cooper, E. L., & Burton, L. D. (2004). *Agriscience: Fundamentals and application* (3rd ed.). Albany, NY: Delmar.

National Council for Agricultural Education. (1998). *Decisions and dollars*. Alexandria, VA: Author.

Newman, M. E., & Wills, W. J. (1994). *Agribusiness management and entrepreneurship*. Upper Saddle River, NJ: Pearson Prentice Hall.

Steward, J., Jobes, R., Casey, J. E., & Purcell, W. D. (2004). *Farm and ranch business management* (5th ed.). Moline, IL: Deere and Company.

Agriculture and Natural Resources I
Unit 3: Animal Science **(30 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Select proper animal for specific farm enterprise or for participation in livestock shows and sales. a. Identify types of animals for use in a specific farm enterprise or in a livestock show or sale including beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest. b. Describe characteristics of breeds of livestock used in a specific farm enterprise or in a livestock show or sale including beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest.	**Teaching:** • Use the Oklahoma State University web site *Breeds of Livestock* (http://www.ansi.okstate.edu/breeds/) to discuss and illustrate the different breeds of cattle, swine, horses, sheep, and chickens. • Have students research and report to the class on a selected breed of livestock. The report should include a brief history of the breed, identifying characteristics, and important traits. **Assessment:** • Use a rubric to evaluate the presentation/report. (See Sample Rubric on a Written Report in Appendix E.) • Give a written test on livestock selection.
2. Compare and contrast the anatomy and physiology of beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest with special attention to: a. embryonic development b. digestion c. circulation d. excretion e. reproduction	**Teaching:** • Compare and contrast livestock species with the use of PowerPoint presentations, transparencies, videos, and printed resources. • Students will distinguish differences of species by labeling a diagram. **Assessment:** • Evaluate student exercise to label a diagram. • Give a written test on anatomy and physiology.
3. Discuss nutritional requirements and rations for beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest. a. Identify terms related to animal nutrition. b. Identify nutrient groups and their functions. c. Compare and contrast nutritional requirements for different species.	**Teaching:** • Identify terms with the use of PowerPoint presentations, transparencies, videos, and printed resources. (A "Jeopardy" game can be used to reinforce learning.) • Have students list nutrient groups and their functions. • Have students research rations for different species and compare the nutritional requirements for these animals. **Assessment:** • Give a written test on nutritional requirements and rations for livestock.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	• Use a rubric to evaluate student's research report. (See Sample Rubric on a Written Report in Appendix E.)
4. Explain management practices for maintaining health in beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest. a. Examine management practices for maintaining animal health. b. Examine causes and preventions of disease and parasites. c. Investigate the economic impact of sound herd health management practices.	**Teaching:** • Identify major health management practices with the use of PowerPoint presentation, transparencies, videos, and printed resources. • Have students complete an assignment on the economic impact of utilizing proper management practices relating to maintaining health and prevention of diseases and parasites. **Assessment:** • Grade student assignment on economic impact and prevention of diseases and parasites. • Give a written test on management practices.
5. Explain procedures for managing livestock reproduction. a. Define terms associated with livestock reproduction. b. Describe periods of estrus and gestation in livestock. c. Read and interpret Estimated Progeny Difference (EPD). d. Explore new technologies in livestock reproduction such as embryo transfer, cloning, gender selection, and genetic engineering.	**Teaching:** • Identify terms associated with livestock reproduction with the use of PowerPoint presentations, transparencies, videos, and printed resources. • Have students complete an assignment to calculate birthdate from conception date. • Have students select a sire using the EPD process. • Have students research and debate current issues and technologies in animal reproduction. **Assessment:** • Grade student assignment on calculating birthdates. • Grade student assignment on selecting a sire using EPD. • Use a rubric to assess student performance in the debate. (See Sample Rubric for a Debate in Appendix E.) • Give a written test on procedures for managing animal reproduction.

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

ELR1 Know and understand the importance of professional ethics and legal responsibilities.
ELR2 Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
ANM1 Apply knowledge of anatomy and physiology to produce and/or manage animals in a domesticated or natural environment.
ANM2 Recognize animal behaviors to facilitate working with animals safely.
ANM3 Provide proper nutrition to maintain animal performance.
ANM4 Know the factors that influence an animal's reproductive cycle to explain species response.
ANM5 Identify environmental factors that affect an animal's performance.
TET1 Use tools, equipment, machinery, and technology to work in areas related to AFNR.
TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
NRS1 Recognize importance of resource and human interrelations to conduct management activities in natural habitats.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
A4 Explore and communicate the characteristics and operations of polynomials.
A5 Utilize various formulas in problem-solving situations.
A8 Analyze data and apply concepts of probability.
B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
B2 Investigate the biochemical basis of life.
B3 Investigate cell structures, functions, and methods of reproduction.
B5 Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
B6 Investigate concepts of natural selection as they relate to diversity of life.
B7 Investigate the interdependence and interactions that occur within an ecosystem.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.
H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
H2 Describe the impact of science and technology on the historical development of the United States in the global community.
H3 Describe the relationship of people, places, and environments through time.
H5 Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Ensminger, E. E. (1991). *Animal science digest* (9th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Gillespie, J. R. (1994). *Modern livestock and poultry production* (7th ed.). Albany, NY: Delmar.

Web Sites

ABS Global. (2005). *ABS global*. Retrieved July 26, 2005, from http://www.absglobal.com/index.phtml

Burditt, L., Buchanan, D., & Fitch, J. (1995). *Breeds of livestock*. Retrieved July 26, 2005, from Oklahoma State University Department of Animal Science web site: http://www.ansi.okstate.edu/breeds/

Mississippi State University. (2005). *MSU cares: Livestock*. Retrieved August 8, 2005, from http://msucares.com/livestock/index.html

Oska, C. (2005). *Animal science*. Retrieved July 26, 2005, from http://glenroseffa.org/ansci1.ppt

Agriculture and Natural Resources I
Unit 4: Plant Science **30 hours**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Discuss the anatomy and physiology of a plant. a. Describe the function and purpose of the different parts of a basic plant cell. b. Identify and describe the vegetative parts of a plant. c. Identify and describe the reproductive parts of a plant. d. Identify the relationship among photosynthesis, respiration, and translocation within a plant. e. Discuss the storage of foods within the plant.	**Teaching:** • Using illustrations or PowerPoint presentations, identify and describe the purpose and functions of the different parts of a plant cell. Have students examine a typical cell under a microscope or photograph, draw the cell, and label its parts. • Have students draw and label the major parts of a leaf, stem, and root. • Have students draw and label the major parts of a complete flower. • Discuss the processes of photosynthesis and respiration. Identify the xylem and phloem tissues of a plant and discuss their functions including the process of translocation. • Discuss the different methods by which plants store sugars and other food products. **Assessment:** • Assess drawings of a cell, leaf, stem, root, and flower. • Give a written test on plant anatomy and physiology.
2. Describe how plants are classified. a. Describe the different life cycles of plants. b. Classify plants according to number of cotyledons. c. Describe the binomial classification plant system. d. Identify and describe plants that are categorized as cereal crops, oil crops, fiber crops, forage and pasture crops, horticultural crops, and specialty crops.	**Teaching:** • Describe and discuss with the students the life cycle of plants to include annuals, biennials, and perennials, providing students with examples of agricultural crops in each life cycle. • Describe and discuss with the students examples of plants that are classified as monocotyledons or dicotyledons. • Discuss the use of the binomial classification system from kingdom through species and variety. • Have students research and compile a database of plants that are classified as cereal crops, oil crops, fiber crops, forage and pasture crops, horticultural crops, and specialty crops. The database should include cultural practices, uses, and economic factors.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	Assessment: • Give a written test on life cycle, cotyledons, and the binomial classification system. • Grade student crop and plant database.
3. Explore the processes of plant reproduction. a. Describe the process of seed formation including parts of a seed. b. Calculate germination rate for a given batch of seed. c. Identify the different forms of asexual reproduction including tissue culture.	**Teaching:** • Using a video or PowerPoint presentation, illustrate the process by which plants are pollinated and produce seed. • Have students perform a germination test by planting a given number of seeds in a flat and recording the number of seeds that germinate and survive for 30 days. • Demonstrate to the students techniques for successfully using asexual propagation to include plant division, layering, grafting, cuttings, and tissue culture. **Assessment:** • Give a written test on seed formation and parts of the seed. • Assess activity to germinate and grow seed. • Give a written test on asexual propagation methods.
4. Explore plant nutrition. a. Differentiate among primary, secondary, and micro plant nutrients required for proper plant growth. b. Describe the functions of the primary plant nutrients. c. Examine the analysis of a complete fertilizer. d. Investigate the relationship of soil pH to soil nutrient availability. e. Demonstrate the procedure to take a soil sample for fertility testing. f. Perform a nutritional and pH analysis of a soil. g. Calculate fertilizer needed for a specific application.	**Teaching:** • Provide students with a list of the essential elements necessary for proper plant growth and identify which elements are classified as primary, secondary, and micro nutrients. • Have students research the functions of nitrogen, phosphorous, and potassium, and summarize their findings in writing. • Display an analysis tag or label from a container of fertilizer and explain the meaning of each number. Demonstrate the procedure for calculating weight of actual nutrients in a fertilizer mix. Have students complete an assignment to calculate nutrient weight. • Using a graphic illustration, show how soil pH affects the availability of soil nutrients to plants. Discuss how pH of a soil can be adjusted. • Provide students with a soil sample identification form and collection

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	procedure. Observe students collecting a soil sample from the school grounds. Have students complete the form. • Using a simple soil testing kit, have students bring samples of soil from their home and conduct a nutritional analysis to determine N, P, and K content of the soil and soil pH. • Demonstrate the procedure for calculating the amount of fertilizer required to meet the recommendations of a soil test. Have students complete an assignment on this task. **Assessment:** • Give a written test on classifying nutrients as primary, secondary, or micro. • Use a rubric to evaluate student report on primary nutrient functions. (See Sample Rubric on a Written Report in Appendix E.) • Grade student assignment on nutrient weight. • Use a checklist to observe students taking and labeling a soil sample. (See Sample Checklist on Obtaining and Labeling a Soil Sample in Appendix E.) • Grade student assignment to calculate weight of fertilizer for a given application.
5. Describe plant pests and their control. a. Identify common plant insects. b. Identify common weeds. c. Identify common plant diseases. d. Discuss and illustrate the different methods of pest control. e. Explore the concept of integrated pest management.	**Teaching:** • Have students collect common insects from the local area and classify each insect by common name and economic class (beneficial or non-beneficial). • Using a PowerPoint presentation or pictures, identify common weed pests of the local area. • Using a PowerPoint presentation or pictures, identify common plant diseases. • Discuss with the students the three major methods of pest control (cultural/ mechanical, biological, and chemical). • Identify common controls used for weeds, diseases, and insects. • Invite a crop consultant or local producer to speak to the class on integrated pest management concepts and practices. Have

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	students prepare a written summary of the presentation. **Assessment:** • Evaluate student insect collection. • Give a written test on weeds and plant diseases. • Give a written test on major pest control methods. • Use a rubric to evaluate summary of guest speaker presentation. (See Sample Rubric for a Guest Speaker Activity in Appendix E.)

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

PLT1 Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
PLT2 Address taxonomic or other classifications to explain basic plant anatomy and physiology.
TET1 Use tools, equipment, machinery, and technology to work in areas related to AFNR.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
B2 Investigate the biochemical basis of life.
B3 Investigate cell structures, functions, and methods of reproduction.
B4 Investigate the transfer of energy from the sun to living systems.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.

E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acqsuires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T5 Technology research tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Cooper, E. L., & Burton, L. D. (2004). *Agriscience: Fundamentals and application* (3rd ed.). Albany, NY: Delmar.

Reiley, H. E., & Shry, C. (2004). *Introductory horticulture* (6th ed.). Albany, NY: Delmar.

Web Sites

Georgia Department of Education. (2004). *Functions of plant systems*. Retrieved August 10, 2005, from http://aged.ces.uga.edu/2004cds/cd1/Lesson%20Plans/Middle%20School%20Curriculum/Unit%2009%20%20Plant%20Science/Unit%209.02%20Functions%20of%20plant%20systems.doc

Georgia Department of Education. (2004). *The process of photosynthesis in plants*. Retrieved August 10, 2005, from http://aged.ces.uga.edu/2004cds/cd1/Lesson%20Plans/Middle%20School%20Curriculum/Unit%2009%20%20Plant%20Science/Unit%209.03%20The%20Process%20of%20Photosynthesis%20in%20Plants.doc

Pannell, B. (n.d.). *Plant growth and reproduction*. Retrieved August 10, 2005, from http://www.glenroseffa.org/lesson%20plans.htm

Agriculture and Natural Resources I
Unit 5: Soil Science **(30 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Discuss the factors that affect soil formation and texture. a. Identify and discuss the factors that affect soil formation including weather, slope, and drainage. b. Identify the components of a soil. c. Identify the common layers of a soil profile. d. Classify soil texture by sand, silt, and clay content.	**Teaching:** • Discuss the factors that affect soil formation and the process over time by which soil is formed, including chemical and physical weathering and the development of the different horizons of a soil profile. • Discuss with the class the components of soils including minerals, organic materials, soil air, and soil moisture. • Using a PowerPoint presentation or video, show students the major layers of a soil profile (topsoil, subsoil, and parent material). Explain the characteristics and importance of each layer. • Discuss the characteristics of the basic soil types (sands, silts, clays, and loams). • Demonstrate the use of the textural triangle to classify soil texture. Have students bring a sample of soil from their home area and conduct a mechanical analysis of the soil to determine its texture. Have students estimate texture of different soils using the finger roll or ribbon method. **Assessment:** • Give a written test on soil formation and texture. • Grade on activity to conduct a mechanical analysis and estimate soil texture.
2. Contrast types of soil erosion and controls. a. Identify the different types of soil erosion. b. Identify different practices that can be used to control erosion. c. Apply erosion control practices to given situations.	**Teaching:** • Use a PowerPoint presentation or video to illustrate and discuss the different types of soil erosion and associated control practices. Take students on a field trip of the school campus to compare the depth of topsoil at various locations and determine possible reasons for differences from one site to another. Identify different methods that could be used at each site to prevent further erosion. • Using a PowerPoint presentation identify different practices that can be used to

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	control each type of erosion (tillage, terracing, cover crops, etc.). Explain the application of each practice. • Provide students with a series of scenarios and have them identify the erosion control practices that could be used in each instance. **Assessment:** • Give a written test on soil erosion and control and on land capability classification. • Use a checklist to evaluate student participation in field trip. (See Sample Checklist for Field Trip Participation in Appendix E.) • Grade student assignment to classify soils.
3. Apply the land classification system. a. Identify factors that determine the capability class of land as related to erosion and highest potential use. b. Classify a given location according to its highest potential use.	**Teaching:** • Use the *Instructions on Land Judging in Mississippi* bulletin and accompanying scorecard to discuss and illustrate the factors associated with land capability classification. Discuss the concept of highest potential use as related to land classes. • Using information obtained from a campus tour, have students complete an assignment to classify different soils on campus according to highest potential use. **Assessment:** • Give a written test on land classification system. • Grade land judging scorecard for each student.
4. Evaluate a given location for a home site. a. Identify factors that should be evaluated in selecting a home site. b. Classify a given location using home site selection criteria.	**Teaching:** • Using the home site evaluation process found in the *Instructions on Land Judging in Mississippi* bulletin, discuss the different criteria that should be evaluated in selecting a home site. • Using information provided from a campus tour, evaluate a site using home site selection criteria. **Assessment:** • Give a written test on home site evaluation.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	• Grade home site evaluation assignment.

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

PWR1 Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
NRS1 Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
NRS3 Apply scientific principles to natural resource management activities.
NRS4 Employ knowledge of natural resource industries to describe production practices and processing procedures.
NRS5 Practice responsible conduct to protect natural resources.
ENV5 Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
A7 Interpret and apply slope as a rate of change.
B7 Investigate the interdependence and interactions that occur within an ecosystem.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E10 Use language and critical thinking strategies to serve as tools for learning.
H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Cooper, E. L., & Burton, L. D. (2004). *Agriscience: Fundamentals and application* (3rd ed.). Albany, NY: Delmar.

Crouse, K. (2004). *Instructions on land judging in Mississippi*. Mississippi State, MS: Mississippi State University Extension Service.

Reiley, H. E., & Shry, C. (2004). *Introductory horticulture* (6th ed.) Albany, NY: Delmar.

Agriculture and Natural Resources I
Unit 6: Agricultural Shop Operations and Safety **(75 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Identify safety procedures and safety devices for the agricultural workplace. a. Describe procedures for maintaining a clean and safe workplace environment. b. Demonstrate safe use of all protective devices.	**Teaching:** • Provide students with a written list of safety rules and procedures for the workplace. • Have students create safety posters illustrating these rules to be posted in the laboratory areas. **Assessment:** • Give a written test on safety rules and procedures. • Use a rubric to evaluate student safety posters. (See Sample Poster Rubric in Appendix E.) • Use of personal safety devices will be monitored on a daily basis throughout the year as part of assessment of all shop and laboratory activities.
2. Apply general safety rules pertaining to hand and stationary power tools. a. Demonstrate rules for hand tools including basic operation, danger points, and observer safety. b. Demonstrate rules for power tools including basic operation, danger point, observer safety and electrical safety.	**Teaching:** • Demonstrate and discuss rules for safe use of hand and power tools including basic operation, danger points, and observe safety. **Assessment:** • Give a written test on safety rules related to hand and stationary power tools. • Safety practices will be included in the assessment of all activities involving hand and power tools.
3. Explain the relationship between volts, amps, and watts. a. Describe the applications of volts, amps and watts. b. Perform basic calculations of Ohm's law using volts, amps, and watts.	**Teaching:** • Use a PowerPoint presentation or video to introduce volts, amps, and watts. • Demonstrate and discuss the procedure for using Ohm's law to calculate volts, amps, and/or watts. • Have students complete an assignment to calculate volts, amps, and watts. **Assessment:** • Give a written test on Ohm's law. • Grade student assignment to calculate volts, amps, and watts.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
4. Describe the safety issues and devices associated with electricity. a. Discuss the causes of electrical accidents including short circuits, overloads, improper insulation, and presence of moisture. b. Demonstrate procedures for preventing electrical accidents such as use of proper tools, disconnecting of power when working on circuits (lockout-tagout), proper grounding and safety devices, and proper working environment. c. Discuss the use of breakers, fuses, ground fault connector interrupters and control switches in electrical safety.	**Teaching:** • Invite a representative of the local power company to speak to the class on electrical safety. Have students summarize important points in their journals. • Discuss the uses and functions of different electrical safety devices. • Have students draw posters illustrating procedures for preventing electrical accidents. **Assessment:** • Give a written test on electrical safety. • Use a rubric to evaluate student posters. (See Sample Poster Rubric in Appendix E.) • Use a rubric to evaluate the student notebook/journal. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)
5. Identify and use electrical tools and materials. a. Demonstrate use of the voltmeter, amp meter, pliers, screwdriver, wire cutters, and wire strippers. b. Demonstrate the installation of wires, insulation materials, control devices, overload devices, and conduit.	**Teaching:** • Demonstrate the proper use of different electrical tools and materials. • Have students complete a laboratory activity to wire a simple circuit including the installation of wires, switches, and load. **Assessment:** • Give a written test on electrical tools and materials. • Use a checklist to evaluate student performance in wiring a simple circuit. (See Sample Checklist for Wiring an Electrical Circuit in Appendix E.)
6. Identify common equipment and tools used in welding. a. Identify major types of welders including the shield metal arc welding (SMAW), gas metal arc welding (GMAW), and gas tungsten arc welding (GTAW). b. Identify tools and equipment used with each type of welding.	**Teaching:** • Use a video or PowerPoint presentation to identify the different types of welders and the tools and equipment used in welding. **Assessment:** • Give a written test on welding equipment and tools identification.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
7. Apply safety precautions used in welding. a. Describe eye protection, proper apparel, ventilation, and materials handling procedures. b. Demonstrate the use of eye protection, proper apparel, and materials handling procedures.	**Teaching:** • Discuss and demonstrate the use of protective equipment and safety practices including the consequences of not using these devices or following the practices. **Assessment:** • Give a written test on safety precautions used in welding. • Safety procedures will be assessed as part of all activities related to welding.
8. Describe different welding supplies used in welding. a. Identify low hydrogen, mild steel and alloy welding electrodes. b. Identify the different types of gases involved in the SMAW process.	**Teaching:** • Invite a representative from the welding industry to discuss welding supplies and equipment needed in welding. Have students summarize the presentation in their notebook/journal. **Assessment:** • Use a rubric to evaluate the student notebook/journal. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)
9. Compare the different types of welds. a. Identify the bead, groove, and fillet weld. b. Identify the different types of weld joints including T, lap, corner, edge, and butt.	**Teaching:** • Identify and discuss the procedures for making the different types of welds and weld joints. **Assessment:** • Give a written test on different types of welds.
10. Perform various welding techniques. a. Perform welding techniques including start, stop, and restart, pad construction, and flat butt construction. b. Utilize various welding equipment including SMAW, GMAW, and GTAW.	**Teaching:** • Demonstrate the procedures for striking an arc, running a bead, building a pad, and constructing a flat butt weld. • Have students practice the above operations. **Assessment:** • Use a rubric on welding techniques. (See Sample Rubric on Welding Techniques in Appendix E.) (NOTE: All rubrics will assess student performance in terms of welding safety, proper procedures, and weld appearance.)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
11. Apply safety procedures for using oxyacetylene equipment. a. Identify parts of the oxyacetylene welding and cutting equipment. b. Discuss and demonstrate safety procedures of use of oxyacetylene equipment.	**Teaching:** • Identify the parts of an oxyacetylene welding and cutting unit. • Provide students with a written list of safety procedures and practices associated with oxyacetylene equipment. Have students draw cartoons illustrating these practices. **Assessment:** • Give a written test on oxyacetylene equipment parts and safety practices.
12. Identify the different types of oxyacetylene flames. a. Compare neutral, oxidizing, and carburizing flames. b. Describe applications of the three different types of oxyacetylene flames.	**Teaching:** • Discuss the different types of oxyacetylene flames and their applications. • Demonstrate the adjustments needed to create each type of flame. **Assessment:** • Give a written test on different types of flames.
13. Assemble and operate oxyacetylene welding and cutting equipment. a. Setup equipment for cutting operations to include selecting the proper tip and setting regulator pressures. b. Practice the “pushing the puddle” procedure for heat control in welding. c. Make a cut in mild steel.	**Teaching:** • Demonstrate and discuss the procedures for setting up oxyacetylene equipment including selecting and attaching the proper tip and adjusting pressure regulators. • Demonstrate the practice of “pushing the puddle” on a mild steel plate to control heat of the base metal. • Demonstrate the practice for making a cut in mild steel. • Have students practice setting up equipment, “pushing the puddle,” and making a cut in mild steel. **Assessment:** • Give a written test on assembly and operation of oxyacetylene welding and cutting equipment. • Use a rubric on setting up equipment, “pushing the puddle,” and making a cut in mild steel. (See Sample Rubric on Oxyacetylene Welding and Cutting Operations in Appendix E.) (NOTE: Students will be assessed on safety practices and procedures throughout the practice.)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
14. Examine the major parts and function of a small engine. a. Identify the major systems of a small gasoline engine to include ignition, air intake, lubrication, power train, cooling, exhaust, and fuel systems. Identification will include the purpose or function of each component. b. Identify and demonstrate the use of hand tools and diagnostic instruments. c. Trace events in the intake, compression, power, and exhaust strokes of a four cycle small engine. d. Trace events in the intake-compression and power-exhaust strokes of a two cycle small engine. e. Compare differences in two- and four-stroke cycle engines to indicate absence or presence of oil sump, mixed fuel, and labeling indicating stroke type.	**Teaching:** • Use a videotape or PowerPoint presentation to identify and illustrate the major systems of a small gasoline engine, including their function or purpose. • Set up a display of the different common and specialty tools and instruments used in small engine service and repair. Discuss the safe and proper use of each tool or instrument. Have students make a drawing of each tool and note its use in their notebook/journal. • Have the student draw diagrams tracing the events of a four-cycle and two-cycle engine and identify different characteristics of each type in their notebooks/journals. **Assessment:** • Give a written test on major parts and functions of a small engine. • Use a rubric to evaluate student notebook/journal. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)
15. Perform preventive maintenance and troubleshooting on a small engine. a. Service a crankcase breather, air cleaner, carburetor, governor, starter, and engine oil. b. Diagnose ignition, fuel, and engine control problems.	**Teaching:** • Provide students with an operator's manual for a given engine. Have them follow manufacturer's recommendations in servicing the different systems on the engine. • Provide students with a checklist for diagnosing problems in a small engine. Provide them with different scenarios and have them identify what they would do to troubleshoot an engine with a specific problem. **Assessment:** • Give a written test on small engine maintenance and troubleshooting. • Use a rubric on servicing and troubleshooting a small engine. (See Sample Rubric – Servicing and Troubleshooting a Small Engine in Appendix E.)

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

TET1 Use tools, equipment, machinery, and technology to work in areas related to AFNR.
PWR1 Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
PWR2 Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
PWR3 Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
STR1 Exercise basic skills in blueprint and design development to create sketches, drawings, and plans.
STR4 Develop skills required to use construction/fabrication equipment and tools.
STR5 Plan, implement, manage, and/or provide support services for facility design and construction; equipment design, manufacture, repair, and service; and agricultural technology.
TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
TEC2 Use available power sources to plan and apply control systems.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
A5 Utilize various formulas in problem-solving situations.
A6 Communicate using the language of algebra.
A7 Interpret and apply slope as a rate of change.
A8 Analyze data and apply concepts of probability.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T3 Technology productivity tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Briggs & Stratton. (1994). *Briggs and Stratton single cylinder "L" head repair manual*. Milwaukee, WI: Author.

Herren, R. (2006). *Agriculture mechanics: Fundamentals and applications* (5th ed.). Albany, NY: Delmar.

Deere & Company. (2003). *Compact equipment: Engines*. Moline. IL: Author.

Phipps, L. J., Miller, G. M., & Lee, J. S. (2004). *Introduction to agricultural mechanics* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Phipps, L. J., & Reynolds, C. L. (1992). *Mechanics in agriculture* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Radcliff, R. B., & Roark, D. L. (1997). *Small engines*. Homewood, IL: American Technical Publishers.

Agriculture and Natural Resources II
Unit 1: Orientation/Careers/Leadership **(23 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Review safety rules and behavior. a. Identify safety rules and behavior for the classroom. b. Identify safety rules and behavior for the shop and laboratory areas.	**Teaching:** • Identify and discuss with the students basic safety rules and behavior for the classroom, shop, and laboratory areas using handouts, PowerPoint presentations, demonstrations, and/or videos. (Note: Instruction in safety is an ongoing process throughout the school year. Safety will be stressed and monitored on a daily basis.) • Students will participate in safety role play to support safety rule understanding. **Assessment:** • Give a written test on safety practices. (The teacher may use the Farm Bureau safety test found on B.R.I.D.G.E. Agriculture Education Blackboard site.) • Assessment of safety will be included as part of the assessment of all shop and laboratory activities.
2. Select careers in agricultural and natural resources. a. Compare the careers available in Agriculture and Natural Resources. b. Analyze careers according to the factors influencing career choices.	**Teaching:** • The teacher will review opportunities available in the following agriculture and natural resource areas: Agriculture Production, Agriculture Mechanics, Agriculture Processing, Forestry, Horticulture, Agriculture Business, Aquaculture, and Natural Resources. • Have students identify one area that is of interest to them and identify an expert within this area. Students will create an a portfolio with ongoing information and communication with the expert to include important characteristics of their occupations, including factors such as educational requirements, working conditions, career ladders, etc. **Assessment:** • Use a rubric for evaluating the portfolio. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
3. Develop an individual FFA activity plan. a. Identify FFA activities and programs that contribute to career advancement and individual achievement. b. Select and document FFA activities and programs that contribute to personal development.	**Teaching:** • Have students use the FFA Manual, Student Handbook, PowerPoint presentations, FFA organization web site (www.ffa.org), Local Program Success Guide, and LifeKnowledge lesson handouts and worksheets to identify and describe the different FFA events, programs, and degrees; and explore how each contributes to career advancement and individual achievement. • Have each student select FFA activities, events, and/or award programs to participate in the coming year(s). Have students keep an ongoing journal of preparation for FFA activities as part of their supervised experience program. **Assessment:** • Use a rubric to evaluate the student journal. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)
4. Develop and present a three to five minute multi-media presentation on an agriculture or natural resource topic. a. Discuss guidelines for preparing a successful presentation preparation, resource development, writing skills, and presentation skills. b. Present a three to five minute speech.	**Teaching:** • Discuss and demonstrate presentation techniques and guidelines with the student. Show videos of examples of speeches and have students evaluate the speaker and topic using the FFA scorecard. • Have students research, prepare, and deliver a three to five minute speech on their selected occupation. **Assessment:** • Students and teacher will evaluate the speeches using the scorecard found in the Mississippi FFA Contest Handbook. (See FFA Prepared Public Speaking Scorecard in Appendix E.)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
5. Apply the principles of leadership and personal development. a. Identify the principles of leadership and personal development. b. Demonstrate leadership and personal development.	**Teaching:** • Discuss with the students characteristics of a good leader. • Using a chart, PowerPoint presentation, or video, identify and describe the characteristics of a good leader. • Have students demonstrate leadership by taking turns in a supervisory role in the classroom, shop, and/or laboratory. **Assessment:** • Give a written test on principles of leadership and personal development.
6. Maintain Supervised Agricultural Experience records. a. Maintain records of income and expenses related to SAE activities. b. Maintain records of skills learned through SAE. c. Maintain other records associated with SAE supplementary projects (improvement projects, community service projects, etc.).	**Teaching:** • Review procedures for maintaining records of SAE activities. • Students will maintain records of SAE activities throughout the year using an approved recordbook. **Assessment:** • Give a written test on SAE records. • Make monthly or quarterly checks of student recordbook.

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

LEA1 Use leadership skills in collaborating with others to accomplish organizational goals and objectives

LEA2 Use personal growth skills in collaborating with others to accomplish organizational goals and objectives

Academic Standards

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.

Workplace Skills for the 21st Century

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Computer Software

Bridges Transitions. (2005). *Choices 2005* [Computer software]. Oroville, WA: Author.

National Council on Agricultural Education and National FFA organization. (2003). *Local program success guide* (2nd ed.) [Computer software]. Indianapolis, IN: National FFA Organization.

National FFA Organization. (2005). Lesson HS.128: Managing my journey (Managing SAE's). In *LifeKnowledge-Real lessons for real life* [Computer software]. Indianapolis, IN: Author.

Textbooks and Other Publications

Cooper, E. L., & Burton, L. D. (2004). *Agriscience: Fundamentals and application* (3rd ed.). Albany, NY: Delmar.

National FFA Organization. (2005). *FFA manual*. Indianapolis, IN: Author.

National FFA Organization. (2005). *FFA student handbook*. Indianapolis, IN: Author.

Web Sites

Georgia Department of Education. (2002). *Basic parliamentary procedure*. Retrieved August 2, 2005, from http://aged.ces.uga.edu/2004cds/cd1/Lesson%20Plans/Agricultural%20Leadership%20&%20Personal%20Development-01012/01012-07.1%20Basic%20Parliamentary%20Procedure.doc

Mississippi Farm Bureau. (2005). *Farm bureau safety test*. Retrieved November 16, 2005, from http://rcu.blackboard.com/webapps/portal/frameset.jsp?tab=courses&url=/bin/common/course.pl?course_id=_2045_1

U.S. Department of Labor. (2005). *Occupational outlook handbook.* Retrieved August 2, 2005, from http://www.bls.gov/oco/home.htm

Agriculture and Natural Resources II
Unit 2: Natural Resources (Conservation and Management) (45 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore the basic concepts of natural resource conservation and management. a. Classify renewable and non-renewable natural resources. b. Discuss the concept of sustainability as related to natural resources and the environment.	**Teaching:** • Define renewable and non-renewable resources. Have students create a list of renewable and non-renewable natural resources in the area. • Briefly discuss and define the concept of sustainability and relate this concept of the efficient use of natural resources and protection of the environment. Have students research practices in agriculture that exemplify sustainability and prepare a brochure or poster for exhibit to the class. **Assessment** • Give a written test on basic concepts of natural resource conservation and management. • Use a rubric to evaluate student poster or brochure. (See Sample Poster Rubric in Appendix E.)
2. Explore issues related to agriculture and the environment. a. Discuss the concept of an environment and how the environment affects the quality of life. b. Discuss agricultural issues that affect the environment. c. Describe agricultural practices and policies designed to protect and enhance the environment. d. Discuss issues related to disposal of waste products in agriculture.	**Teaching:** • Invite a representative of the USDA or other agency associated with agricultural environmental issues to speak to the class on the concept of environment, agricultural issues affecting the environment, practices and policies that protect and enhance the environment, and waste disposal. Have students summarize important points in their notebooks. Follow up with a discussion to make sure that students have listed all important points in their notes. **Assessment:** • Use a rubric to evaluate the student notebook/journal. (See Sample Rubric for Evaluating a Student Journal in Appendix E.) • Give a written test on agricultural and environmental issues and policies.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
3. Explore issues related to air and water quality and conservation/preservation. a. Discuss the sources of water and potential threats to each source. b. Discuss sources of air pollution and precautions that can be taken to reduce or prevent pollution. c. Explore ways in which agricultural enterprises protect and enhance air and water quality.	**Teaching:** • Have students investigate and research the different sources of water and potential threats to each source and complete an assignment. • Invite a representative of the Department of Environmental Quality to discuss with the students major threats to air and water quality in the local area. Have students summarize this discussion in their notebook. Follow up with the students to make sure they have recorded important points. **Assessment:** • Give a written test on air and water quality issues. • Use a rubric on student notebook/journal. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)
4. Explore concepts and practices related to wildlife conservation and management. a. Create a diagram illustrating the interrelationships among the soil, plants, animals, and humans. b. Discuss the concept of a food web. c. Identify and discuss conservation and management of wildlife. d. Research a given species of wildlife to determine habitat and management practices.	**Teaching:** • Discuss the interrelationships among soil, plants, animals, and humans. Have students prepare a diagram illustrating these relationships. • Have students prepare a diagram showing a food web for a given species. • Using a Power Point or other visual presentation, discuss the different approaches to wildlife conservation and management. • Assign a given species of wildlife to each student. Have the student research and compile a report on habitat and management practices. Have students present the findings to the class. **Assessment:** • Give a written test on concepts and practices of wildlife conservation and management. • Use a rubric to evaluate the student report. (See Sample Rubric on Written Report in Appendix E.)

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
NRS1 Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
NRS3 Apply scientific principles to natural resource management activities.
NRS4 Employ knowledge of natural resource industries to describe production practices and processing procedures.
NRS5 Practice responsible conduct to protect natural resources.
ENV1 Use analysis procedures to plan and evaluate environmental service impacts.
ENV2 Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
ENV3 Apply scientific principles to environmental services.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
A4 Explore and communicate the characteristics and operations of polynomials.
A5 Utilize various formulas in problem-solving situations.
A7 Interpret and apply slope as a rate of change.
B7 Investigate the interdependence and interactions that occur within an ecosystem.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E10 Use language and critical thinking strategies to serve as tools for learning.
H3 Describe the relationship of people, places, and environments through time.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Birkenholz, R., & Garton, B. (1996). *Applied environmental science*. Columbia, MO: Missouri Instructional Materials Laboratory.

Cooper, E. L., & Burton, L. D. (2004). *Agriscience: Fundamentals and application* (3rd ed.). Albany, NY: Delmar.

Porter, L., Lee, J., Turner, D., & Hillan, M. (2003). *Environmental science and technology* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Web Sites

Freenstra, G., Ingels, C., & Campbell, D. (1997). *What is sustainable agriculture?* Retrieved August 22, 2005, from http://www.sarep.ucdavis.edu/concept.htm

Agriculture and Natural Resources II
Unit 3: Agricultural Business Management and Processes (45 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore basic principles of agricultural economics and marketing. a. Describe and contrast the types of business organizations. b. Differentiate between wholesale and retail marketing. c. Identify factors that influence pricing including the law of supply and demand and consumer characteristics.	**Teaching:** • Discuss and contrast the different types of business organizations with the students. Provide examples of different organizations. • Have students identify wholesale and retail outlets in the local area. • Discuss and illustrate the law of supply and demand. Have students work in groups to apply this law to different scenarios regarding agricultural products. **Assessment:** • Give a written test on principles of agricultural economics and marketing.
2. Discuss principles of agricultural finance and credit. a. Compare sources of agricultural credit. b. Discuss the importance of a personal and business credit rating. c. Discuss other banking services for agriculture.	**Teaching:** • Invite a representative of a bank or agricultural financial agency to speak to the class on sources of credit and other financial services. Have students summarize the presentation in their notebooks. Follow-up with a discussion to make sure that all students have noted the important points. • Have students research credit ratings and summarize the factors associated with credit ratings. Have students summarize their findings, including information on the importance of a strong credit rating. • Have students view web sites of local banks and compile a list of other services including checking and savings accounts. Have students compare different institutions accounts, fees, and services. **Assessment:** • Give a written test on finance and credit.
3. Discuss taxes, insurance, and business law related to agriculture. a. Describe the forms and practices associated with income tax preparation. b. Identify insurance needs for an agricultural business.	**Teaching:** • Provide students with copies of the most recent major forms used to file a federal income tax form for an agricultural business. Discuss the concepts of income and expenses from a tax standpoint including deductible expenses.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
c. Discuss essential elements of a contract and other common business agreements and laws.	• Briefly discuss insurance needs for an agricultural business. Student assignment to develop an insurance plan for an agricultural enterprise and its staff. • Provide students with examples of common contracts used in business today (promissory notes, service contracts, etc.). Identify and discuss the elements of these contracts. **Assessment:** • Give a written test on taxes, insurance, and business law. • Grade the tax form exercise. • Grade the insurance plan.
4. Explore principles of property acquisition and transfer. a. Discuss principles of property acquisition and transfer. b. Apply legal land descriptions. c. Discuss principles and practices related to land surveys.	**Teaching:** • Using a PowerPoint presentation or other graphic presentation, discuss with the students the basic means for transferring property. • Using a map of the local area, locate range, township, and sections. Illustrate the division of sections. Have students practice interpreting and writing legal descriptions of property. • Invite a local surveyor to speak to the class and demonstrate surveying techniques and equipment. Have students summarize the presentation in their notebooks and then follow up to make sure they recorded important points. **Assessment:** • Give a written test on principles of property acquisition and transfer. • Grade student assignment on interpreting and writing legal descriptions.
5. Explore the use of geographic information systems (GIS) in agricultural enterprises. a. Identify components of an agricultural GIS system. b. Explore the principles and applications of precision farming operations.	**Teaching:** • Use a video or PowerPoint presentation to identify the use of GIS/GPS and precision farming techniques. Have students summarize the presentation in their notebooks and then follow-up to make sure that all important points are covered. **Assessment:** • Give a written test on GIS and precision farming principles.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	• Use a rubric to evaluate student journals. (See Sample Rubric for Evaluating a Student Journal in Appendix E.)

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

LEA1 Use leadership skills in collaborating with others to accomplish organizational goals and objectives
LEA2 Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
ELR1 Know and understand the importance of professional ethics and legal responsibilities.
TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
TEC3 Explain geospatial technology to demonstrate its applications.
ABS1 Employ leadership skills to accomplish goals and objectives in the AFNR business environment.
ABS2 Practice good recordkeeping to accomplish AFNR business objectives.
ABS3 Apply generally accepted accounting principles and skills to manage budget, credit, and optimal application of AFNR business assets.
ABS4 Employ AFNR industry concepts and practices to manage inventory.
ABS5 Utilize technology to accomplish AFNR business objectives.
ABS6 Use marketing and sales principles to accomplish an AFNR business objective.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Brasse, T. (2006). *Precision agriculture*. Albany, NY: Delmar.

Elliot, J. (1999). *Decisions and dollars*. Albany, NY: Delmar.

Ess, D. R., Shoup, W. B., & Butler, J. N. (2003). *The precision-farming guide for agriculturists*. Moline, IL: Deere and Company.

National Council for Agricultural Education. (1998). *Decisions and dollars*. Alexandria, VA: Author.

Steward, J., Jobes, R., Casey, J. E., & Purcell, W. D. (2004). *Farm and ranch business management* (5th ed.). Moline, IL: Deere and Company.

Web Sites

United States Internal Revenue Service. (2004). *Publication 225: Farmer's tax guide*. Retrieved August 22, 2005, from http://www.irs.gov/publications/p225/index.html

Agriculture and Natural Resources II
Unit 4: Agricultural Construction **(45 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Select and demonstrate proper equipment for a specific construction job. a. Identify tools and equipment for a specific job. b. Select and use hand and power tools safely and properly. c. Demonstrate mathematical concepts in measurement.	**Teaching:** • Review the use of different hand and power tools used in agricultural construction and maintenance operations. • Provide the students with scenarios of actual repair jobs and have them select and safely and properly use appropriate tools and equipment. • Review the different types of measuring tools and their use. Have students take and record measurements using various methods. **Assessment:** • Give a written test on tool and equipment selection and usage. • Grade student activity to select proper tools for a given job. • Grade student measurement activity.
2. Develop a bill of materials for a specific job. a. Compare dimensions, kind, and amount of materials needed. b. Explain the use of wood, metal fasteners, wire, concrete, and roofing materials. c. Design a structure to include justification, size of structure, materials needed, and cost.	**Teaching:** • Briefly discuss the concept of a bill of materials and specifications. • Set up a display or use a PowerPoint presentation to discuss the different types of fasteners used in wood, metal, and concrete. • Have students design a simple structure to include a sketch of the structure, bill of materials, and estimated cost. **Assessment:** • Give a written test on bill of materials. • Grade student assignment to prepare a bill of materials. • Grade student assignment to design a simple structure.
3. Identify the different roof types and materials used in roof construction. a. Describe and illustrate the construction and applications of gable, flat, and gambrel roofs. b. Describe the use of various roofing materials to include tin, wood, tar, asphalt, and fiberglass shingles.	**Teaching:** • Using a PowerPoint presentation and other illustrations, briefly discuss the common roof types and their applications. • Have students research and compare different roof types and materials used in construction.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	Assessment: • Use a rubric to evaluate the student project. (See Sample Rubric for a Group Project in Appendix E.)
4. Lay out and cut common rafters. a. Demonstrate procedure to lay out common rafters. b. Design models or patterns to lay out and cut common rafters and/or doorsteps.	**Teaching:** • Discuss and demonstrate the procedure for laying out common and hip rafters using a framing square and the Pythagorean theorem. • Provide students with materials (paper towels or cardboard will work) and have them lay out a rafter to specifications. **Assessment:** • Give a written test on laying out rafters. • Grade student assignment to lay out a rafter.
5. Construct various types of foundations, walls supports, and roof structures. a. Identify the parts and terms of structural members of a building (foundation, walls, ceilings, etc.). b. Identify structural problems and preventions. c. Describe slab and conventional foundations. d. Plan foundations for frame buildings and forms for concrete slab buildings. e. Construct framing and wall support.	**Teaching:** • Using a PowerPoint presentation, identify the parts and terms used for structural members of a building. • Describe and illustrate common problems associated with structures and how they can be prevented or corrected. • Demonstrate the procedure for laying out corners and establishing building locations. • Have students construct a small building frame to scale. **Assessment:** • Give a written test on building structure. • Use a rubric to evaluate the construction of a building frame and wall. (See Sample Rubric for Constructing a Building Frame and Wall in Appendix E.)

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

ELR2 Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.

TET1 Use tools, equipment, machinery, and technology to work in areas related to AFNR.

PWR1 Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
PWR2 Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
PWR3 Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
STR1 Exercise basic skills in blueprint and design development to create sketches, drawings, and plans.
STR2 Read and relate structural plans to specifications and building codes.
STR3 Examine structural requirements to estimate project costs.
STR4 Develop skills required to use construction/fabrication equipment and tools.
STR5 Plan, implement, manage, and/or provide support services for facility design and construction; equipment design, manufacture, repair, and service; and agricultural technology.
TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
A4 Explore and communicate the characteristics and operations of polynomials.
A5 Utilize various formulas in problem-solving situations.
A6 Communicate using the language of algebra.
A7 Interpret and apply slope as a rate of change.
A8 Analyze data and apply concepts of probability.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Herren, R. (2006). *Agriculture mechanics: Fundamentals and applications* (5th ed.). Albany, NY: Delmar.

Phipps, L. J., Miller, G. M., & Lee, J. S. (2004). *Introduction to agricultural mechanics* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Web Sites

ATTRA. (2005). *Efficient agricultural buildings: An overview*. Retrieved November 8, 2005, from http://attra.ncat.org/attra-pub/PDF/agbuildings.pdf

The University of Tennessee Extension Service. (2005). *The agricultural building and equipment plan list*. Retrieved November 8, 2005, from http://bioengr.ag.utk.edu/Extension/ExtPubs/PlanList97.htm#Machinery%20and%20Supply%20Storage%20Plans

Agriculture and Natural Resources II
Unit 5: Agricultural Equipment Operation and Maintenance (45 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Inspect and maintain agricultural equipment. a. Describe procedures for inspecting coolant, engine oil, tire pressure, hydraulic fluid, gear oil, and air filter. b. Perform operation and maintenance checks on agricultural equipment according to manufacturer's specifications.	**Teaching:** • Provide students with copies of owner maintenance manuals and procedures. Have students identify key maintenance procedures. • Students will perform routine owner equipment checks and maintenance procedures. **Assessment:** • Give a written test on inspecting and maintaining agriculture equipment. • Use a rubric to evaluate performance of routine equipment and owner maintenance procedures. (See Sample Rubric for Performing Routine Equipment Maintenance and Repair Tasks in Appendix E.)
2. Repair agricultural machinery and equipment. a. Assess parts to repair or replace parts based on manufacturer's specifications and observation. b. Perform maintenance for required parts, reassemble, adjust, and test.	**Teaching:** • Demonstrate the procedure for checking parts for wear or damage using manufacturer's specifications. • Have students inspect, repair and/or replace parts as necessary. Students will be provided hands-on opportunities to inspect and identify procedures for maintaining agricultural equipment. **Assessment:** • Give a written test on procedures for checking parts. • Use a rubric to evaluate performance on maintenance tasks. (See Sample Rubric for Performing Routine Equipment Maintenance and Repair Tasks in Appendix E.)
3. Perform reconditioning of agricultural machinery and equipment. a. Recondition agricultural machinery and equipment. b. Paint agricultural machinery and equipment.	**Teaching:** • Using a PowerPoint or other visual presentation, discuss the procedures for reconditioning and repairing equipment and machinery. • Students will work in teams to recondition equipment and machinery.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
	Assessment: • Give a written test on reconditioning equipment. • Use a rubric to assess performance in reconditioning equipment. (See Sample Rubric on Performing Routine Equipment Maintenance and Repair Tasks in Appendix E.)
4. Perform welds with shielded metal arc welding (SMAW) equipment. a. Fabricate a single v-groove butt welding in the horizontal position. b. Fabricate a single v-groove butt weld in the vertical up position.	**Teaching:** • Review safety rules and procedures for welding. • Discuss and demonstrate procedures of each welding position with the use of practical exercises, PowerPoint presentations, overheads, and print information. • Students will perform an exercise for each welding position. **Assessment:** • Give a written test on shielded metal arc welding. • Use a rubric to evaluate student horizontal and vertical welds. (See Sample Rubric on Advanced Welding and Cutting Techniques in Appendix E.)
5. Perform welds with gas metal arc welding (GMAW) equipment. a. Fabricate a single v-groove butt weld in the horizontal position. b. Fabricate a single v-groove butt weld in the vertical up position.	**Teaching:** • Review safety rules and procedures for oxyacetylene operations. • Discuss and demonstrate procedures of each welding position with the use of practical exercises, PowerPoint presentation, overheads, and print information. **Assessment:** • Give a written test on oxyacetylene welding procedures. • Use a rubric to assess student performance in making a horizontal and vertical weld. (See Sample Rubric on Advanced Welding and Cutting Techniques in Appendix E.)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
6. Cut metal with plasma arc cutter. a. Identify safety rules and practices associated with a plasma arc cutter. b. Identify parts and functions of a plasma arc cutter. c. Demonstrate setup of plasma arc cutter. d. Operate a plasma arc cutter to make cuts in steel.	**Teaching:** • Provide students with a list of safety rules and practices associated with a plasma arc cutter. • Identify the parts of the plasma arc cutter and their functions. • Demonstrate the setup and operation of the plasma arc cutter to the students. • Students will set up and operate a plasma arc cutter to make cuts in steel. **Assessment:** • Give a written test on safety, setup, and operation of plasma arc cutters. • Use a rubric to evaluate student plasma arc cutter activities. (See Sample Rubric on Advanced Welding and Cutting Techniques in Appendix E.)

STANDARDS

Agriculture, Food, and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

TET1 Use tools, equipment, machinery, and technology to work in areas related to AFNR.
PWR1 Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
PWR2 Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
PWR3 Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
STR1 Exercise basic skills in blueprint and design development to create sketches, drawings, and plans.
STR4 Develop skills required to use construction/fabrication equipment and tools.
STR5 Plan, implement, manage, and/or provide support services for facility design and construction; equipment design, manufacture, repair, and service; and agricultural technology.
TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
TEC2 Use available power sources to plan and apply control systems.
ABS1 Employ leadership skills to accomplish goals and objectives in the AFNR business environment.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
A4 Explore and communicate the characteristics and operations of polynomials.
A5 Utilize various formulas in problem-solving situations.
A6 Communicate using the language of algebra.
A7 Interpret and apply slope as a rate of change.
A8 Analyze data and apply concepts of probability.
E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts
T2 Social, ethical, and human issues
T3 Technology productivity tools
T4 Technology communications tools
T5 Technology research tools
T6 Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Herren, R. (2006). *Agriculture mechanics: Fundamentals and applications* (5th ed.). Albany, NY: Delmar.

Phipps, L. J., Miller, G. M., & Lee, J. S. (2004). *Introduction to agricultural mechanics* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Recommended Tools and Equipment

CAPITALIZED ITEMS

1. A-Frame with 10 ton chain hoist (1)
2. Air compressor (1)
3. Air compressor, portable (1)
4. Bandsaw (1)
5. Bender (Hossfield) (1)
6. Cabinet, flammable materials (1)
7. Cement mixer, gas or electric powered (1)
8. Chute, blocking (Optional) (1)
9. Computer with multimedia kit and modem (10)
10. Drill press, 14" with vise (1)
11. Dust collection system for shop (1)
12. Eye protection & sterilization chest (1)
13. Global Positioning System receiver (GPS) with computer cables and software (3)
14. Greenhouse (Business and Plant Science) 25' x 50' (optional) (1)
15. Jointer (1)
16. Livestock trailer (optional) (1)
17. Oxyacetylene cutting and welding set with heating tips (2)
18. Planer, 16" (1)
19. Plasma arc cutter (1)
20. Pressure washer (1)
21. Printer (inkjet) with cables and switches (1)
22. Printers (laserjet), with cables and switches (4)
23. Saw, table (1)
24. Saw, metal cut off (1)
25. Scales, small animal (Optional) (1)
26. Squeeze chute, portable (Optional) (1)
27 String trimmer (weedeater) (1)
28 Tiller (8 hp), rear tines (1)
29. Transit level with tripod and leveling rod (1)
30. Trim table (Optional) (1)
31. Welder, AC/DC 300 amp (SMAW) (4)
32. Welder, AC 225 amp (SMAW) (2)
33. Welder, GMAW (1)

NON-CAPITALIZED ITEMS

1. Air quality test kit (1)
2. Anvil (1)
3. Blower/dryer, large animal (1)
4. Bolt cutter (1)
5. Booth, welding (4)
6. Briggs & Stratton engine, 3-5 hp, horizontal shaft (6)

7. Briggs & Stratton tool kits (3)
8. Brush, wire (10)
9. C-Clamp, assorted sizes (10)
10. C-Clamp, vise grip (6)
11. Calculator, tape (3)
12. Can, gasoline (spill proof) (1)
13. Cash register (1)
14. Circular saw 7-1/4" (1)
15. Clamp, bar (4)
16. Clippers, large animal (1)
17. Clippers, small animal (1)
18. Conduit bender (1/2" and 3/4") (1)
19. Creeper (1)
20. Drill, cordless with drives (2)
21. Drill, pneumatic (1)
22. Fire extinguisher (1)
23. Flaring tool (1)
24. Floor jack, hydraulic, 4 ton (2)
25. Gloves (12 pr)
26. Gloves, welder (10 pr)
27. Goggles, oxyacetylene cutting with lens (5)
28. Greenhouse shade cloth (1)
29. Greenhouse plant bench (10)
30. Greenhouse chipper/shredder (1)
31. Greenhouse thermometer, high/low
32. Greenhouse irrigation system, fans, heaters, and drip pad (with greenhouse) (1)
33. Greenhouse plant flats (100)
34. Greenhouse probe, moisture (1)
35. Greenhouse sprayer, 3 gal (1)
36. Grinder, die (1)
37. Grinder, pedestal (1)
38. Grinder, side, 4-6" (2)
39. Grinder, side, 7-9" (2)
40. Grinder, pneumatic (1)
41. Grinder, bench, 6" (2)
42. Hacksaw (2)
43. Hammer, curved (2)
44. Hammer, sledge (1)
45. Hammer, chipping (10)
46. Hammer, straight (2)
47. Hammer, ball peen (4)
48. Handsaw, rip (1)
49. Handsaw, crosscut (1)
50. Helmet, welder (10)
51. Jack stand (4)
52. Jig saw (2)

53. Jig saw, orbital (1)
54. Level, 48" (1)
55. Level, 24" (1)
56. Livestock panels, portable (4' x 12') (Optional) (6)
57. Metal punches, set (1)
58. Metal chisels, set (1)
59. Meter, pH (1)
60. Micrometer, set (1)
61. Nailer, pneumatic (1)
62. Paint spray gun (1)
63. Pipe wrenches (12"-24") (3)
64. Pipe cutter (1)
65. Pliers, vise grip (2)
66. Pliers, slip joint (5)
67. Pliers, needlenose (5)
68. Pliers, lineman (5)
69. Reamer (1)
70. Respirator (2)
71. Safety first aid kit (OSHA approved) (1)
72. Sander, belt (1)
73. Sander, finish (1)
74. Saw, compound angle (1)
75. Saw, coping (2)
76. Screwdriver, electric (1)
77. Screwdrivers, Phillips, assorted sizes (5)
78. Screwdrivers, flat blade, assorted sizes (10)
79. Shield, safety (5)
80. Socket sets with ratchets and pull handles (Metric 1/4", 3/8", and 1/2" drive) (2)
81. Socket sets with ratchets and pull handles (SAE 1/4", 3/8", 1/2", and 3/4" drive) (2)
82. Soil test kit (1)
83. Solder gun (1)
84. Sparklighter (2)
85. Square, framing (4)
86. Stand, small engine (6)
87. Table, oxyacetylene cutting (4)
88. Table, metal shop (4)
89. Threading dies, set (1)
90. Tip cleaners, torch (3)
91. Tubing cutter (1)
92. Tubing bender (1)
93. Vacuum, shop (wet-dry) (1)
94. Vernier caliper (1)
95. Vise, machinist, 4" (4)
96. Vise, machinist, 6" (4)
97. Vise, pipe (1)
98. Volt ohmmeter (1)

99. Water quality test kit (1)
100. Wheelbarrow, 6 cu. ft. (1)
101. Wire stripper (5)
102. Wiring demonstrator (1)
103. Wrench, Allen set (Metric) (1)
104. Wrench, Allen set (SAE) (1)
105. Wrench, air impact, set with sockets (½") (1)
106. Wrench, set combination (Metric) (2)
107. Wrench set, combination (SAE) (3)

Student Competency Profile for Secondary Agriculture and Natural Resources Technology I

Student:_____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. Noted in parentheses beside each unit is the cluster competency from the MS-CPAS. This form may be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

As an alternative to the use of this form, you may note competency achievement by attaching a report showing comparable results for each student. Please indicate that you are using this alternative report by checking here. _____

Unit 1: Orientation/Careers/Leadership

_____1. Describe the scope and importance of the agriculture and natural resources industry.
_____2. Identify basic safety rules and behavior.
_____3. Explore FFA career development events and other activities that promote student achievement.
_____4. Develop and present a three to five minute speech on an agriculture or natural resource topic.
_____5. Apply the purposes and functions of parliamentary procedure.

Unit 2: Supervised Agricultural Experience (SAE) Programs

_____1. Identify the purposes, requirements and types of the SAE programs.
_____2. Maintain agriculture record keeping for the SAE.

Unit 3: Animal Science

_____1. Select proper animal for specific farm enterprise or for participation in livestock shows and sales.
_____2. Compare and contrast the anatomy and physiology of beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest.
_____3. Discuss nutritional requirements and rations for beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest.
_____4. Explain management practices for maintaining health in beef, dairy, swine, poultry, horses, aquaculture, and other species of local interest.
_____5. Explain procedures for managing livestock reproduction.

Unit 4: Plant Science

_____1. Discuss the anatomy and physiology of a plant.
_____2. Describe how plants are classified.
_____3. Explore the processes of plant reproduction.

_____4. Explore plant nutrition.
_____5. Describe plant pests and their control.

Unit 5: Soil Science

_____1. Discuss the factors that affect soil formation and texture.
_____2. Contrast types of soil erosion and controls.
_____3. Apply the land classification system.
_____4. Evaluate a given location for a home site.

Unit 6: Agricultural Shop Operations and Safety

_____1. Identify safety procedures and safety devices for the agricultural workplace.
_____2. Apply general safety rules pertaining to hand and stationary power tools.
_____3. Explain the relationship among volts, amps, and watts.
_____4. Describe the safety issues and devices associated with electricity.
_____5. Identify and use electrical tools and materials.
_____6. Identify common equipment and tools used in welding.
_____7. Apply safety precautions used in welding.
_____8. Describe different welding supplies used in welding.
_____9. Compare the different types of welds.
_____10. Perform various welding techniques.
_____11. Apply safety procedures for using oxyacetylene equipment.
_____12. Identify the different types of oxyacetylene flames.
_____13. Assemble and operate oxyacetylene welding and cutting equipment.
_____14. Examine the major parts and function of a small engine.
_____15. Perform preventive maintenance and troubleshooting on a small engine.

Student Competency Profile for Secondary Agriculture and Natural Resources Technology II

Student:_____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. Noted in parentheses beside each unit is the cluster competency from the MS-CPAS. This form may be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

As an alternative to the use of this form, you may note competency achievement by attaching a report showing comparable results for each student. Please indicate that you are using this alternative report by checking here. _____

Unit 1: Orientation/Careers/Leadership/SAE

_____1. Review safety rules and behavior.
_____2. Select careers in agriculture and natural resources.
_____3. Develop an individual FFA activity plan.
_____4. Develop and present a three to five minute multi-media presentation on an agriculture or natural resource topic.
_____5. Apply the principles of leadership and personal development.
_____6. Maintain Supervised Agricultural Experience records.

Unit 2: Natural Resources (Conservation and Management)

_____1. Explore the basic concepts of natural resource conservation and management.
_____2. Explore issues related to agriculture and the environment.
_____3. Explore issues related to air and water quality and conservation/preservation.
_____4. Explore concepts and practices related to wildlife conservation and management.

Unit 3: Agricultural Business Management and Processes

_____1. Explore basic principles of agricultural economics and marketing.
_____2. Discuss principles of agricultural finance and credit.
_____3. Discuss taxes, insurance, and business law related to agriculture.
_____4. Explore principles of property acquisition and transfer.
_____5. Explore the use of geographic information systems (GIS) in agricultural enterprises.

Unit 4: Agricultural Construction

_____1. Select and demonstrate proper equipment for a specific construction job.
_____2. Develop a bill of materials for a specific job.
_____3. Identify the different roof types and materials used in roof construction.
_____4. Lay out and cut common rafters.
_____5. Construct various types of foundations, walls supports, and roof structures.

Unit 5: Agricultural Equipment Operation and Maintenance

_____1. Inspect and maintain agricultural equipment.
_____2. Repair agricultural machinery and equipment.
_____3. Perform reconditioning of agricultural machinery and equipment.
_____4. Perform welds with shielded metal arc welding (SMAW) equipment.
_____5. Perform welds with gas metal arc welding (GMAW) equipment.
_____6. Cut metal with plasma arc cutter.

Appendix A: Proposed Standards for Mississippi Agriculture Education Programs[1]

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. Each standard represents a pathway knowledge and skill statement as listed in this document. Standards are clustered by career pathway. The complete text of this document can be found at http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf.

LEADERSHIP (LEA)

LEA1 Use leadership skills in collaborating with others to accomplish organizational goals and objectives.

a. Embrace empowerment, risk, communication, focusing on results, decision-making, problem-solving, investment in individuals, and resource use and access to develop premier leadership.
b. Embrace compassion, service, listening, coaching, developing others, team development, and understanding and appreciating others to develop premier leadership.
c. Embrace enthusiasm, creativity, the future, conviction, mission, courage, concept, focus, principles, and change to develop premier leadership.
d. Embrace integrity, courage, values, ethics, humility, perseverance, self-discipline, and responsibility to develop premier leadership.
e. Include self, community, diversity, environment, global awareness, and knowledge to develop premier leadership.
f. Embrace innovation, intuition, adaptation, life-long learning, and coachability to develop premier leadership.

LEA2 Use personal growth skills in collaborating with others to accomplish organizational goals and objectives.

a. Embrace attitude, exercise, goal-setting, planning, self-discipline, sense of balance, persistence, and respect to develop personal growth.
b. Embrace friendship, integrity, morals, values, etiquette, citizenship, cross-cultural awareness, acceptance/change, and respect for differences to develop personal growth.
c. Embrace goal setting, planning, decision-making, principles, respect, attitude, dependability, loyalty, trustworthiness, and communication to develop personal growth.
d. Embrace learning, critical thinking, reasoning, creative thinking, attitude, dependability, decision-making, and problem-solving to develop personal growth.
e. Embrace attitude, self-discovery, coping, friendship, self-reliance, sense of balance, empathy, compassion, and integrity to develop personal growth.
f. Embrace ethics, coping, courage, attitude, self-image/worth, values, principles, and sense of balance to develop personal growth.

[1] *Career cluster resources for agriculture, food, and natural resources*. (n.d.). Retrieved November 16, 2005, from http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf

ETHICS AND LEGAL RESPONSIBILITIES (ELR)

ELR1 Know and understand the importance of professional ethics and legal responsibilities.
- a. Apply knowledge of professional and workplace ethics and legal responsibilities to organize guidelines for workplace conduct.
- b. Apply ethical and legal reasoning to workplace situations.
- c. Review appropriate resources to identify national and international rules associated with a desired career.
- d. Identify what ethical issues and concerns affect a desired career field to assist in making career decisions.

ELR2 Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- a. Evidence interest and concern to demonstrate natural resource stewardship and ethics.
- b. Exercise personal habits and actions to demonstrate workplace ethics.

FOOD PRODUCTS AND PROCESSING SYSTEMS (FPP)

FPP1 Apply principles of food processing to maintain equipment and facilities.
- a. Develop management plans to maintain equipment and facilities.
- b. Interpret and follow, develop, and implement Hazardous Critical Control Point (HACCP) procedures to establish operating parameters.

FPP2 Apply principles of food science to the food industry.
- a. Apply food science principles to enhance product development.

FPP3 Plan, implement, manage, and/or provide services for the preservation and packaging of food and food products.
- a. Analyze product preparation options to prepare products for distribution.
- b. Compare and select food preservation methods to develop food preservation programs.

FPP4 Identify processing, handling, and storage factors to show how they impact product quality and safety.
- a. Develop a “quality factors program” to comply with local, national, and governmental, and international standards.
- b. Develop slaughter/inspection techniques to process foods and analyze food product options.

PLANT SYSTEMS (PLT)

PLT1 Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- a. Analyze and evaluate nutritional requirements and environmental conditions to develop and implement a fertilization plan.
- b. Test appropriate materials or examine data to evaluate and manage soil/media nutrients.
- c. Explain and use basic methods for reproducing and propagating plants.
- d. Develop and use a plan for integrated pest management.

PLT2 Address taxonomic or other classifications to explain basic plant anatomy and physiology.

a. Examine unique plant properties to identify/describe functional differences in plant structures including roots, stems, flowers, leaves, and fruit.
b. Classify plants on physiology for taxonomic or other classifications.

PLT3 Apply fundamentals of production and harvesting to produce plants.

a. Apply fundamentals of plant management to develop a production plan.
b. Apply fundamentals of plant management to harvest, handle, and store crops.

PLT4 Exercise elements of design to enhance an environment (e.g., floral, forest, landscape, and farm).

a. Apply basic design elements and principles to create a design using plants.

ANIMAL SYSTEMS (ANM)

ANM1 Apply knowledge of anatomy and physiology to produce and/or manage animals in a domesticated or natural environment.

a. Use classification systems to explain basic functions of animal anatomy and physiology.
b. Recognize the anatomy of animal species to understand how the body structures interact and affect animal health.
c. Analyze a subject animal to determine the nature of its health status.

ANM2 Recognize animal behaviors to facilitate working with animals safely.

a. Develop a safety plan for working with a specific animal.

ANM3 Provide proper nutrition to maintain animal performance.

a. Examine animal developmental stages to comprehend why nutrient requirements are different throughout an animal's life cycle.
b. Analyze a feed ration to determine whether or not it fulfills a given animal's nutrient requirements.
c. Record and compare feed variations to assess whether the nutritional requirements of an animal are being met.

ANM4 Know the factors that influence an animal's reproductive cycle to explain species response.

a. Analyze elements in the reproductive cycle to explain differences in the male and female reproductive systems.
b. Discuss reproductive cycles to show how they differ from species to species.
c. Evaluate an animal to determine its breeding soundness.

ANM5 Identify environmental factors that affect an animal's performance.

a. Recognize optimum performance for a given animal species.
b. Create a program to develop an animal to its highest potential performance.
c. Assess an animal to determine if it has reached its optimum performance level.
d. Develop efficient procedures to produce consistently high-quality animals, well-suited for their intended purposes.

TOOLS, EQUIPMENT, TECHNOLOGY, AND SAFETY (TET)

TET1 Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- a. Select the appropriate tool to perform a given task.
- b. Keep tools in good working order for efficient work use.
- c. Wear protective equipment and handle natural resource tools and equipment with skill to demonstrate safe use of tools and equipment.

POWER SYSTEMS (PWR)

PWR1 Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- a. Relate power generation to energy sources.
- b. Apply principles of lubricants to sort and classify lubricants.

PWR2 Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- a. Perform scheduled service routines to maintain machinery and equipment.
- b. Observe rules of the road to operate machinery and equipment.

PWR3 Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- a. Troubleshoot problems and evaluate performance to service and repair components of internal combustion engines.
- b. Follow manufacturer's guidelines to service and repair power transmission systems.
- c. Evaluate performance and check maintenance manuals to service and repair hydraulic lines.
- d. Troubleshoot from schematics to service vehicle electrical systems.
- e. Use company diagrams and scenarios to service vehicle heating and air conditioning systems.
- f. Check performance parameters to service and repair steering, suspension, traction, and vehicle performance systems.
- g. Use tools in the workplace to demonstrate safe and proper skills with construction/fabrication hand tools.

STRUCTURAL SYSTEMS (STR)

STR1 Exercise basic skills in blueprint and design development to create sketches, drawings, and plans.
- a. Use computer skills to develop simple sketches and plans.

STR2 Read and relate structural plans to specifications and building codes.
- a. Examine blueprints and local codes to develop a logical construction plan.

STR3 Examine structural requirements to estimate project costs.
- a. Use bids and billing information to develop a complete materials list and project cost estimate.

STR4 Develop skills required to use construction/fabrication equipment and tools.

a. Use tools in the workplace to demonstrate safe and proper skills with construction/fabrication hand tools.

STR5 Plan, implement, manage, and/or provide support services for facility design and construction; equipment design, manufacture, repair, and service; and agricultural technology.

a. Design machinery and equipment including vehicles, implements, buildings, and facilities (e.g., feeding, feed storage).
b. Follow architectural and mechanical plans to construct buildings and facilities.

TECHNICAL SYSTEMS (TEC)

TEC1 Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.

a. Identify and explain the various types of hardware systems to show their applications and potentials.

TEC2 Use available power sources to plan and apply control systems.

a. Measure with selective instruments to demonstrate knowledge of basic electricity.
b. Reference electrical drawings to design, install, and troubleshoot control systems.

TEC3 Explain geospatial technology to demonstrate its applications.

a. Employ appropriate techniques to demonstrate application of GPS/GIS systems principles.
b. Use computer applications to produce maps that reflect surveying and mapping principles.
c. Select an area of personal expertise to demonstrate knowledge of end applications.

NATURAL RESOURCE SYSTEMS (NRS)

NRS1 Recognize importance of resource and human interrelations to conduct management activities in natural habitats.

a. Identify resource management components to establish relationships in natural resource systems.
b. Apply cartographic skills to natural resource activities.
c. Monitor natural resource status to obtain planning data.
d. Employ environmental and wildlife knowledge to demonstrate natural resource enhancement techniques.
e. Examine weather and other criteria to recognize dangers related to work in an outdoor environment.
f. Learn applicable rules or laws to demonstrate natural resource mitigation techniques.

NRS2 Use effective venues to communicate natural phenomena to the public.

a. Communicate natural resources information to the general public.
b. Personally interpret natural resource phenomena to natural resource users.

NRS3 Apply scientific principles to natural resource management activities.

a. Use science concepts, processes, and research techniques to examine natural resource topics.

b. Examine biological and physical characteristics to identify and classify natural resources.
c. Examine natural cycles and related phenomena to describe ecologic concepts ad principles.

NRS4 Employ knowledge of natural resource industries to describe production practices and processing procedures.

a. Prepare presentations to describe how natural resource products are produced, harvested, processed, and used.

NRS5 Practice responsible conduct to protect natural resources.

a. Employ techniques and equipment needed to prevent wildfire.
b. Use wildfire suppression techniques to demonstrate abilities in firefighting and control.
c. Recognize symptoms of animal and plant diseases and use appropriate techniques to prevent their spread.
d. Recognize insect types and available controls to prevent insect infestation.
e. Use acceptable pesticides to treat insect infestation.
f. Know law enforcement procedures to manage public gatherings and to gain entry into secure, closed, or restricted areas.

ENVIRONMENTAL SERVICE SYSTEMS (ENV)

ENV1 Use analysis procedures to plan and evaluate environmental service impacts.

a. Use instrumentation to monitor samples.
b. Calibrate and service instruments on a timely schedule to maintain environmental instrumentation.
c. Apply statistics, charts, and scattergrams to measure and monitor operations.

ENV2 Identify public policies and regulations impacting environmental services to determine their effect on facility operations.

a. Consult reliable resources or training to identify the major laws impacting environmental services.

ENV3 Apply scientific principles to environmental services.

a. Apply meteorological knowledge to recognize weather systems and weather patterns.
b. Describe soil composition and properties to demonstrate knowledge of soil science.
c. Explain well design and groundwater supplies to demonstrate knowledge of hydrology.
d. Discuss properties, classifications, and functions in order to understand wetland principles.
e. Discuss properties, classifications, and functions in order to understand watershed principles,
f. Use chemical analysis to conduct tests.
g. Apply sampling techniques and other assessments to demonstrate background knowledge of microbiology.

ENV4 Operate environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy) to manage a facility environment.

a. Use pollution control measures to maintain a safe facility environment.
b. Apply principles of solid waste management (landfill) to manage safe disposal of all categories of waste.
c. Apply drinking water treatment principles to assure safe drinking water at a facility.
d. Apply wastewater treatment operations principles to manage wastewater disposal in keeping with rules and regulations.
e. Apply hazardous materials management principles to assure a safe facility and to comply with applicable regulations.
f. Explore conventional and alternative supplies to define energy sources.

ENV5 Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

a. Use technology tools to map land, facilities, and infrastructure.

AGRIBUSINESS SYSTEMS (ABS)

ABS1 Employ leadership skills to accomplish goals and objectives in the AFNR business environment.

a. Develop a mission statement to guide business activities effectively.
b. Apply leadership skills to accomplish general business activities from production to public relations.
c. Apply management skills to accomplish general business activities from production to public relations.

ABS2 Practice good recordkeeping to accomplish AFNR business objectives.

a. Prepare and maintain all files as needed to accomplish effective recordkeeping.

ABS3 Apply generally accepted accounting principles and skills to manage budget, credit, and optimal application of AFNR business assets.

a. Use key accounting fundamentals to accomplish dependable bookkeeping and associated files.

ABS4 Employ AFNR industry concepts and practices to manage inventory.

a. Monitor inventory levels to accomplish practical inventory control.

ABS5 Utilize technology to accomplish AFNR business objectives.

a. Use technology and information technology strategies for business improvement.

ABS6 Use marketing and sales principles to accomplish an AFNR business objective.

a. Conduct market research.
b. Develop a marketing plan.
c. Implement a marketing plan.
d. Merchandise products and services.

Appendix B: Academic Standards

Algebra I[2]

Competencies and Suggested Objective(s)

A1 Recognize, classify, and use real numbers and their properties.
- a. Describe the real number system using a diagram to show the relationships of component sets of numbers that compose the set of real numbers.
- b. Model properties and equivalence relationships of real numbers.
- c. Demonstrate and apply properties of real numbers to algebraic expressions.
- d. Perform basic operations on square roots excluding rationalizing denominators.

A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- a. Analyze relationships between two variables, identify domain and range, and determine whether a relation is a function.
- b. Explain and illustrate how change in one variable may result in a change in another variable.
- c. Determine the rule that describes a pattern and determine the pattern given the rule.
- d. Apply patterns to graphs and use appropriate technology.

A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- a. Solve, check, and graph linear equations and inequalities in one variable, including rational coefficients.
- b. Graph and check linear equations and inequalities in two variables.
- c. Solve and graph absolute value equations and inequalities in one variable.
- d. Use algebraic and graphical methods to solve systems of linear equations and inequalities.
- e. Translate problem-solving situations into algebraic sentences and determine solutions.

A4 Explore and communicate the characteristics and operations of polynomials.
- a. Classify polynomials and determine the degree.
- b. Add, subtract, multiply, and divide polynomial expressions.
- c. Factor polynomials using algebraic methods and geometric models.
- d. Investigate and apply real-number solutions to quadratic equations algebraically and graphically.
- e. Use convincing arguments to justify unfactorable polynomials.
- f. Apply polynomial operations to problems involving perimeter and area.

A5 Utilize various formulas in problem-solving situations.
- a. Evaluate and apply formulas (e.g., circumference, perimeter, area, volume, Pythagorean Theorem, interest, distance, rate, and time).
- b. Reinforce formulas experimentally to verify solutions.

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[2] *Mississippi mathematics framework—Algebra I*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/mathematics/ma_algebra_i.html

c. Given a literal equation, solve for any variable of degree one.
d. Using the appropriate formula, determine the length, midpoint, and slope of a segment in a coordinate plane.
e. Use formulas (e.g., point-slope and slope-intercept) to write equations of lines.

A6 Communicate using the language of algebra.
a. Recognize and demonstrate the appropriate use of terms, symbols, and notations.
b. Distinguish between linear and non-linear equations.
c. Translate between verbal expressions and algebraic expressions.
d. Apply the operations of addition, subtraction, and scalar multiplication to matrices.
e. Use scientific notation to solve problems.
f. Use appropriate algebraic language to justify solutions and processes used in solving problems.

A7 Interpret and apply slope as a rate of change.
a. Define slope as a rate of change using algebraic and geometric representations.
b. Interpret and apply slope as a rate of change in problem-solving situations.
c. Use ratio and proportion to solve problems including direct variation (y=kx).
d. Apply the concept of slope to parallel and perpendicular lines.

A8 Analyze data and apply concepts of probability.
a. Collect, organize, graph, and interpret data sets, draw conclusions, and make predictions from the analysis of data.
b. Define event and sample spaces and apply to simple probability problems.
c. Use counting techniques, permutations, and combinations to solve probability problems.

Biology I[3]

Competencies and Suggested Objective(s)

B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
a. Demonstrate the proper use and care for scientific equipment used in biology.
b. Observe and practice safe procedures in the classroom and laboratory.
c. Apply the components of scientific processes and methods in the classroom and laboratory investigations.
d. Communicate results of scientific investigations in oral, written, and graphic form.

B2 Investigate the biochemical basis of life.
a. Identify the characteristics of living things.
b. Describe and differentiate between covalent and ionic bonds using examples of each.
c. Describe the unique bonding and characteristics of water that makes it an essential component of living systems.

[3] *Mississippi science framework—Biology I*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/science/sci_biology_I.html

d. Classify solutions using the pH scale and relate the importance of pH to organism survival.
e. Compare the structure, properties and functions of carbohydrates, lipids, proteins and nucleic acids in living organisms.
f. Explain how enzymes work and identify factors that can affect enzyme action.

B3 Investigate cell structures, functions, and methods of reproduction.
a. Differentiate between prokaryotic and eukaryotic cells.
b. Distinguish between plant and animal (eukaryotic) cell structures.
c. Identify and describe the structure and basic functions of the major eukaryotic organelles.
d. Describe the way in which cells are organized in multicellular organisms.
e. Relate cell membrane structure to its function in passive and active transport.
f. Describe the main events in the cell cycle and cell mitosis including differences in plant and animal cell divisions.
g. Relate the importance of meiosis to sexual reproduction and the maintenance of chromosome number.
h. Identify and distinguish among forms of asexual and sexual reproduction.

B4 Investigate the transfer of energy from the sun to living systems.
a. Describe the structure of ATP and its importance in life processes.
b. Examine, compare, and contrast the basic processes of photosynthesis and cellular respiration.
c. Compare and contrast aerobic and anaerobic respiration.

B5 Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
a. Compare and contrast the molecular structures of DNA and RNA as they relate to replication, transcription, and translation.
b. Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.
c. Analyze the applications of DNA technology (forensics, medicine, agriculture).
d. Discuss the significant contributions of well-known scientists to the historical progression of classical and molecular genetics.
e. Apply genetic principles to solve simple inheritance problems including monohybrid crosses, sex linkage, multiple alleles, incomplete dominance, and codominance.
f. Examine inheritance patterns using current technology (gel electrophoresis, pedigrees, karyotypes).

B6 Investigate concepts of natural selection as they relate to diversity of life.
a. Analyze how organisms are classified into a hierarchy of groups and subgroups based on similarities and differences.
b. Identify characteristics of kingdoms including monerans, protists, fungi, plants and animals.
c. Differentiate among major divisions of the plant and animal kingdoms (vascular/non-vascular; vertebrate/invertebrate).
d. Compare the structures and functions of viruses and bacteria relating their impact on other living organisms.

e. Identify evidence of change in species using fossils, DNA sequences, anatomical and physiological similarities, and embryology.
f. Analyze the results of natural selection in speciation, diversity, adaptation, behavior and extinction.

B7 Investigate the interdependence and interactions that occur within an ecosystem.
a. Analyze the flow of energy and matter through various cycles including carbon, oxygen, nitrogen and water cycles.
b. Interpret interactions among organisms in an ecosystem (producer/consumer/decomposer, predator/prey, symbiotic relationships and competitive relationships).
c. Compare variations, tolerances, and adaptations of plants and animals in major biomes.
d. Investigate and explain the transfer of energy in an ecosystem including food chains, food webs, and food pyramids.
e. Examine long and short-term changes to the environment as a result of natural events and human actions.

English II[4]

Competencies and Suggested Objective(s)

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
a. Produce individual and/or group compositions and/or projects to persuade, tell a story, describe, create an effect, explain or justify an action or event, inform, entertain, etc.
b. Produce writing typically used in the workplace such as social, business, and technical correspondence; explanation of procedures; status reports; research findings; narratives for graphs; justification of decisions, actions, or expenses; etc.
c. Write a response, reaction, interpretation, analysis, summary, etc., of literature, other reading matter, or orally presented material.
d. Revise to ensure effective introductions, details, wording, topic sentences, and conclusions.

E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
a. Listen to determine the main idea and supporting details, to distinguish fact from opinion, and to determine a speaker's purpose or bias.
b. Speak with appropriate intonation, articulation, gestures, and facial expression.
c. Speak effectively to explain and justify ideas to peers, to inform, to summarize, to persuade, to entertain, to describe, etc.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
a. Read, view, and listen to distinguish fact from opinions and to recognize persuasive and manipulative techniques.

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[4] *Mississippi language arts framework—English II*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/language_arts/la_10.html

b. Access both print and non-print sources to produce an I-Search paper, research paper, or project.
c. Use computers and audio-visual technology to access and organize information for purposes such as resumes, career search projects, and analytical writings, etc.
d. Use reference sources, indices, electronic card catalog, and appropriate research procedures to gather and synthesize information.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
a. Interact with peers to examine real world and literary issues and ideas.
b. Show growth in critical thinking, leadership skills, consensus building, and self-confidence by assuming a role in a group, negotiating compromise, and reflecting on individual or group work.

E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
a. Share, critique, and evaluate works in progress and completed works through a process approach.
b. Communicate effectively in a group to present completed projects and/or compositions.
c. Edit oral and written presentations to reflect correct grammar, usage, and mechanics.

E6 Explore cultural contributions to the history of the English language and its literature.
a. Explore a variety of works from various historical periods, geographical locations, and cultures, recognizing their influence on language and literature.
b. Identify instances of dialectal differences which create stereotypes, perceptions, and identities.
c. Recognize root words, prefixes, suffixes, and cognates.
d. Relate how vocabulary and spelling have changed over time.

E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
a. Listen to and read aloud selected works to recognize and respond to the rhythm and power of language to convey a message.
b. Read aloud with fluency and expression.
c. Analyze the stylistic devices, such as alliteration, assonance, word order, rhyme, onomatopoeia, etc., that make a passage achieve a certain effect.
d. Demonstrate how the use of language can confuse or inform, repel or persuade, or inspire or enrage.
e. Analyze how grammatical structure or style helps to create a certain effect.

E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
a. Read and explore increasingly complete works, both classic and contemporary, for oral discussion and written analysis.
b. Read, discuss, and interpret literature to make connections to life.
c. Read from a variety of genres to understand how the literary elements contribute to the overall quality of the work.

d. Identify qualities in increasingly complex literature that have produced a lasting impact on society.
e. Read for enjoyment, appreciation, and comprehension of plot, style, vocabulary, etc.

E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
a. Infuse the study of grammar and vocabulary into written and oral communication.
b. Demonstrate, in the context of their own writing, proficient use of the conventions of standard English, including, but not limited to, the following: complete sentences, subject-verb agreement, plurals, spellings, homophones, possessives, verb forms, punctuation, capitalization, pronouns, pronoun-antecedent agreement, parallel structure, and dangling and misplaced modifiers.
c. Give oral presentations to reinforce the use of standard English.
d. Employ increasingly proficient editing skills to identify and solve problems in grammar, usage, and structure.

E10 Use language and critical thinking strategies to serve as tools for learning.
a. Use language to facilitate continuous learning, to record observations, to clarify thought, to synthesize information, and to analyze and evaluate language.
b. Interpret visual material orally and in writing.

U. S. History from 1877[5]

Competencies and Suggested Objective(s)

H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
a. Apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues (e.g., gold standard, free coinage of silver, tariff issue, laissez faire, deficit spending, etc.).
b. Explain the emergence of modern America from a domestic perspective (e.g., frontier experience, Industrial Revolution and organized labor, reform movements of Populism and Progressivism, Women's Movement, Civil Rights Movement, the New Deal, etc.).
c. Explain the changing role of the United States in world affairs since 1877 through wars, conflicts, and foreign policy (e.g., Spanish-American War, Korean conflict, containment policy, etc.).
d. Trace the expansion of the United States and its acquisition of territory from 1877 (e.g., expansionism and imperialism).

H2 Describe the impact of science and technology on the historical development of the United States in the global community.
a. Analyze the impact of inventions on the United States (e.g., telephone, light bulb, etc.).
b. Examine the continuing impact of the Industrial Revolution on the development of our nation (e.g., mass production, computer operations, etc.).

[5] *Mississippi social studies framework—U.S. History from 1877*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/social_studies/ss_us_history.html

c. Describe the effects of transportation and communication advances since 1877.

H3 Describe the relationship of people, places, and environments through time.

a. Analyze human migration patterns since 1877 (e.g., rural to urban, the Great Migration, etc.).

b. Analyze how changing human, physical, geographic characteristics can alter a regional landscape (e.g., urbanization, Dust Bowl, etc.).

H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

a. Interpret special purpose maps, primary/secondary sources, and political cartoons.

b. Analyze technological information on graphs, charts, and timelines.

c. Locate areas of international conflict (e.g., Caribbean, Southeast Asia, Europe, etc.).

H5 Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.

a. Examine various reform movements (e.g., Civil Rights, Women's Movement, etc.).

b. Examine the government's role in various movements (e.g., arbitration, 26th Amendment, etc.).

c. Examine the role of government in the preservation of citizens' rights (e.g., 19th Amendment, Civil Rights Act of 1964).

d. Examine individuals' duties and responsibilities in a democratic society (e.g., voting, volunteerism, etc.).

Appendix C: Workplace Skills for the 21st Century[6]

WP1 Allocates resources (time, money, materials and facilities, and human resources).

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.

WP5 Selects, applies, and maintains/troubleshoots technology.

WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

[6] *Secretary's commission on achieving necessary skills*. Retrieved July 13, 2004, from http://wdr.doleta.gov/SCANS/

Appendix D: National Educational Technology Standards for Students[7]

T1 Basic operations and concepts
- Students demonstrate a sound understanding of the nature and operation of technology systems.
- Students are proficient in the use of technology.

T2 Social, ethical, and human issues
- Students understand the ethical, cultural, and societal issues related to technology.
- Students practice responsible use of technology systems, information, and software.
- Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

T3 Technology productivity tools
- Students use technology tools to enhance learning, increase productivity, and promote creativity.
- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

T4 Technology communications tools
- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

T5 Technology research tools
- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

T6 Technology problem-solving and decision-making tools
- Students use technology resources for solving problems and making informed decisions.
- Students employ technology in the development of strategies for solving problems in the real world.

[7] International Society for Technology in Education. (2000). *National educational technology standards for students (NETS).* Retrieved July 13, 2004, from http://www.iste.org/

Appendix E: Sample Rubrics and Checklists for Assessment Activities

Sample Rubric on Written Report

CATEGORY	4-Exceptional	3-Admirable	2-Acceptable	1-Amateur	SCORE
Organization	Content is extremely well organized in a logical format that is easy to follow and flows smoothly from one idea to another enhancing the effectiveness of the project.	Content is presented in a thoughtful, organized manner, and most transitions were easy to follow. Only a few ideas were unclear.	While content was somewhat organized, ideas were not presented coherently, and transitions were not always smooth.	The content was choppy and confusing. It was difficult to follow; transitions were abrupt and seriously distracted the audience.	
Content Accuracy	All content was completely accurate; all facts were precise and explicit.	Content was mostly accurate with only a few inconsistencies or errors in information.	Content was somewhat accurate, but there were more than a few inconsistencies or errors in information.	Content was grossly inaccurate to the point that the facts in this project were misleading to the audience.	
Research	Research on the project went above and beyond expectations. The student solicited material in addition to what was provided, brought in personal ideas and information to enhance project, and utilized more than six types of resources to make project effective.	The student did a very good job of researching, using materials provided to their full potential; the student used more than four types of research to enhance project (at least one source from information outside of the school).	The student used at least three references provided by the school in an acceptable manner but did not consult any additional resources.	The student did not use provided resources effectively and did little or no fact gathering on the topic.	
Creativity	The report demonstrated exceptional creativity and originality on the part of the student.	The report was cleverly presented in a thoughtful and interesting manner.	The student did add a few creative touches to enhance the report but mostly reported the information as provided.	The report showed little creativity or originality.	

Sample Rubric for a Group Project

CATEGORY	4-Exceptional	3-Admirable	2-Acceptable	1-Amateur	SCORE
Group Participation	All students participated in the activity.	3/4 of the students participated in the activity.	1/2 of the students participated in the activity.	Only one or two students actively participated.	
Shared Responsibility	Responsibility for task is shared evenly by all members of the group.	Responsibility is shared by most group members.	Responsibility is shared by 1/2 the group members.	One or two members bore the majority of the responsibility for accomplishing the task.	
Quality of Interaction	All members exhibited excellent listening and leadership skills.	Most students exhibited excellent listening skills.	The group demonstrated some ability to listen, interact, and discuss.	There was very little interaction or discussion. Some students were disinterested or distracted.	
Roles Within Group	Each student was assigned a clearly defined role; group members perform roles effectively.	Each student was assigned a role but roles were not clearly defined or consistently adhered to.	Students were assigned roles but roles were not consistently adhered to.	No effort was made to assign roles to group members.	

Sample Poster Rubric

CATEGORY	4-Exceptional	3-Admirable	2-Acceptable	1-Amateur	SCORE:
Required Elements	The poster includes all required elements as well as additional information.	All required elements are included on the poster.	All but 1 of the required elements are included on the poster.	Several required elements were missing.	
Labels	All items of importance on the poster are clearly labeled with labels that can be read from at least three feet away.	Almost all items of importance on the poster are clearly labeled with labels that can be read from at least three feet away.	Many items of importance on the poster are clearly labeled with labels that can be read from at least three feet away.	Labels are too small to view, OR no important items were labeled.	
Graphics - Relevance	All graphics are related to the topic and make it easier to understand. All borrowed graphics have a source citation.	All graphics are related to the topic and most make it easier to understand. Some borrowed graphics have a source citation.	All graphics relate to the topic. One or two borrowed graphics have a source citation.	Graphics do not relate to the topic, OR several borrowed graphics do not have a source citation.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed. It is not attractive.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are 1-2 grammatical or mechanical mistakes on the poster.	There are 3-4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	
Total Score:					

Sample Rubric for Evaluating a Student Journal

CATEGORY	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	SCORE:
Writing Quality	There is a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There is a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style which conveys meaning adequately. Some minor grammatical, syntax, and spelling errors.	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
Content	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
Insight and Understanding	Definite insights into the implications of the activity are recorded. Awareness of complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
Application	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of agriculture.	Content of the activity is related to life in general.	Only limited connections are made between the content of the activity and the surrounding world.	
Total Score:					

FFA Prepared Public Speaking Scorecard

	Max. Points	One	Two	Three	Four	Five	Six
Content of Manuscript	200						
• Importance and appropriateness of subject • Suitability of material used • Accuracy of statements • Evidence of purpose • Completeness and accuracy of bibliography							
Manuscript Composition	100						
• Organization of contents • Unity of thought • Logical development • Language used • Sentence structure • Accomplishment of purpose-conclusion							
Voice	100						
• Quality, pitch • Articulation • Pronunciation • Force							
Stage Presence	100						
• Personal appearance • Poise and body posture • Attitude, confidence, and personality • Ease before audience							
Power of Expression	100						
• Communicative ability including fluency, emphasis, directness, and sincerity • Conveyance of thought and meaning							
Response to Questions	300						
• Ability to answer questions on the speech which are asked by the judges, indicating originality, familiarity with subject, and ability to think quickly							
General Effect	100						
• Extent to which the speech was interesting, understandable, convincing, pleasing, and held attention							
Gross Total Points							
Less Time Deduction							
Net Total Points							

Sample Scorecard for Parliamentary Procedure Demonstration

	Points
Required motion	5
Discussion (max. of 5 debates @ 2 pts. each)	10
Additional motion (includes main or alternate main motion)	5
Chair	10
Ability to preside	5
Leadership	10
Team's general effect	15
Conclusions reached by team	10
(Team's use of motions and discussion support disposal of the main motion)	
Team effect	10
(Degree to which discussion was convincing, logical, realistic, orderly, and efficient)	
Team's voice, poise, expression and appearance	5
Completeness and accuracy	5
Format	5
Grammar, style, legibility	5
SUBTOTAL	100
Deductions	
Deductions for parliamentary mistakes	5-20 pts/minor mistake
Deductions for omitting assigned motion	10
TOTAL	____

(Adapted from FFA CDE Handbook)

Sample Rubric for an SAE Plan

CATEGORY	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	SCORE:
Occupational Goals	Detailed long range and short term goals for reaching an occupational goal in the field of agriculture, food, and natural resources occupations are provided.	General long range and short term goals for reaching an occupational goal in the field of agriculture, food, and natural resources occupations are provided.	General long range and short term goals for reaching an occupational objective in fields outside of agriculture, food, and natural resources occupations are provided.	Only vague general statements concerning any occupational goal are provided.	
Resources Required	Detailed resources required to achieve goals are identified.	General resources required to achieve goals are identified.	A general statement on the resources required to achieve the goals is provided.	Very limited information on resources required to achieve program goals is provided.	
Training Agreement	Responsibilities of all parties (students, parents, teachers, employers/sponsors) in the SAE are detailed and accepted by signature.	General responsibilities of all parties in the SAE are identified.	Responsibilities of all parties in the SAE are stated in very general terms.	Responsibilities of all parties are not clearly defined.	
Skills to be Accomplished	A detailed list of skills representing a broad range of activities associated with the SAE is provided.	A general list of skills representing a moderately broad range of activities is provided.	A general list of skills representing a narrow range of activities is provided.	A very limited list of skills to be accomplished is provided.	
Outcomes	A detailed list of outcomes including income and expenses, if applicable, is provided.	A general list of outcomes is provided.	Expected outcomes are listed but not in specifics.	Limited outcomes are identified.	
Total Score:					

Sample Rubric for a Debate

CATEGORY	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	SCORE:
Information	All information was accurate and clear.	Most information was accurate and clear.	Most information was accurate but not completely thorough or clear.	Information was inaccurate or needed clarification.	
Rebuttal	All counterarguments were accurate, relevant, and strong.	Most counter-arguments were accurate, relevant, and strong.	All counterarguments were accurate and relevant, but some were weak.	Counterarguments were not accurate or relevant.	
Organization	All arguments were logical and clearly followed a premise.	Most arguments were logical and clearly followed a premise.	Arguments were logical but did not always follow a premise.	Arguments were not logical and/or did not follow a premise.	
Understanding of the Topic	The individual/team clearly understood the topic fully and presented in a convincing manner.	The individual/team clearly understood the topic fully and presented with ease.	The individual/team understood the main points of the topic and presented those well.	The individual/team did not exhibit an adequate understanding of the topic.	
Respect for Other Individual/Team	High respect was displayed in language, responses, and body expressions.	Good respect was displayed in language, responses, and body expressions.	Moderate respect was displayed in language, responses, and body expressions.	Language, responses, and body expressions were consistently disrespectful.	
Total Score:					

Sample Checklist on Obtaining and Labeling a Soil Sample

Place a check by each step which the student successfully completed.

___1. The student selected the proper tool for sampling.

___2. The student divided the area to be sampled into sub-areas based on soil type and/or plants to be grown.

___3. The student took samples from typical soil within each sub-area, avoiding wet or bare spots on the soil surface.

___4. The student removed surface litter and took the sample to the proper depth.

___5. The student sampled from 15-20 different spots within each sub-area and placed all samples in a separate clean container.

___6. The student allowed the samples to air dry without using other heat sources and mixed the samples to obtain one composite sample.

___7. The student placed about 12-16 ounces of the composite sample in a soil sample container.

___8. The student labeled the container neatly and completely.

Sample Rubric for a Guest Speaker Activity

CATEGORY	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	SCORE:
Listening Behavior	Student consistently minimizes/avoids behaviors that interfere with listening and attends to the speaker.	Student minimizes/ avoids behaviors that interfere with listening and attends to the speaker almost all of the time.	Some inappropriate behaviors that interfere with listening and attending to the speaker are noted.	Student seldom or never minimizes/avoids behaviors that interfere with listening and attending to the speaker.	
Note Taking	Student consistently takes notes that identify all of the main points made by the speaker.	Student notes identify most of the main points made by the speaker.	Student notes identify only one or two main points made by the speaker.	Student notes do not reflect main points made by the speaker.	
Questioning	Questions asked by the student are intended to expand on information provided by the speaker.	Questions asked by the student are intended to clarify information provided by the speaker.	Questions asked by the student cause the speaker to repeat information already presented.	No questions are asked by the student.	
Total Score:					

Sample Checklist for Field Trip Participation

_____ 1. The student arrived at the designated meeting place on time with all materials and supplies required for the field trip.

_____ 2 The student observed all safety rules and policies while traveling to and participating in the field trip.

_____ 3. The student demonstrated interest in the content of the field trip by paying attention to the exhibits and speakers, asking pertinent questions, and taking notes.

_____ 4. The student exhibited a positive attitude toward the events and activities of the field trip.

_____ 5. The student remained on task throughout the field trip.

_____ 6. The student exhibited cooperative workplace skills with other students throughout the field trip.

Sample Checklist for Wiring an Electrical Circuit

Place a check by each step that the student completed satisfactorily.

___1. Read blueprint or schematic before beginning the project.

___2. Selected correct tools, equipment, and supplies.

___3. Ran conductors from supply to source correctly.

___4. Stripped and spliced connectors correctly.

___5. Connected switches and devices to conductors correctly.

___6. Applied current and tested circuit for proper operation.

___7. Observed all safety rules and practices throughout the activity.

___8. Practiced general workplace skills.

Sample Rubric on Welding Techniques

CATEGORY	4	3	2	1	SCORE:
Equipment Setup and Safety	The student selected and set up equipment safely and correctly with the proficiency of an experienced welder. No further practice is required.	The student selected and set up the equipment safely and correctly. Additional practice may be required to become as proficient as an experienced welder.	The student selected and set up the equipment safely and correctly with some assistance from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching to select and correctly set up the equipment.	
Striking an Arc	The student repeatedly struck an arc and ran a short bead with the proficiency of an experienced worker. No further practice is required.	The student was able to strike an arc and run a short bead correctly. Further practice may be required to become truly proficient.	The student was able to strike an arc and run a short bead with coaching and assistance from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching from the instructor to strike an arc and run a short bead.	
Running a Bead	The student was able to run a bead on mild steel in the flat position with the proficiency of an experienced welder. No further training or practice is required.	The student was able to run a bead on mild steel in the flat position. Further practice may be required to become truly proficient.	The student was able to run a bead on mild steel in the flat position with some assistance and coaching from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching from the instructor to run a bead on mild steel in the flat position.	
Building a Pad	The student was able to build a pad on mild steel in the flat position with the proficiency of an experienced welder. No further training or practice is required.	The student was able to build a pad on mild steel in the flat position. Further practice may be required to become truly proficient.	The student was able to build a pad on mild steel in the flat position with some assistance and coaching from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching from the instructor to build a pad on mild steel in the flat position.	
Constructing a Flat Butt Weld	The student was able to build a pad on mild steel in the flat position with the proficiency of an experienced welder. No further training or practice is required.	The student was able to build a pad on mild steel in the flat position. Further practice may be required to become truly proficient.	The student was able to build a pad on mild steel in the flat position with some assistance and coaching from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching from the instructor to build a pad on mild steel in the flat position.	
Total Score:					

Sample Rubric for Oxyacetylene Welding and Cutting Operations

CATEGORY	4	3	2	1	SCORE:
Equipment Setup and Safety	The student selected and set up equipment safely and correctly with the proficiency of an experienced welder. No further practice is required.	The student selected and set up the equipment safely and correctly. Additional practice may be required to become as proficient as an experienced welder	The student selected and set up the equipment safely and correctly with some assistance from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching to select and correctly set up the equipment.	
"Pushing the Puddle"	The student was able to control the size and shape of the weld puddle consistently with the proficiency of an experienced welder	The student was able to control size and shape of the weld puddle. Further practice may be required to become truly proficient.	The student was able to control the size and shape of the weld puddle with coaching and assistance from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching from the instructor to control the size and shape of the weld puddle.	
Cutting Mild Steel	The student was able to cut mild steel safely with the proficiency of an experienced welder. No further training or practice is required.	The student was able to cut mild steel safely. Further practice may be required to become truly proficient.	The student was able to cut mild steel with some assistance and coaching from the instructor. Further training and practice will be required to become proficient.	The student required a great deal of assistance and coaching from the instructor to cut mild steel safely.	
Total Score:					

Sample Rubric on Servicing and Troubleshooting a Small Engine

Rate the ability of the student to perform maintenance and repair tasks shown below using the following scale:

4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker.
3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker.
2 Introductory – Can perform the task but some coaching and further training is required.
1 Limited – Can perform the task with extensive coaching. Further training and practice is required.

Task	Rating
Select proper tools and supplies	
Follow safety procedures and policies	
Service crankcase air breather	
Service foam type air filter	
Service pleated paper air filter	
Service fuel system	
Service rewind starter	
Service lubrication system	
Diagnose ignition system problems	
Diagnose fuel system problems	
Diagnose engine control problems	

Sample Rubric on Constructing a Building Frame and Wall

Rate the ability of the student to perform maintenance and repair tasks shown below using the following scale:

4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker.
3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker.
2 Introductory – Can perform the task but some coaching and further training is required.
1 Limited – Can perform the task with extensive coaching. Further training and practice is required.

Task	Rating
Selected proper tools, equipment, supplies, and materials	
Followed safety procedures and practices	
Read blueprints/plans	
Laid out corners and batter board lines	
Constructed foundation	
Framed floors	
Framed wall	
Framed roof	
Installed door	

Sample Rubric on Performing Routine Equipment Maintenance and Repair Tasks

Rate the ability of the student to perform maintenance and repair tasks shown below using the following scale:

4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker.
3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker.
2 Introductory – Can perform the task but some coaching and further training is required.
1 Limited – Can perform the task with extensive coaching. Further training and practice is required.

Task	Rating
Check engine oil level and condition	
Check coolant level and concentration	
Check hydraulic/transmission fluid and condition	
Check pleated paper air filter	
Check oil bath air filter	
Assess machinery parts for wear or breakage	
Recondition agricultural machinery	

Sample Rubric on Advanced Welding and Cutting Tasks

Rate the ability of the student to perform maintenance and repair tasks shown below using the following scale:

4 Proficient – Can perform consistently and independently with proficiency of an incumbent worker.
3 Intermediate – Can perform the task but may require further practice to become as proficient as an incumbent worker.
2 Introductory – Can perform the task but some coaching and further training is required.
1 Limited – Can perform the task with extensive coaching. Further training and practice is required.

Task	Rating
Fabricate a single v-groove butt weld in the horizontal position using SMAW equipment	
Fabricate a single v-groove butt weld in the vertical up position using SMAW equipment	
Fabricate a single v-groove butt weld in the horizontal position using GMAW equipment	
Fabricate a single v-groove butt weld in the vertical up position using GMAW equipment	
Set up a plasma arc cutter	
Make cuts in mild steel using a plasma arc cutter	