



National FFA Career Development Events

*A Special Project of the
National FFA Foundation*

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General Information

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These are the official rules and regulations for National FFA Career Development Events for 2012-2016. Refer to the CDE webpage on ffa.org for the most up-to-date edition of the career development event handbook.

Prepared and published by the National FFA Organization. The National FFA Organization is a resource and support organization that does not select, control or supervise state association, local chapter or individual member activities except as expressly provided for in the National FFA Organization Constitution and Bylaws. The National FFA Organization affirms its belief in the value of all human beings and seeks diversity in its membership, leadership and staff.

FFA makes a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education. National FFA Online, www.ffa.org, FFA's Internet web site, can provide information about the National FFA Organization.

Philosophy of National FFA Career Development Events

The National FFA Organization is dedicated to organizing experiences that will meet the future needs of students while accomplishing the current purposes of agricultural education. The primary goal of career development events is to develop individual responsibilities, foster teamwork and promote communication while recognizing the value of ethical competition and individual achievement.

The activities in each career development event:

- include problem solving, critical thinking and teamwork skills, where appropriate.
- encourage appreciation for diversity by reducing barriers to participation among members.
- develop general leadership and recognize individual and team achievement.
- promote concentrated focus on future needs of members and society.

The National FFA Organization assumes the leadership role in developing and continuously improving relevant FFA career development events. National career development events should reflect instruction that currently takes place in the entire agricultural education program, including classroom instruction, laboratory instruction, individualized instruction and/or supervised agricultural experience. Career development events and awards are intended to be an outgrowth of instruction. Also, it is appropriate for the national organization to develop career development events and awards that stimulate instruction in emerging areas that reflect both current and future community, national and global work force needs. National FFA Career Development Events should be developed with significant input from FFA members, teachers, partners, respective industry sponsors and others involved in agricultural education. The National FFA Organization continues to encourage accessibility and provide opportunities for achievement and recognition for students with diverse backgrounds.

Career development events that include team activities should be based on cooperation and teamwork while recognizing the value of competition and individual achievement. Where appropriate, team activities will be included that require two or more members from one chapter working cooperatively.

Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards

Agriculture is a highly technical and ever-changing industry upon which everyone is dependent. In order to maintain agriculture as the nation's number one industry, it is crucial to understand the importance of agrisciences, marketing strategies, safe food production and continuous research. Strong, relevant agriscience programs are one way to can maintain the nation's agricultural edge.

The National AFNR Career Cluster Content Standards were developed as part of the National FFA 10 x 15 project to provide state agricultural education leaders and teachers with a forward-thinking guide for what students should know and be able to do through the study of agriculture. The National AFNR Career Cluster Content Standards should be used as a guide to develop well-planned curriculum in agriscience education to be delivered to students throughout the country. For a complete copy of the AFNR Career Cluster Content Standards please visit www.agedlearning.org.

National FFA Organization has adopted the AFNR Career Cluster Content Standards and integrated them into all national award and recognition programs for the benefit of the members, school administration and agriculture as a whole. Details outlining the incorporation of the standards in career development events can be found at the end of each event chapter in the CDE handbook.

Official CDE Rules and Policies – 2012-2016

General Rules

Violations of any of the following rules may be grounds for the event superintendent to disqualify the participants. National FFA staff and event superintendents will use the published rules and procedures to organize and implement the National FFA Career Development Events. Event activities may not be conducted due to lack of necessary materials, expertise or extreme impact to event budgets. Teams that are certified to compete will receive the current event format in a team orientation packet prior to the convention.

Official Dress Recommendations, Number of Participants and Number of Scores for Team Total

Event	Official Dress Appropriate	Number of Participants Allowed (per team)	Number of Scores Counted for Team Score
Agricultural Communications	Yes	3	3
Agricultural Issues Forum	Optional	3-7	Team Score Event
Agricultural Technology and Mechanical Systems	No	4	Top 3 Scores
Agricultural Sales	Yes	4	4
Agronomy	Yes	4	4
Creed Speaking	Yes	1	N/A
Dairy Cattle Management and Evaluation	Yes	4	4
Dairy Cattle Handlers	Yes	1	N/A
Environmental and Natural Resources	No	4	4
Extemporaneous Public Speaking	Yes	1	N/A
Farm Business Management	Yes	4	Top 3 Scores
Floriculture	Yes	4	4
Food Science and Technology	Yes	4	4
Forestry	No	4	4
Horse Evaluation	Yes	4	Top 3 Scores
Job Interview	Yes	1	N/A
Livestock Evaluation	Yes	4	4
Marketing Plan	Yes	3	Team Score Event
Meats Evaluation and Technology	No	4	Top 3 Scores
Milk Quality and Products	Yes	4	4
Nursery/Landscape	Yes	4	Top 3 Scores
Parliamentary Procedure	Yes	6	Team Score Event
Poultry Evaluation	Yes	4	Top 3 Scores
Prepared Public Speaking	Yes	1	N/A
Veterinary Science	No	4	4

Eligibility of Participants

- A. Each participant must be a current, bona fide, dues paying FFA member in good standing with the local chapter, state FFA association and the National FFA Organization during the school year which the participant qualified to participate at the national level.
 - 1. In the event a participant's name is not on the chapter's official roster for the years in which the dues were payable to the National FFA Organization, a past due membership processing fee, in addition to the dues, must be paid prior to the national event.
 - 2. National FFA membership staff will set the processing fee amount annually.
- B. The participant, at the national event, must:
 - 1. Be a high school FFA member; high school refers to grades 9-12. (A graduating senior is considered eligible to compete in state and national career development events up to and including his/her first national convention following graduation.)
 - 2. Have qualified as a 7th, 8th or 9th grade member to participate in the Creed speaking event.
 - 3. While in high school, be enrolled in at least one agricultural education course during the school year and/or follow a planned course of study; either course must include a supervised agricultural experience program, the objective of which is preparation for an agricultural career.
 - 4. If a student moves to a different chapter or a different state once a he/she has qualified as a state representative in a career development event, that student may be allowed to compete in the national event with the school he/she qualified with during the qualifying year.
- C. A student may not participate more than once in the same official National FFA Career Development Event.
- D. No student may participate in more than one National FFA Career Development Event each year.
- E. Each member participating in a National FFA Career Development Event must submit the proper *Waiver, Release of Liability and Consent to Medical Treatment Form* prior to start of event.

Selection and Certification of State Teams

- A. Each state will submit a team declaration form by **June 1** prior to the national FFA convention. An entry processing fee will be charged for participation in each declared event with the exception of the dairy cattle handlers activity.
- B. Each team will be composed of the number of members determined by the specific event rules and formats. The members of a state team must be from the same chapter. Members must qualify in the career development event in which they are to participate at the national level. Teams must be selected at a state or interstate career development event held between the immediate previous national FFA convention and prior to the national FFA convention in which they are participating. States that qualify more than one year out must request and submit a written waiver for approval by the certification deadline.
 - 1. Online certification deadline: **September 15**.
 - 2. Online add/delete deadline: **Tuesday before convention at noon (Eastern)**.
- C. With extenuating circumstances a teacher may substitute another student from the chapter who may not have participated at a state qualifying event, with the exception of Creed speaking, dairy handlers activity, extemporaneous public speaking, job interview and prepared public speaking, which must be submitted and approved by state staff.

- D. The state supervisor of agricultural education or the executive secretary must certify that participants are eligible. If an ineligible student participates in any career development event, the member will be disqualified and may result in the disqualification of the team as well.
- E. All students must be certified online by the designated deadline. Once original certification has been completed, no member may be added without first deleting a member.
- F. The national organization will certify National FFA Career Development Event winners for international competition when states request, with the understanding that the state team will provide their own travel expenses.

Emergency Conditions

Under emergency conditions a state team participating in a National FFA Career Development Event may be made up of less than the required members. States must still certify teams prior to the national FFA convention, but fewer than the required members could compete if an emergency condition such as illness, death in the family or an act of God would occur. Those individuals competing would still be eligible to qualify for individual awards, if applicable.

Disqualification

- A. Any communication, verbal or non-verbal, between participants during a career development event will be sufficient cause to eliminate the team member involved from the career development event. The only exception to this would be communications between team members during the team activity portion of a given career development event.
- B. Teams or participants arriving after the career development event has begun may be disqualified or penalized.
- C. Any assistance given to a team member from any source other than the career development event officials or assistants will be sufficient cause to eliminate the team from the career development event.
- D. Event superintendents may stop any participant if they deem their manner to be hazardous either to themselves or others. Such action shall deem the individuals disqualified for that section of the career development event.
- E. Participants who start an event and do not complete the event without notifying event officials at the time of departure will be disqualified. This can affect the overall team rank and position. In some events this will also disqualify the entire team.
- F. Participants will not be allowed to utilize personal electronic communication devices, other than those approved by the event officials, during the entire course of the event. Participants who access personal electronic communication devices without prior approval of the event officials will be disqualified.
- G. No participant shall gain access to real materials that will be utilized by the event committee during competition. Any team, participant, advisor or coach reported and proven to do so will be disqualified from the national event.

Additions/Deletions of National Events

- A. National FFA staff is expected to be proactive in developing new or initiating changes within existing career development events to ensure that they meet the needs of FFA members.
- B. If fifteen (15) state supervisors/executive secretaries develop a proposal for a new career development event, the national FFA staff will conduct a study for the validity of the career development event and make a recommendation to the chief executive officer. Representatives of these states must be from each of the FFA regions. The same process may be used to eliminate a national career development event.
- C. Three years following the initiation of a new career development event, at least fifteen (15) states should be participating. After the next three-year period, at least twenty-six (26) states should be participating in order to retain the event at the national level.

Rules Committee/Scoring Appeals Process

- A. If a written appeal is filed within the seven (7) calendar days after results announcement, national CDE staff will review the appeal. Upon receiving input from team leader and division director, national CDE staff will accept or deny the appeal. The national CDE staff's recommendation will be shared with appeals committee and National FFA Chief Executive Officer for further input, if necessary.
 1. The written appeal must be filed with the Education Division staff responsible for scoring career development events within seven (7) calendar days of the results announcement and accompanied by a \$50 filing fee. The fee will be returned if the appeal is justified.
- B. The appeals committee will be chaired by the National FFA Awards, Recognition and Career Development Events Advisory Committee chairperson who will in turn appoint a representative of each of the following organizations: National Association of Supervisors of Agricultural Education (NASAE), National Association of Agricultural Educators (NAAE) and the American Association for Agricultural Education (AAAE). The National FFA staff responsible for career development events will also serve on the committee.

Waiver of FFA Rules

Any local chapter seeking a waiver of a National FFA policy or procedure must submit in writing to the chapter's state FFA association office. If the request is approved at the state level, it must be forwarded, under the signature of the state advisor or executive secretary, to the career development events education specialist. After study by the appropriate FFA staff, a recommendation to grant or deny the appeal will be forward to the chief executive officer for his/her approval. The request must be submitted to the national FFA staff at least 30 days prior to the scheduled event or due date for which the waiver is requested. This policy does not supersede any current FFA policy for appeals already established for a particular FFA program.

Selection of CDE Superintendents and CDE Committee Members

- A. Nominations for CDE superintendents may come to National FFA staff from the following sources:
 - 1. standing CDE superintendent
 - 2. current CDE committee members
 - 3. state leadership
 - 4. Team Ag Ed partners
- B. CDE superintendents will be selected by national CDE staff and approved by the National FFA Chief Executive Officer.
- C. Each CDE superintendent will serve a three to five year term. At the end of the superintendent's term, a qualified replacement will assume the duties of superintendent.
- D. National FFA staff and CDE superintendents will select qualified individuals to serve on CDE committees. Selection of committee members will be based on:
 - 1. individual qualifications.
 - 2. recommendations from state leaders, current CDE committee members, CDE superintendents or National FFA staff.
 - 3. recommendations from Team Ag Ed partners.
 - 4. current rotational procedures developed by each CDE committee.
 - 5. provide diversity for the committee.
 - 6. commitment to serve a minimum of three years on the committee.
- E. Final approval of new committee members is the responsibility of the National FFA CDE staff with input and recommendations from CDE event superintendent and committee.

Sanctioning Events

Sanctioning of non-national FFA competitive events (those competitive events conducted by organizations other than the National FFA Organization) as National FFA Career Development Events should occur when:

- 1. The highest quality event possible is conducted.
- 2. Organization conducting event and National FFA Organization agree that event can and should be sanctioned.
- 3. Event is recommended by the National FFA Staff responsible for CDEs with input and agreement from the Award and Recognition Advisory Committee and approved by the National FFA Chief Executive Officer.
- 4. National FFA is represented by staff responsible for career development events on the planning and implementation committee for each event.
- 5. Winners of the national sanctioned event will be recognized in the same manner as national career development events winners are currently recognized.

Official Dress

Participants are expected to observe the National FFA Code of Ethics and the proper use of the FFA jacket during career development events. (Please reference the latest edition of the Official FFA Manual.) Official FFA dress is highly recommended for all participants where appropriate and is required for the awards presentation and recognition.

Accessibility for All Students

All special needs requests and appropriate documentation as outlined in the special needs request policy must be submitted at time of certification.

- 1. Special needs policy is posted on the CDE program page at www.ffa.org/cde
- 2. Special needs request due: **August 15**

Written Document Penalties

A penalty of 10% of the total points allotted will be assessed for the written documents received after the postmarked deadline. If the document is still not received seven days after the postmarked deadline, the team/individual may be subject to disqualification.

1. National staff will mark late entries as such.
2. Event officials will be notified of late entries at the time written documents are provided for judging.
3. Event superintendent will ensure that penalty is applied.

National FFA Agricultural Technology and Mechanical Systems Career Development Event

A Special Project of the National FFA Foundation

Important Note

Please thoroughly read the Introduction Section at the beginning of this handbook for complete rules and procedures that are relevant to all National FFA Career Development Events.

I. Purpose

Technological advances in America continue to influence the way students must prepare for their futures. Students entering the workforce need a strong knowledge base and the ability to comprehend the interaction of complex systems. Employers want productive workers and managers that can access and use a broad range of information. The most sought after employees are those who communicate effectively, continue to stay current with modern technology and work successfully and effectively as individuals and as team members. Students with these skills and abilities are more competitive in the job market, receive financial rewards and are selected for advancement.

Agricultural technology and mechanical systems is comprised of strong technical content and complimented by the development of practical, hands-on skills. The subject matter areas and skill development practices have been grouped into five ‘systems’ areas, so named because of the complex interaction and synergistic processes common to agriculture. The term ‘system’ is used to emphasize the interactive relationship between each area of agricultural technology and mechanical systems. These five systems areas are described and examples appear on the pages that follow.

Each agricultural technology and mechanical systems activity is in response to a problem or need encountered in the workplace. The solving of such problems is dependent upon how each decision or solution, imposed on one component, will influence the other system components. Solving one component of a problem without using a ‘systems approach’ can, and often does, result in additional problems. An example of where this has occurred is observed in the many obstacles that agricultural producers currently face regarding environmental pollution, ground water contamination and stricter governmental regulations. Decisions and solutions made earlier in this century have impacted the environment negatively and resulted in a new set of problems.

The National FFA Agricultural Technology and Mechanical Systems Career Development Event recognizes students with agricultural technology and mechanical systems competencies important to the modern workplace. The technical content and required skills continue to include all traditional areas of agricultural technology and mechanical systems. Additionally, the operation of modern equipment, the application of new management strategies and the mastering of advanced technologies are increasingly emphasized. This career development event selects and awards those students and teams that demonstrate: (1) mastery of the subject matter and skills common to the systems areas; (2) effective communication skills; (3) superior problem solving techniques; (4) an understanding of modern technology; (5) the ability to function as individuals and as team members working together.

II. Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards

With the recommendation of the National FFA Board of Directors, all national FFA programs have incorporated these standards to guide the direction and content of program materials and activities. Refer to Appendix A in this chapter of the handbook for a complete list of the measurable activities that participants will carry out in this event. For details about the incorporation of AFNR standards, refer to the Introduction chapter of the CDE handbook.

III. Event Rules and Format

A. Team Make-Up

Teams may consist of three or four members. Team ranking is determined by combining the scores of the top three students from each team. Teams having fewer than three members are not eligible for team awards, but students may receive individual awards.

B. Equipment

1. Needed- Safety Materials Students Must Provide.

Each event participant must adhere to the safe practices and work habits appropriate when performing required activities. Participants are responsible and must provide all personal safety equipment including:

- a. Industrial-quality eye protection: INDIVIDUALS MUST WEAR STYLE B (SEE BELOW) INDUSTRIAL-QUALITY EYE PROTECTION during the team activity and the skill/problem solving activities. Those with prescription eyewear that is not Style B must also wear safety glasses or goggles while participating in this event. Safety glasses do not have to be worn while completing the written exam. Acceptable spectacles or goggles must adhere to the American National Standard Practice for Occupational and Education Eye and Face Protection, Z87.1-1979 (or Z87.1-1968) and revisions approved by ANSI. Descriptions of style A, B, and C Industrial Quality Eye Protection are as follows:
 - i. Style A: NOT ACCEPTABLE for use in the event. These are safety spectacles without side shields. They are for limited-hazard use requiring only frontal protection. The addition of accessory side shields that are not firmly secured does not upgrade style A to a style B or C.
 - ii. Style B: ACCEPTABLE—Safety spectacles with wire mesh, perforated plastic or non-perforated side shields. The side shields shall be tapered, with an anatomical periphery extending at least half-way around the circumference of the lens frame. Industrial-quality eye protection for those not wearing prescription glasses shall be style B.
 - iii. Style C: NOT ACCEPTABLE for use in the event. Safety spectacles with semi- or flat-fold shield that must be firmly secured to the frame. Style C glasses do not provide maximum protection from the top and bottom angles.
- b. Clothing: Each individual shall furnish and wear appropriate clothing such as long pants and long sleeved cotton shirt, coveralls, etc. for this event. Clothing must be in good repair and fit properly. Oversized or loose fitting clothing is dangerous around agricultural equipment and is not allowed. Long-sleeves must be worn when welding or oxy-fuel cutting. No open-toed footwear shall be worn during the event.

- c. **Other Materials:** Each participant must have a clipboard, two sharpened No. 2 pencils and an electronic calculator. Calculators used in this event should be battery operated and silent.
- d. **Computers:** Each state team is required to provide a laptop computer, printer and printer paper for the team activity. Minimum computer specifications will be determined and posted on the event webpage and in the team orientation packet prior to the event. Computers must be Microsoft Office ® compatible.

2. **Provided- Specialized safety equipment**

- a. Necessary equipment such as helmets, shields, gloves, welding leathers, hearing protection devices, etc., will be provided by the National FFA Agricultural Technology and Mechanical Systems Career Development Event committee.
- b. Tools and equipment will be furnished for the event. Teams/individuals may choose to use their own equipment subject to approval by the event superintendent.
- c. If a team member needs modified equipment due to physical size and stature, the student must supply this equipment. The team member or coach must present the student-supplied equipment to the event superintendent prior to the start of the event for approval. Team members who need specialized or modified equipment due to disability as defined by the American Disabilities Act must submit the appropriate special needs request form and documentation at the time of the team's certification.

C. **Event Areas**

The National FFA Agricultural Technology and Mechanical Systems Career Development Event is divided into the following five systems areas. Each system includes a broad range of information and performance skills common to agricultural technology and mechanical systems.

1. **Machinery and Equipment Systems:** repair and maintenance, materials handling, processing, adjustments, metal fabrication
2. **Electrical Systems:** AC/DC power, electrical safety, electrical standards, sensing devices, electrical wiring, controls, electronics, motors and other electrical loads, operating instructions, and manufacturer's recommendations
3. **Energy Systems:** mechanical power, chemical power, wind power, solar power, hydraulic power, engine operation, maintenance, trouble-shooting, repair
4. **Structural Systems:** structures, storage, concrete, masonry, plumbing, electrical, fabrication, construction, building materials, ventilation, heating, air conditioning
5. **Environmental and Natural Resource Systems:** water quality, sustainable agricultural practices, soil and water conservation, biological waste handling

D. **Team Activities**

The individuals on each state team will work together and be evaluated as a team while solving multi-system agricultural problem(s) selected from the skills and problem solving of the five system competency areas. The specific problem scenario is presented to the team on the day of the event. Team members will utilize the materials and equipment provided to solve the problem(s) and prepare a computer generated report. Teams will organize themselves, assign duties and complete tasks together or separately depending on individual skills and abilities. Each team will receive a score, and each team member will receive one-third of the total team activity score.

E. Individual Activities

1. Individual problem solving and skill development activities

Each student is individually evaluated in each of the five systems areas. The specific activities occurring in each event are not publicized prior to the event. Each student is allowed 25 minutes to complete each of the five activities.

2. Written examination

Each student completes an examination that consists of 25 problem solving/multiple-choice questions. There are 5 questions from each of the five agricultural technology and mechanical systems areas. Students will have 60 minutes to complete this portion of the career development event.

F. Schedule of Theme Announcement

Agricultural technology and mechanical systems theme for the career development event is on a five year rotation and is published and distributed by the National FFA Organization and posted at the following web site: <http://web.missouri.edu/~schumacherl/natcon.html>

Specific information and event updates generally occur following each year's event during November, June, and August. The schedule for announcing event information and details on equipment selection is governed by equipment availability and late changes by equipment manufacturers, dealers and contributors. The theme examples listed below provides direction for students and their advisors. This short list should not stifle or limit the learning or instructional process as students and advisors prepare themselves to solve integrated system problems in the workplace of today and tomorrow.

THEMES

The schedule for Agricultural Technology and Mechanical Systems themes:

2012	Materials Handling Systems
2013	Processing Systems
2014	Plant Production Systems
2015	Integrated Pest Management
2016	Animal Production Systems

An example of the *integrated pest management* theme appears in Appendix C at the end of this chapter. This example illustrates the interaction between systems in a typical theme. An individual solving a pesticide application problem must consider numerous variables and make a variety of decisions. The following list includes some of the systems competencies needed during the planning, preparation and implementation of the problem solution. Many other competencies exist and identical competencies may be required in more than one system.

Machinery and Equipment Systems- application and equipment calibration, nozzle selection, equipment testing and maintenance

Electrical Systems- electronic sensing devices, multi meters, relays, switches, magnetic motor controllers, motor selection, electrical trouble shooting

Energy Systems- power requirements, variable rate applications, electronically controlled equipment, valves, pumps, pressure regulators

Structural Systems- storage, mixing and loading requirements, fire safety, temperature control, ventilation, construction requirements, fabrication

Environmental and Natural Resource Systems- pesticide and pesticide container disposal, pesticide handling, drift control, impact on non-target plants, animals and insects

Team Activity – members will collaborate on topics such as equipment selection, assembly, calibration and/or repair, and developing a computer generated final report

IV. Scoring

Event participants are evaluated as follows:

INDIVIDUAL SCORING

Written examination	50
Individual activities (5 at 30 points each)	150
Team activity (1/3 of total team score)	133.3
<i>Total Possible Individual Score</i>	<i>333.3</i>

TEAM SCORING

Top three written examinations	150
All individual activities for top three individuals	450
Team activity	400
<i>Total Possible Team Score (top three)</i>	<i>1000</i>

V. Tiebreakers

Team

The team activity scores will be used to break a tie associated with the team rankings. If a tie still exists, the combined written exam scores of the top three team members will be used to break the tie.

Individual

If a tie exists between individuals, the combined highest problem solving/skill scores will break the tie(s). If still tied, the highest written examination score will be used to break the tie.

VI. Awards

Awards will be presented at the awards ceremony. Awards are presented to teams as well as individuals based upon their rankings. Awards are sponsored by a cooperating industry sponsor(s) as a special project, and/or by the general fund of the National FFA Foundation. Special recognition awards to individuals or teams by a sponsor(s) will be at the sole discretion of the sponsor(s).

The high scoring individual in each of the five system skill/problem solving areas and the high scoring team in the team activity will be recognized with a certificate. The scores used to award this recognition include the exam questions and individual problem-solving/skill activity associated with each system area.

VII. References and resources

This list of references is not intended to be all-inclusive. Other sources may be utilized, and teachers are encouraged to make use of the very best instructional materials available. The following list contains references that may prove helpful during event preparation.

The goal of the National FFA Agricultural Technology and Mechanical Systems Career Development Event is to guide and promote quality instructional programs in agricultural technology and mechanical systems. The following list contains references that may prove helpful during event preparation. The multiple-choice test questions are written to be generic in nature and are selected from a variety of sources. It is the intent of the national event committee to reflect current technological practices common to the agricultural production industry. Refer to the CDE website for additional references and resources.

1. National FFA Core Catalog—Past CDE Material (<http://shop.ffa.org/cde-qas-c1413.aspx>)
2. Information specific to each annual event is available on the National FFA Agricultural Technology and Mechanical Systems Career Development Event web page at <http://web.missouri.edu/~schumacher1/natcon.html>. Specific information and event updates generally occur following each year's event during November, June and August.
3. *FOS*. John Deere.
4. *FMO*. John Deere.
5. *Agricultural Power and Machinery*. (CD format) CEV Multimedia. LTD.
6. *Agricultural Engineering Technology*. (ASABE) Springer Science + Business Media, LLC.
7. *Mechanics in Agriculture*. Prentice Hall.
8. *Agricultural Mechanics Fundamentals and Applications*. Delmar and Thompson
9. *Modern Agricultural Mechanics*, V3. Prentice Hall.
10. *Developing Shop Safety Skills*. American Association for Vocational Instructional Materials.
11. *Power Tool Safety and Operation*. Hobar Publications.
12. *Practical Farm Buildings*. Prentice Hall.
13. *National Electrical Code* (latest edition). NFPA.
14. *Ag Wiring Handbook*. Rural Electricity Resource Council.
15. *Mechanical Technology in Agriculture*. Prentice Hall.
16. Industry websites

VIII. Event Related Competencies

The following list of statements with specific understandings and performances are provided as examples for the systems areas identified. Examination questions are primarily developed from “problem solving” categories. The “skills” categories are the basis for performance activities. Problem solving activities are developed from both “problem solving” and “skills” categories. In each systems area, the requirements for effective communication, problem solving activities and the application of modern technology - specifically computers and computer software - are strongly emphasized. Industry has recently identified important skills, abilities and competencies needed by new employees. These important attributes are described following the list of system competencies.

A. Machinery/Equipment Systems Competencies

Problem Solving

1. Identify safe machinery operation practices for field and highway conditions.
2. Identify the recommended service and maintenance operations from the operator's manual.
3. Select lubricants for machinery and equipment.
4. Identify functions of machinery components.
5. Identify parts and functions of hydraulic systems.
6. Identify and compute harvest losses.
7. Prepare machinery for storage.
8. Identify and select reduced tillage and conservation tillage equipment.
9. Explain principles of machinery management.
10. Describe functions of chemical application, harvesting, materials handling, processing, planting, seeding and tillage equipment.
11. Identify appropriate shapes of tool and equipment cutting edges.
12. Select abrasives for grinding and sharpening.

13. Identify safe adjustment [level] on power equipment.
14. Identify pipe, valves and fittings by type.
15. Select pipe sizes to meet pressure and flow requirements.
16. Select valves and controllers for turf and drip irrigation systems.
17. Identify and select pipe sealants.
18. Identify characteristics and applications of fiberglass and plastic.
19. Identify repair procedures and techniques.
20. Select repair material needed for specific jobs.
21. Match tractors to implements.

Skills

1. Check and adjust driveline components.
2. Adjust equipment hitches and drives.
3. Install, adjust and service belt and chain drives.
4. Select and use test equipment including meters, tachometers and timing devices to determine proper machine operation.
5. Adjust and/or calibrate chemical application, seeding, fertilizing, harvesting, processing and materials handling machinery.
6. Install, operate, maintain, adjust and evaluate machine systems.
7. Inflate tires to proper air pressure.
8. Adjust equipment for field and crop conditions.
9. Prepare grinding and sharpening equipment.
10. Recondition chain saw, horticultural and turf cutting tools.
11. Recondition rotary lawn mower blades.
12. Adjust bed knife on reel mowers.
13. Join metals with appropriate fasteners.
14. Bend sheet and strap steel to angles or shapes.
15. Repair damaged threads.
16. Cut, thread and assemble steel pipe.
17. Connect flare, compression, flat-face or other types of specialized fittings.
18. Install and set programmable timers.
19. Select tools and materials for specific repair jobs.
20. Repair structural or cosmetic damage using proper materials.
21. Select and use appropriate safety equipment.
22. Identify safe machinery operation practices for field and highway conditions.
23. Identify the recommended service and maintenance operations from the operator's manual.
24. Describe how to repair a specific component or system.
25. Select fuels, lubricants, hydraulic fluids and coolants for proper operation.
26. Identify importance of oil analysis as a management tool.
27. Operation and interpretation of circuit diagrams and flowcharts for: electrical, hydraulic, fuel, oil, cooling, intake and exhaust systems.
28. Identify the function and operating principles of clutches, transmissions, control devices and brakes.
29. Explain and describe principles of power transmission.
30. Identify the parts and functions of electrical, hydraulic, lubrication, cooling, governor and fuel systems.
31. Select proper ballast for machinery weighting.
32. Use load/inflation table for tires (constant deflection table).

33. Evaluate engine performance under load and no-load operation using dynamometer data.
34. Conduct a pre-operation inspection of a tractor or implement.
35. Start, stop and operate machinery/engines.
36. Perform recommended periodic service jobs (as found in operator's manuals).
37. Test and service cooling systems.
38. Make hitch and PTO adjustments to the implement.
39. Adjust wheel tread spacing.
40. Adjust steering linkage.
41. Match tractors to implements.
42. Conduct on-board tractor monitor checks as identified in operator's manual.
43. Test and service air conditioning systems.
44. Select and use engine overhaul equipment, including valve, cylinder, piston, seal and bearing tools.
45. Service and maintain fuel, air intake and exhaust, cooling and lubrication systems.
46. Operate engine and adjust or check ignition timing, engine speed and carburetor adjustments.

B. Electrical Systems Competencies

Problem Solving

1. Interpret horsepower, torque and other performance criteria.
2. Use appropriate standards for agricultural applications, including the National Electrical Code (NEC), Electrical Testing Laboratory (ETL), Factory Mutual, Underwriters Laboratory (UL), Canadian Standard Association (CSA) and/or OSHA standards.
3. Plan safe electrical circuits.
4. Select conductor type and size for specific applications.
5. Calculate voltage drop.
6. Determine electrical power requirements.
7. Identify the characteristics of single and three-phase circuits.
8. Plan and evaluate proper grounding systems and ground-fault protection.
9. Determine volt, amp and ohm relationships (Ohm's and other application laws).
10. Select adequate and appropriate lighting fixtures.
11. Make connections in a computer-simulated wiring task.
12. Select motors based upon type of application.
13. Interpret electric motor nameplate data.
14. Identify electric motors and motor parts.
15. Identify methods of providing electric motor protection.
16. Interpret power (horsepower, kilowatt), power factor, torque and other motor selection criteria.
17. Select, size and isolate standby power generators.
18. Calculate heating and cooling loads.
19. Identify and describe basic principles of controls including thermostats; humidistat; photoelectric; magnetic relays; programmable controllers; proximity switches and sensors; ultrasonics; timers and other time-delay equipment and pressure, motion, limit, float and sail switches.
20. Select controls from supply catalogs, microforms, microfiche or computers.
21. Select controls for electrical applications.
22. Use low-voltage electrical control equipment.
23. Identify and select devices for automated systems.

Skills

1. Connect electrical motor drives.
2. Use electrical test instruments such as: VOA (volt-ohm-amp)-meter, DMM (digital multi-meter) and tachometer.
3. Test and troubleshoot electronic sensing devices.
4. Remove, service and replace electrical components.
5. Read schematics and sketch wiring circuits.
6. Attach conductors to terminals.
7. Install plugs and cord connector bodies.
8. Make proper splices and connections.
9. Troubleshoot electrical circuits using proper testing equipment and measuring devices.
10. Measure electrical circuits for voltage, amperage, resistance and wattage.
11. Install service entrance for single phase 120/240V service or three-phase power.
12. Wire 120/240V service outlets.
13. Install electrical circuits, switching devices and appliances.
14. Install ground-fault circuit interrupters.
15. Make connections in a computer-simulated wiring task.
16. Troubleshoot electric motor circuits using proper testing equipment.
17. Connect a dual voltage motor to power source.
18. Change the direction of electric or hydraulic motor rotation.
19. Disassemble and reassemble an electric motor.
20. Provide suitable motor over-current protection.
21. Service and lubricate electric motor.
22. Check the running amperage and voltage of a motor.
23. Select and mount an electric motor on a machine.
24. Connect electric motor controls.
25. Install timer circuits and automation devices.
26. Install thermal and solid-state delay/relay controls.
27. Install a low-voltage motor control system.
28. Install sensing devices including thermostats; humidistat; photoelectric; magnetic relays; programmable controllers; proximity switches and sensors; ultrasonic; timers and other time delay equipment and pressure, motion, limit, float and sail switches.
29. Wire devices that are capable of providing artificial heat.

C. Energy Systems Competencies**Problem Solving**

1. Interpret horsepower, torque and other power measurement criteria.
2. Identify and use OECD (Organization for Economic Cooperation and Development) and/or Nebraska Tractor Test results.
3. Interpret metric units in measurements.
4. Compare costs of alternative machine uses.
5. Understand interactive electronic components.
6. Describe operating principles of two-stroke and four-stroke spark or compression ignition engines.
7. Evaluate engine performance under load and no-load operation.
8. Determine hydraulic cylinder force and speed.
9. Interpret wiring diagrams.
10. Identify and select devices for automated systems.
11. Select aquaculture air delivery systems.
12. Select aquaculture water heating devices.

13. Determine water filtration needs.
14. Establish ballast and tire pressures.
15. Use safe wiring practices for specific applications.
16. Select standby power generators and isolation equipment for specific applications.
17. Match tractors to implements.
18. Select energy efficient equipment and materials.
19. Identify energy conservation measures to reduce costs and operation(s).
20. Determine energy consumption and cost savings of alternatives.

Skills

1. Connect hydraulic, electric or pneumatic motor drives.
2. Conduct a pre-operation inspection of a tractor.
3. Starting, stopping and operating machinery engines.
4. Perform recommended periodic service jobs (as found in operator's manuals).
5. Use measuring tools and test instruments such as: micrometer and telescoping gauges, dial indicator, compression tester, torque wrench, VOA (volt-ohm-amp)meter, DMM (digital multi-meter), timing devices, tachometer and dynamometer for determining test procedures.
6. Test and troubleshoot electronic sensing devices.
7. Remove, service and replace electrical components.
8. Test and service batteries, charging, lighting, warning and cranking systems.
9. Test and service air conditioning systems.
10. Select and use engine overhaul equipment, including valve, cylinder, piston, seal and bearing tools.
11. Service and maintain fuel, air intake and exhaust, cooling and lubrication systems.
12. Operate engine and adjust or check ignition timing, engine speed and carburetor adjustments.
13. Select and install aquaculture control and sensing systems.
14. Measure energy output from or consumption of devices and cost savings of alternatives.

D. Environmental and Natural Resources Systems Competencies

Problem Solving

1. Identify environmental problems in livestock and crop handling and processing buildings.
2. Read and interpret maps including conservation, land use, soils, topographic, aerial and remote sensing and geological surveys.
3. Describe principles involved in appropriate conservation and/or land use planning.
4. Read legal land descriptions.
5. Determine land areas.
6. Determine the difference in elevation of two or more points.
7. Determine cuts, fills, cut/fill ratios and volumes.
8. Describe the characteristics of a profile-leveling plot.
9. Identify water quality criteria for aquaculture.
10. Select terracing and water diversion options for soil conservation.
11. Selecting strip-cropping principles and practices.
12. Select water management techniques including grassed waterways, parallel terrace outlets, tile outlet systems and erosion control structures.
13. Determine types of vegetative cover and mulch for erosion stabilization.
14. Determine and select appropriate cultural tillage or mechanical practices of equipment for specific soil type and residue management.

15. Compare effects of traffic patterns on soil compaction.
16. Calculate soil loss using universal equations and determine effects of the components of the equations.
17. Determine practices to improve or maintain water quality and recharge.
18. Determine appropriate types, locations and uses of erosion and sedimentation control basins.
19. Determine appropriate types, locations and uses of water impoundment structures.
20. Describe surface and subsurface drainage and irrigation techniques.
21. Calculate subsurface drainage and irrigation requirements.
22. Select appropriate drainage including open drainage, closed gravity and pumping systems.
23. Determine land shaping and grading requirements.
24. Determine water needs.
25. Select irrigation systems for specific conditions.
26. Select irrigation equipment and techniques.
27. Determine soil moisture and temperature.
28. Select surface and subsurface irrigation systems for specific application.
29. Size and select system components.
30. Determine power requirements and pump size for specific applications.
31. Calculate irrigation system requirements.
32. Optimize water management system choices.
33. Understand water quality impacts on drainage and irrigation.
34. Apply water pressure, flow and head concepts.
35. Select pumps and power sources and compare efficiencies.
36. Interpret pump characteristics curves.
37. Determine appropriate biological waste disposal methods.

Skills

1. Utilize GPS system components.
2. Set up and level the surveying instrument.
3. Take rod readings.
4. Measure distance with tape and/or instruments.
5. Lay out corners using instruments.
6. Determine direction by use of a compass.
7. Record field notes for differential, profile and topographic leveling.
8. Lay out contour lines.
9. Lay out grade stakes for cut/fills.
10. Determine soil types and select appropriate structures or practices.
11. Use automatic leveling and laser equipment.
12. Use water-testing equipment.
13. Lay out and map contour lines.
14. Measure crop residue on the land.
15. Determine soil losses.
16. Measure cross-sectional areas of a grass waterway, drainage ditch and earthen embankment.
17. Determine field slope and length.
18. Identify soil limitations and determine the effects on land use.
19. Assemble turf irrigation equipment.
20. Determine soil moisture.
21. Estimate soil permeability and infiltration rates.

22. Determine and compare evaporation losses.
23. Install drainage systems or components.
24. Lay out contour ditches, basins, borders, contour levees, furrow and corrugation systems for irrigation.
25. Lay out and assemble solid-set, lateral move, center-pivot and traveling gun irrigation systems and components.
26. Lay out and assemble trickle and drip irrigation systems or components including main-lines, lateral lines, control devices, valves, pressure regulators, gauges and filters.
27. Install components of irrigation systems for specific applications.
28. Determine delivery rates of pumps.
29. Determine percent of slope or grade.

E. Structures Systems Competencies

Problem Solving

1. Select and evaluate building sites.
2. Determine the size, specifications and layout of building.
3. Select appropriate framing, siding, roofing, insulation and vapor barrier materials.
4. Develop a bill of materials.
5. Interpret plans and working drawings.
6. Select appropriate structural components of buildings.
7. Select preservatives for building materials.
8. Evaluate building construction techniques.
9. Select hand, electric and pneumatic tools.
10. Estimate handling materials, cost and construction time.
11. Plan footings, foundations and concrete finishing.
12. Select materials for concrete form construction.
13. Determine quantity and cost of materials for concrete and masonry jobs.
14. Determine the appropriate water-cement ratio and aggregate for concrete masonry construction.
15. Select materials for concrete and masonry construction.
16. Order “ready-mix” concrete.
17. Select procedures for mixing and placing concrete in cold or hot weather.
18. Select materials and techniques to reinforce concrete and masonry construction.
19. Select techniques for placing, finishing and curing concrete and masonry units.
20. Select concrete additives to increase strength and reduce cracking.
21. Select concrete additives to control hydration rate.
22. Select tools and equipment for concrete and masonry construction.
23. Interpret lumber and manufactured wood product grade stamps.
24. Determine ventilation air inlet size based on exhaust fan capacity.
25. Select alternative construction styles (stud frame, post frame, rigid arch and stressed skin).
26. Select structural components for each alternative construction style.
27. Select materials for the construction of wood foundation systems.
28. Calculate and compare the installation and maintenance costs of crushed rock and concrete materials in the construction of feedlot surfaces.
29. Determine size and quality of aggregates and materials.
30. Use traditional, electronic and laser tools in concrete and masonry construction.
31. Specify and plan windbreak structures for livestock protection and reduction of snow accumulation in feedlot and farmstead drive areas.
32. Select arc welding machines and accessories.

33. Read drawings and welding symbols.
34. Control distortion in arc welding.
35. Select appropriate electrodes and wires.
36. Select hard surfacing alloys.
37. Prepare materials and equipment for arc welding.
38. Test weld quality and strength.
39. Select shielding gases.
40. Select gas welding, plasma arc and cutting equipment and supplies.
41. Assemble gas welding, plasma arc and cutting equipment.
42. Check equipment for leaks.
43. Select welding rods and fluxes.
44. Start-up and shut down of welding equipment.
45. Describe cylinder sizes and gas flow extraction rates.
46. Calculate the volume of acetylene that can be delivered per cylinder per hour.
47. Explain the functions of flashback arresters and reverse flow check valves.
48. Prepare metals for soldering.
49. Select hand metal working tools by types and sizes.
50. Determine tap and drill sizes.
51. Select files and saw blades.
52. Read metal working plans and prints.
53. Select metal alloys and their strength.
54. Select power shears, benders, brakes and saws.
55. Calculate materials costs.
56. Select pipe threading and cutting tools.
57. Select types of pipe and tubing.
58. Calculate lengths of pipe.
59. Join dissimilar plumbing materials.
60. Select pipe, valves and fittings by type.
61. Select the appropriate tools to use when welding plastics.
62. Select the types and properties of plastics.

Skills

1. Lay out a building foundation.
2. Identify, select and apply construction fasteners.
3. Use and maintain hand, electric and pneumatic tools and measuring instruments for building construction.
4. Lay out, cut and construct structural components.
5. Install composition shingles, metal and fiberglass roofing materials.
6. Selection of paint and other finishing materials.
7. Prepare a site for concrete and masonry construction.
8. Construct forms.
9. Calculate concrete or mortar mix.
10. Determine moisture content in sand.
11. Mix concrete or mortar on the job site.
12. Conduct and evaluate a slump test.
13. Place concrete or masonry reinforcement.
14. Layout and make isolation, control and construction joints.
15. Place, consolidate and finish concrete.
16. Place and finish concrete masonry units.
17. Produce special finishes on concrete.

18. Use and maintain concrete and masonry tools and equipment.
19. Calculate types and amount of concrete or mortar mix for a job.
20. Adjust ventilation air inlet openings.
21. Fabricate and install reinforcing steel bar and welded wire mesh.
22. Specify and use admixtures for concrete.
23. Set up manufactured form systems for poured-in-place foundation walls.
24. Select and apply appropriate framing, siding, roofing, insulation and vapor barrier materials.
25. Identify different types of metals.
26. Layout and prepare metal for arc welding.
27. Recommend metals based on load bearing strength.
28. Weld basic joints in all positions.
29. Join pipe for welding.
30. Prepare for and apply hard surfacing alloys.
31. Adjust cutting machines for different metals, joints and thickness.
32. Start up and shut down for welding equipment.
33. Light and adjust the torch flame for specific welding or cutting operations.
34. Layout and prepare metal for welding or cutting.
35. Fuse and braze welding basic joints on mild steel and cast iron.
36. Cut mild steel, including pipe, all shapes.
37. Join steel pipe, tubing or shapes by welding.
38. Estimate and calculate welding materials costs.
39. Adjust machines for various types of thickness of metal.
40. Identify the type of metals used in agricultural instruction.
41. Cut metal with plasma cutting unit.
42. Solder copper joints and sheet metal.
43. Solder electrical connections.
44. Operate power tools such as nibblers, drills and saws.
45. Operate hand tools such as saws and files.
46. Select appropriate metals for projects (strength).
47. Shape hot and cold metals using power shears, benders, brakes and saws.
48. Cut and assemble plastic pipe.
49. Solder copper fittings and tubing.
50. Assemble dissimilar plumbing materials.

IX. General Cluster Skills

1. Strong interpersonal communication abilities.
2. Knowledge combined with leadership qualities and the ability to delegate responsibilities.
3. People skills to deal with customers, the public and large groups.
4. Identify and interpret the correct resources to make an educated decision.
5. Understand and apply principles of mathematics, economics, biology and physics.
6. Have a high level of common sense, logic and critical thinking skills.
7. Be an independent thinker with an analytical mind.
8. Ability to understand and follow detailed instruction - written and oral.
9. Motivated to learn from various methods of instruction.
10. Remain literate in current technologies - computers, electronics, mechanical systems, etc.
11. Know how to calculate cost per units, per hour, per bushel, per acre, etc.
12. Know how to estimate value of equipment and recommend future buying decisions.

13. Know how to use technology to eliminate waste of time and resources.
14. Know about computer hardware, software, Internet, etc.
15. Know how to be productive with time, money and people.
16. Be knowledgeable with global agriculture - encompassing planning, production, marketing and finance.
17. Understand how cash flow is critical for business planning and operation.
18. Know how to measure and estimate costs and develop plans for business/industry improvements.
19. Be able to write annual goals with specific objectives and measurement tools for review.
20. Have skills in business operations and management.
21. Have experience with general accounting and cash flow management.
22. Be able to effectively implement the use of technology in the workplace.
23. Understand how to use a systematic approach to diagnose equipment problems.
24. Know how to service and maintain equipment so that productivity can be maintained.
25. Understand on-board computerized systems that monitor, test, store and report equipment operation.
26. Be familiar with computerized recognition of crop productivity and quality, field conditions and pests.
27. Understand electrical circuits - amperage, watts, voltage, resistance and transistors.
28. Understand hydraulic system operation - flow, resistance and temperature.
29. Understand mechanical system operation - mechanical advantage, material specifications and gear design.
30. Have experience in reading schematics, replacing components – including control modules.
31. Know how to diagnosis electrical, computer, mechanical and hydraulic systems.
32. Have experience in analyzing mechanical system failures.
33. Have experience with CAD software and know how to produce mechanical drawings.

**National FFA Agricultural Mechanics Career Development Event
Team Activity Final Report Scoring Rubric**

Criteria	Very strong evidence skill is present (100-90%)	Moderate evidence skill is present (89-60%)	Strong evidence skill is not present (59-0%)	Points Earned	Weight	Total Score
<i>Cover page with title and state name</i>	<ul style="list-style-type: none"> Cover page contains both required items. 	<ul style="list-style-type: none"> Cover page is missing one required item. 	<ul style="list-style-type: none"> Cover page is missing both required items. 		x1	
<i>Description of activity</i>	<ul style="list-style-type: none"> Contains a complete description of the team activity. 	<ul style="list-style-type: none"> Missing one component of the team activity. 	<ul style="list-style-type: none"> Missing two or more components of the team activity. 		X3	
<i>Description of roles of team members to complete activity</i>	<ul style="list-style-type: none"> Contains a complete description of roles and safety measures used by all team members completing the activity. 	<ul style="list-style-type: none"> Contains a vague description of roles and safety measures used by team members completing the activity. 	<ul style="list-style-type: none"> Fails to describe the roles and safety measures used by team members completing the activity. 		X3	
<i>Section to include calculations, diagrams, tables, figures, etc. related to specific CDE activity theme and identified by instructions</i>	<ul style="list-style-type: none"> This section of the report includes all required items as specified in activity directions. 	<ul style="list-style-type: none"> This section of the report is missing one required item. 	<ul style="list-style-type: none"> This section of the report is missing two or more required items. 		X5	
<i>Grammar, punctuation, and spelling</i>	<ul style="list-style-type: none"> Spelling, grammar and punctuation are of extremely high quality with less than 2 errors throughout the report. 	<ul style="list-style-type: none"> Spelling, grammar and punctuation are adequate with 3-5 errors present throughout the report. 	<ul style="list-style-type: none"> Spelling, grammar and punctuation are less than adequate with 6 or more errors present throughout the report. 		X2	
<i>Professional format</i> <ul style="list-style-type: none"> Typed in a 12 point type font 1" margins Double spaced 	<ul style="list-style-type: none"> Report is extremely neat and professional looking with all three required formatting criteria being present. 	<ul style="list-style-type: none"> Report is reasonably neat and professional looking with two of the required formatting criteria being present. 	<ul style="list-style-type: none"> Report is very unprofessional in appearance with one or none of the required formatting criteria being present. 		X2	
Total Points						

National FFA Agricultural Mechanics Career Development Event Team Activity Process Rubric

Indicators	Very strong evidence skill is present 5-4	Moderate evidence skill is present 3-2	Strong evidence skill is not present 1-0	Points Earned	Weight	Total Score
A. Managing team dynamics	<p><i>Completely committed to team dynamics, maturity and professionalism are always present.</i></p> <ul style="list-style-type: none"> In team conflicts, problem-solving and decision-making methods and skills are used to produce a positive compromise. 	<p><i>Somewhat committed to team dynamics, maturity and professionalism are seldom present.</i></p> <ul style="list-style-type: none"> In team conflicts, problem-solving and decision-making methods and skills are sometimes used to produce a compromise. Sometimes involvement in this process is limited. 	<p><i>Lacking team dynamics, maturity and professionalism.</i></p> <ul style="list-style-type: none"> When team conflict arises minimal or no attempt at a resolution is made by team members. 		X 4	
B. Awareness of personality styles of others	<p><i>Totally conscious and respectful of differing attitudes, personalities and behaviors.</i></p> <ul style="list-style-type: none"> Language is free of bias and completely shows an understanding and respect for others' differences in learning and personality. 	<p><i>Is, for the most part, respectful of others' differences in personality and behavior.</i></p> <ul style="list-style-type: none"> For the most part, language conveys an understanding of others' differences in learning and personality. 	<p><i>Shows little tolerance for differing personalities and behaviors.</i></p> <ul style="list-style-type: none"> Language used may be expressed as not understanding others' differences in personality and learning styles. 		X 4	
C. Uses positive and mature language and mannerisms	<p><i>Always uses mature language and mannerisms.</i></p> <ul style="list-style-type: none"> Never uses immature verbal and/or nonverbal communication. Always has positive communications. 	<p><i>Usually uses mature language and mannerisms.</i></p> <ul style="list-style-type: none"> Rarely uses immature verbal and/or nonverbal communication. Usually has positive communications. 	<p><i>Seldom or never uses mature language and mannerisms.</i></p> <ul style="list-style-type: none"> Frequently uses immature verbal and/or nonverbal communication. Seldom has positive communications. 		X 4	
D. Reacting to changes	<p><i>Has ability to react and transition effortlessly to change.</i></p> <ul style="list-style-type: none"> Shows excellent ability to adapt with unexpected change; thinks quickly; shows no sign of stress. 	<p><i>Typically reacts well to changes.</i></p> <ul style="list-style-type: none"> Seems able to adapt to unexpected change most of the time; occasionally stresses. 	<p><i>Has difficulty reacting well to changes.</i></p> <ul style="list-style-type: none"> Seems stressed by change. 		X 4	
E. Handling tasks	<p><i>Handles tasks with ease, including task assignment.</i></p> <ul style="list-style-type: none"> Efficient in planning, managing and completing all tasks in a timely and organized fashion. All project parts are assigned equally. 	<p><i>Does a good job handling tasks with some ease, including task assignment.</i></p> <ul style="list-style-type: none"> Is thoughtful about the planning and sequencing of tasks, but occasional priority mistakes are made. Some project parts are assigned equally. 	<p><i>Has difficulty handling tasks, including task assignment.</i></p> <ul style="list-style-type: none"> Seems to have trouble deciding the order to do several tasks and struggles with completion in a timely manner. No project parts are assigned equally. 		X 4	
Total Points						

Appendix A: AFNR Career Content Cluster Standards

	Performance Measurement Levels	Event Activity Addressing Measurement	Related Academic Standards
ABS.01.02. Performance Indicator: Apply principles of entrepreneurship in businesses.			Social Studies: 7d
	ABS.01.02.01.c. Demonstrate entrepreneurship, including idea generation, opportunity analysis and risk assessment.	Team activity	
ABS.03.02. Performance Indicator: Implement appropriate inventory management practices.			Language Arts: 8
	ABS.03.02.01.b. Use computer technology in inventory management and reporting, including spreadsheets, databases, word processing, networked systems and the Internet.	Team activity	
AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.			Science: C6 and F6
	AS.07.01.01.b. Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe and efficient use of the facility.	Structural system; team activity	
	AS.07.01.02.c. Select equipment and implement animal handling procedures and improvements to enhance production efficiency.	Structural system; environmental and natural resources system; machinery and equipment system; team activity	
AS.07.02. Performance Indicator: Comply with government regulations and safety standards for facilities used in animal production.			Science: F5
	AS.07.02.01.c. Design a facility that meets standards for the legal, safe, ethical and efficient production of animals.	Environmental and natural resources system; structural system; team activity	
ESS.01.01. Performance Indicator: Analyze and interpret samples.			Math: 1A, 1B, 4A and 5B Science: A2
	ESS.01.01.01.c. Analyze and interpret results of sample measurements.	All activities	
	ESS.01.01.02.c. Calibrate and use laboratory and field equipment and instruments according to standard operating procedures.	All activities	

ESS.03.02. Performance Indicator: Apply soil science principles to environmental service systems.		Science: B2 and D2 Social Studies: 3k
ESS.03.02.03.b. Identify the physical qualities of the soil that determine its use for environmental service systems.	Environmental and natural resources system; structural system; machinery and equipment system; team activity	
ESS.03.03. Performance Indicator: Apply hydrology principles to environmental service systems.		Science: D2
ESS.03.03.04.c. Test and document the quality of groundwater supplies.	Environmental and natural resources system	
ESS.03.03.06.c. Install and maintain pumps and associated delivery systems.	Environmental and natural resources system	
ESS.04.02. Performance Indicator: Manage safe disposal of all categories of solid waste.		Science: F1, F4 and F5
ESS.04.02.01.c. Analyze environmental hazards associated with the identification and acceptance of solid waste disposal sites.	Environmental and natural resources system	
ESS.04.05. Performance Indicator: Manage hazardous materials to assure a safe facility and to comply with applicable regulations.		Science: F4 and F5
ESS.04.05.01.c. Describe the procedures for the treatment and disposal of hazardous materials and hazardous waste.	Environmental and natural resources system	
ESS.06.01. Performance Indicator: Use technological and mathematical tools to map land, facilities and infrastructure.		Science: A3 Social Studies: 3c and 3e
ESS.06.01.01.c. Demonstrate surveying and cartographic skills to make site measurements and map facility accesses and infrastructure.	Environmental and natural resources system; machinery and equipment system; team activity	
ESS.06.02. Performance Indicator: Maintain tools, equipment and machinery in safe working order for tasks in environmental service systems.		N/A
ESS.06.02.01.c. Demonstrate proper preventive maintenance techniques and set up a mock preventive maintenance schedule.	All activities	
FPP.02.01. Performance Indicator: Manage operational procedures and create equipment and facility maintenance plans.		Language Arts: 12
FPP.02.01.03.c. Perform basic equipment and facility maintenance in a food products and processing operation.	All activities	

NRS.02.02. Performance Indicator: Demonstrate cartographic skills to aid in developing, implementing and evaluating natural resource management plans.		Math: 4B Science: A3 and F2 Social Studies: 3b and 3c
	NRS.02.02.01.c. Employ Global Positioning System and Geographic Information Systems technologies to inventory features in natural resource management.	Environmental and natural resources system; machinery and equipment system; team activity
PS.02.03. Performance Indicator: Develop and implement a fertilization plan for specific plants or crops.		Math: 4B Science: A2
	PS.02.03.04.c. Use variable-rate technology to apply fertilizers to meet crop nutrient needs.	Environmental and natural resources system, machinery and equipment system, team activity
PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management.		Science: C4 and C6 Language Arts: 7
	PS.03.03.04.c. Evaluate environmental and consumer concerns regarding pest management strategies.	Environmental and natural resources system, machinery and equipment system, team activity
PS.03.04. Performance Indicator: Apply principles and practices of sustainable agriculture to plant production.		Science: F3, F4 and F6
	PS.03.04.01.c. Prepare and implement a plan for an agricultural enterprise that involves practices in support of sustainable agriculture.	All activities
PS.03.05. Performance Indicator: Harvest, handle and store crops.		Science: F5
	PS.03.05.01.a. Identify harvesting methods and harvesting equipment.	Machinery and equipment system
PST.01.01. Performance Indicator: Select energy sources in power generation appropriate to the situation.		Science: B5, D1 and F3
	PST.01.01.01.c. Compare the efficiency of energy production from various sources.	All activities
PST.01.02. Performance Indicator: Apply physical science laws and principles to identify, classify and use lubricants.		Science: B4
	PST.01.02.01.c. Select, use and dispose of lubricants.	Machinery and equipment system, environmental and natural resources system

PST.01.03. Performance Indicator: Identify and use hand and power tools and equipment for service, construction and fabrication.		Science: E2
PST.01.03.01.c. Assess the performance of employees in use of hand and power tools to safely and efficiently service, construct and fabricate quality products.	All activities	
PST.02.01. Performance Indicator: Perform service routines to maintain power units and equipment.		Science: E2
PST.02.01.01.c. Test and service electrical systems.	Electrical system, energy system, machinery system, team activity	
PST.02.01.02.c. Troubleshoot malfunctions and failures in equipment using computer and on-board diagnostics.	Machinery and equipment system, electrical system, energy system, team activity	
PST.02.01.03.c. Maintain and calibrate metering, monitoring and sensing devices on equipment.	Machinery and equipment system, electrical system, energy system, team activity	
PST.02.02. Performance Indicator: Operate, service and diagnose the condition of power units and equipment.		Science: E2
PST.02.02.01.c. Select power units and equipment for operational efficiencies.	Machinery and equipment system, electrical system, structural system, energy system, team activity	
PST.02.02.02.c. Adjust equipment for safe and efficient operation.	All activities	
PST.03.01. Performance Indicator: Troubleshoot and repair internal combustion engines.		Science: A1 and A4 Language Arts: 3
PST.03.01.01.c. Performance test internal combustion engines to determine service and repair needs.	Machinery and equipment system, energy system, team activity	
PST.03.01.02.c. Overhaul spark-and-compression internal combustion engines.	Machinery and equipment system, energy system, team activity	
PST.03.02. Performance Indicator: Utilize manufacturers' guidelines to service and repair the power transmission systems of equipment.		Math: 1C and 6B Science: B4 and E1
PST.03.02.02.b. Describe features, benefits and applications of mechanical transmission components, including belts, chains, gears, bearings, seals, universals and drive shafts.	Machinery and equipment system, energy system, team activity	
PST.03.02.03.a. Identify power transfer principles, including those using friction, gears and fluids.	Machinery and equipment system, energy system, team activity	

PST.03.03. Performance Indicator: Service and repair hydraulic and pneumatic systems.		Science: B4 and E1
	PST.03.03.02.c. Inspect, analyze and repair hydraulic and pneumatic system components, including fluid and compressed-air conveyance components.	Machinery and equipment system, energy system, team activity
PST.03.04. Performance Indicator: Troubleshoot and service electrical systems.		Math: 6B Science: E1
	PST.03.04.01.c. Evaluate power unit and equipment electrical systems, including ignition, lighting, auxiliary and electronic braking.	Machinery and equipment system, energy system, electrical system, team activity
	PST.03.04.02.c. Assess and repair malfunctioning electrical systems and components, such as battery, lighting, instrumentation and accessories.	Machinery and equipment system, energy system, electrical system, team activity
PST.03.05. Performance Indicator: Service vehicle heating and air-conditioning systems.		Math: 4A and 6C
	PST.03.05.01.b. Describe physical principles of operation of vehicle heating and air-conditioning systems and interpret symbols and diagrams used with such systems.	Machinery and equipment system, energy system, team activity
PST.03.06. Performance Indicator: Service and repair steering, suspension, traction and vehicle performance systems.		Math: 4A and 6C
	PST.03.06.01.c. Evaluate vehicle stability, power-hop, creep-crawl, wheel slip and tractive performance and service as needed.	Machinery and equipment system, team activity
	PST.03.06.02.c. Evaluate vehicle suspension and steering systems and service as needed.	Machinery and equipment system, energy system, team activity
PST.04.01. Performance Indicator: Create sketches and plans of agricultural structures.		Math: 4A Science: A3 and E1
	PST.04.01.01.c. Apply principles of design, fabrication and installation of agricultural structures.	Structural system, team activity
	PST.04.01.02.c. Design functional and efficient facilities for agricultural use.	All activities
PST.04.02. Performance Indicator: Apply structural plans, specifications and building codes.		Language Arts: 12
	PST.04.02.02.c. Follow local construction and safety codes and specifications in agricultural construction.	Structural system, electrical system, energy system, team activity
PST.04.03. Performance Indicator: Examine structural requirements for materials and procedures and estimate construction cost.		Math: 1C and 6B
	PST.04.03.01.c. Prepare a project cost estimate, including materials, labor and management.	All activities

PST.04.04. Performance Indicator: Follow architectural and mechanical plans to construct and/or repair equipment, buildings and facilities.		Math: 1C, 4A and 4B Science: E2
PST.04.04.01.c. Evaluate work products or samples for quality and efficiency of workmanship following architectural and mechanical plans.	Structural system, environmental and natural resources system, electrical system, team activity	
PST.04.04.02.c. Install and/or repair electrical wiring components and fixtures following appropriate codes and standards.	Structural system, electrical system, energy system, team activity	
PST.04.04.04.c. Insulate a structure.	Structural system, energy system, team activity	
PST.04.04.05.b. Construct and/or repair with concrete, brick, stone or masonry units.	Structural system, team activity	
PST.04.04.07.c. Construct and/or repair metal structures and equipment using welding fabrication procedures, including those associated with SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch methods.	Structural system, team activity	
PST.05.01. Performance Indicator: Use instruments and meters to test and monitor electrical and electronic processes.		Math: 4B Science: A3
PST.05.01.01.c. Locate and use electrical codes and regulations.	Structural system, energy system, team activity	
PST.05.02. Performance Indicator: Prepare and/or use electrical drawings to design, install and troubleshoot control systems.		Science: E1
PST.05.02.01.c. Identify and use electrical control system components, including transistors, relays, HVAC and logic controllers.	Electrical system, energy system, team activity	
PST.05.02.02.c. Troubleshoot electrical control system performance problems.	Electrical system, energy system, team activity	
PST.05.02.03.c. Plan and install electrical control circuits to assure proper operation.	Electrical system, energy system, team activity	
PST.05.03. Performance Indicator: Use geospatial technologies in agricultural applications.		Science: A3, E2 and F6 Social Studies: 3c
PST.05.03.02.c. Output and apply maps using GIS/GPS systems.	Environmental and natural resources system, machinery and equipment system, team activity	
PST.05.03.03.c. Demonstrate geospatial applications, including calibration, volumetric controlling and electrical design.	Environmental and natural resources system, machinery and equipment system, team activity	

CS.01.01. Performance Indicator: Action: Exhibit the skills and competencies needed to achieve a desired result.		Social Studies: 4d and 4h
CS.01.01.01.c. Work independently and in group settings to accomplish a task.	Team activity	
CS.01.01.03.c. Implement an effective project plan.	Team activity	
CS.01.01.06.c. Develop strengths and talents of team members so that all can achieve success.	Team activity	
CS.01.02. Performance Indicator: Relationships: Build a constituency through listening, coaching, understanding and appreciating others.		Language Arts: 12 Social Studies: 4h
CS.01.02.02.b. Utilize communication skills to collaborate in a group setting.	Team activity	
CS.02.02. Performance Indicator: Social Growth: Interact with others in a manner that respect the difference of a diverse and changing society.		Language Arts: 12 Social Studies: 1e
CS.02.02.03.b. Exhibit the behaviors needed for developing and maintaining a professional relationship.	Team activity	
CS.02.04. Performance Indicator: Mental Growth: Demonstrate the effective application of reasoning, thinking and coping skills.		Math: 6C Science: A4 Language Arts: 4 and 8
CS.02.04.01.c. Demonstrate critical and creative thinking skills while completing a task.	Team activity	
CS.03.02. Performance Indicator: Decision Making –Analyze situations and execute an appropriate course of action.		Science: A1 and A5 Social Studies: 1c and 4h
CS.03.02.01.c. Make decisions for a given situation by applying the decision- making process.	Team activity	
CS.03.02.02.c. Use problem-solving skills.	Team activity	
CS.03.03.02.c. Performance Indicator: Flexibility: Adaptability: Describe traits that enable one to be capable and willing to accept change.		Science: A2, A6 and E2 Language Arts: 7 Social Studies: 8a
CS.03.03.02.c. Evaluate strategies that can be used to manage change within the workplace.	Team activity	

Appendix B: Related Academic Standards

National academic standards for mathematics, science, English language arts and social studies related to this event are reported below. The statements are based on information in reports of the respective associations/organizations in the academic areas. Some adjustment of numbering was done to facilitate the process of alignment with the standards that have been developed in the pathways of the Agriculture, Food and Natural Resources (AFNR) Career Cluster.

The approach was to determine the presence of alignment between the content standards, expectations or thematic strands of the four academic areas and the performance indicators of the AFNR Standards. Supporting statements have been included to clarify content of the respective content standards, expectations or thematic strands. The statements were initially developed independently by the respective organizations and, therefore, are not parallel in wording and presentation. Occasionally minor editing was done to adjust the background or stem of a statement but not the statement itself.

Mathematics:

1. Standard and Expectations: Number and Operations
 - 1A. Understand numbers, ways of representing numbers, relationships among numbers and number systems.
 - 1B. Understand meanings of operations and how they relate to one another.
 - 1C. Compute fluently and make reasonable estimates.
4. Standard and Expectations: Measurement
 - 4A. Understand measurable attributes of objects and the units, systems and processes of measurement.
 - 4B. Apply appropriate techniques, tools and formulas to determine measurements.
5. Standard and Expectations: Data Analysis and Probability
 - 5B. Select and use appropriate statistical methods to analyze data.
6. Standard and Expectations: Problem Solving
 - 6B. Solve problems that arise in mathematics in other contexts.
 - 6C. Apply and adapt a variety of appropriate strategies to solve problems.

Science:

- A. Content Standard: Science as an Inquiry
 - A1. Identify questions and concepts that guide scientific investigation.
 - A2. Design and conduct scientific investigations.
 - A3. Use technology and mathematics to improve investigations and communications.
 - A4. Formulate and revise scientific explanations and models using logic and evidence.
 - A5. Recognize and analyze alternative explanations and models.
- B. Content Standard: Physical Science
 - B2. Structure and properties of matter.
 - B4. Motions and forces.
 - B5. Conservation of energy and increase in disorder.
- C. Content Standard: Life Science
 - C4. Interdependence of organisms.
 - C6. Behavior of organisms.
- D. Content Standard: Earth and Space Science
 - D1. Energy in the earth system.
 - D2. Geochemical cycles.
- E. Content Standard: Science and Technology
 - E1. Abilities of technological design.
 - E2. Understanding about science and technology.

F. Content Standard: Science in Personal and Social Perspectives

- F1. Personal and community health.
- F2. Population growth.s
- F3. Natural resources.
- F4. Environmental quality.
- F5. Natural and human-induced hazards.
- F6. Science and technology in local, national and global challenges.

Language Arts:

- 3. Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).
- 4. Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5. Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- 7. Students conduct research on issues and interests by generating ideas and questions and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
- 8. Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- 12. Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information).

Social Studies:

- 1. Thematic Strand: Culture
 - 1c. apply an understanding of culture and an integrated whole that explains the functions and interactions of language, literature, the arts, traditions, beliefs and values and behavior patterns;
- 3. Thematic Strand: People, Places, and Environments
 - 3b. create, interpret, use and synthesize information from various representations of the earth, such as maps, globes and photographs;
 - 3c. use appropriate resources, data sources and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS), map projects and cartography to generate, manipulate, and interpret information such as atlases, data bases, grid systems, charts, graphs and maps.
 - 3e. describe, differentiate and explain the relationships among various regional and global patterns of geographic phenomena such as land forms, soils, climate, vegetation, natural resources and population;
 - 3k. propose, compare and evaluate alternative policies for the use of land and other resources in communities, regions, nations and the world.

4. Thematic Strand: Individual Development and Identity

- 4d. apply concepts, methods and theories about the study of human growth and development, such as physical endowment, learning, motivation, behavior, perception and personality;
- 4h. work independently and cooperatively within groups and institutions to accomplish goals;

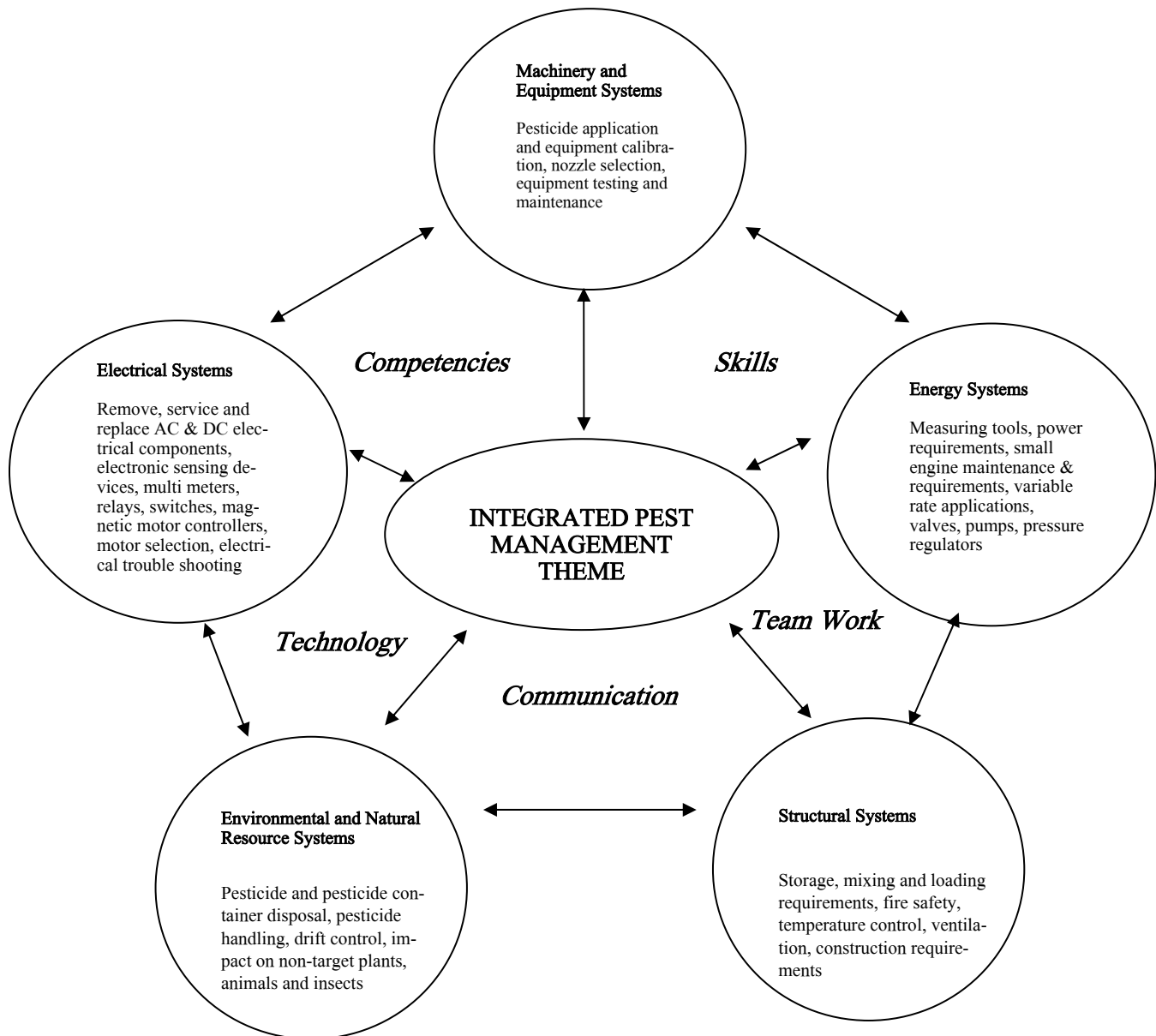
7. Thematic Strand: Production, Distribution and Consumption

- 7d. describe relationships among the various economic institutions that comprise economic systems such as households, business firms, banks, government agencies, labor unions and corporations;

9. Thematic Strand: Global Connections

- 9d. analyze the causes, consequences and possible solutions to persistent, contemporary and emerging global issues, such as health, security, resource allocation, economic development and environmental quality;

APPENDIX C: National FFA Agricultural Technology and Mechanical Systems Career Development Event Sample Theme



This chart illustrates an integrated pest management problem (one of five major themes) that depicts interaction between the agricultural technology and mechanical systems areas. Annual rotating themes will emphasize related competencies. Individuals and teams must possess knowledge and skills in all systems areas to determine acceptable problem solutions.

A number of other issues also influence the systems associated with integrated pest management. Such things as: turf versus agriculture applications, non-restricted versus restricted use pesticides and recent changes in governmental regulations are just a few of the additional concerns that affect the planning, preparation and completion of this activity. The complexity of this theme is further compounded by the number of competencies and skills involved in the solving of such intricate problems. Given the complexity of such problems, individuals are better prepared when they have information/knowledge, experience and expertise within several of the systems areas.