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An Internal Evaluation of the National FFA Agricultural Mechanics Career Development Event through Analysis of Individual and Team Scores from 1996–2006

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The purpose of this study was to conduct an internal evaluation of the National FFA Agricultural Mechanics Career Development Event (CDE) through analysis of individual and team scores from 1996–2006. Data were analyzed by overall and sub–event areas scores for individual contestants and team event. To facilitate the analysis process scores were aggregated by National FFA regions. Since the population of contestants competing by states was known descriptive statistics were used to compare mean scores by regions. States from the Central Region having consistently placed teams in the top–ten include Missouri, Minnesota, Montana, and Iowa. Mean overall event scores ranged from 13.45 (out of 30) to 59.29 (out of 100). Findings revealed the scores posted by individuals and teams from the Central FFA Region were significantly higher than those of the Western, Eastern, and Southern FFA Regions. The variables of industry and marketing system score, explained 40% of the variance in the overall individual event score.

Keywords: Career Development Event: FFA; agricultural mechanics; evaluation; ADDIE

Introduction/Theoretical Framework

FFA Career Development Events (CDE) serve as an opportunity for agricultural education students to apply their knowledge and skills of a variety of curriculum and career–related topics as a competitive event and have been conducted as part of the National FFA Convention since 1947 (Smith & Kahler, 1987). By design, CDE are an outgrowth of classroom and laboratory instruction, and skills gained through SAE. Often, CDE are viewed as a motivational tool for student achievement and recognition (Croom, Moore, & Armbruster, 2009). Additionally, all CDE are competitive and most involve a team activity (Talbert, Vaughn, & Croom, 2005) with most events occurring at the local, state, and national level. Recognition for individual and team achievement occurs in the form of plaques, pins, and scholarships. Students prepare for CDE more for leadership development, award recognition, and to obtain skills that will further their career choice, than for the sake of competition (Croom et al., 2009).

The National Agricultural Mechanics Career Development Event (CDE) is one of 24 CDE conducted annually as part of the National FFA Convention. An organizing committee composed of university, secondary, and agriculture industry representatives are responsible for the development, conduct, and evaluation of activities aimed at measuring the agriculture student' knowledge and technical skill areas of agriculture (Beard, 2001). The agricultural mechanic CDE is composed of five *system* areas, each represented by a knowledge and skill activity. In addition, there is a written exam, and a team activity. The goal of the agricultural mechanics CDE is to assess students' agricultural mechanics competencies important to the modern workplace. The five system areas (along with the written exam and team activity) focus on a specific agricultural theme for a given year. The themes are announced each year and are published in the CDE manual.

The National FFA Agricultural Mechanics CDE is divided into seven sub–event activities: (a) written exam, (b) machinery and equipment systems, (c) industry and marketing systems, (d) energy systems, (e) structural systems, (f) environmental and natural resource systems, and (g) the team activity. Each individual completes the five skill and problem solving areas worth 30 points each (150 points possible), a written exam (100 points possible) and the team activity (250 points possible). Each team member receives one–third of the team activity score. Each team may have four members, but only the scores from the top three members are used to determine total team score (National FFA Organization, 2008).

Research on Career Development Events related to agricultural mechanics has examined student scores on a national–level agriculture mechanics CDE (Buriak, Harper, & Gliem, 1985), prediction of student achievement in a state–level agriculture mechanics CDE related to specific student characteristics (Franklin & Miller, 2005; Johnson, 1991, 1993).

Johnson (1991; 1993) identified several factors contributing to student achievement in state–level agricultural mechanics CDE in Mississippi. A linear combination of average grade received in agriculture classes and farm residence and/or work experience were best predictors of overall student achievement.

Franklin and Miller (2005) reported that grade–level, years in agricultural education, highest math course completed, and achievement on the event written exam were variables that best predicted student achievement in agricultural mechanics CDE in Arizona.

The theoretical foundation of the study is the use of the ADDIE model to conduct an evaluation of instructional materials and training programs ADDIE is the acronym for five phases of the ADDIE Model: *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation* (Dick, Carey, & Carey, 1996; Petersen, 2003). The ADDIE framework is a cyclical process and continues over time. Each stage has a distinct purpose and function (Peterson, 2003). "This approach provides educators with useful, clearly defined stages for the effective implementation of instruction" (2003, p. 227).

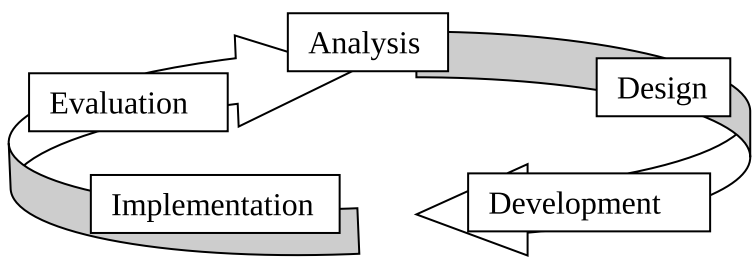

Figure 1. The ADDIE Framework. Source: Peterson, C. (2003).

Nearly three decades ago, Buriak et al., (1985) conducted an internal evaluation of the National FFA Agricultural Mechanics CDE using event scores and selected contestant demographic variables. The researchers published an evaluative study of contestants' scores of National FFA Agricultural Mechanics CDE for the years 1979 to 1984. The then–CDE was made up of six problem solving areas (10 points each), six skill areas (25 points each) and a written examination (90 points/ 90 questions, 15 questions from each six skill areas). The researchers sought to determine if a regional bias existed in any sub–contest (event) area based on scores, and if any sub–contest (event) activity contributed a disproportionate share of variance in the overall performance score of the contestant. The researchers concluded that a significant difference in scores existed based on FFA region. According to Buriak et al. (1985):

> This investigation demonstrates the utility of contest score evaluation and the need for further evaluation. Investigations of the prediction value of selected variables could prove useful in the development and

> enhancement of the contest. The use of trend analysis could explore the progress of contestants'' scores in the various areas of a contest and may indicate areas needing particular attention. (p. 32)

A finding of their research was Central FFA Region contestants scored significantly higher than contestants from other FFA regions. The sub–contest (event) activity, written examination accounted for the largest proportion of the total event score variance. The researchers recommended continual evaluation of the event. This study is an attempt to address the evaluation process of this CDE and suggest an evaluation model for possible adaption by other CDE.

Purpose & Objectives

The purpose of this study was to perform an internal evaluation of the National Agricultural Mechanics Career Development Event. An analysis of performance scores for individual activities, team activities, and the total event over a span from 1996 to 2006 was examined.

The evaluation objectives were to:

1. Identify the rankings of the top–ten states participating in the National Agricultural Mechanics CDE from 1996–2006;
2. Describe the contestant scores for the five system–areas, written exam scores and team activity by National FFA regions for the ten year period of 1996 to 2006;
3. Determine if a significant difference exists among national regions based on any activity area or overall event scores; and
4. Determine if a linear combination of sub–event area scores could explain a significant portion of the variance associated with overall individual achievement in the National Agricultural Mechanics Career Development Event.

Research Methods & Procedures

Population and Sample

This study employed a descriptive–correlational research design. The population for this study included all contestants competing in the National Agricultural Mechanics CDE. The sample consisted of those students competing in the event from 1996 to 2006 (N = 1,735). Data per contestant included: year of competition, state, overall rank, team activity score, and individual final score (from 1996 to 2006). Data from the years 2000 to 2006 included the following: machinery and equipment system score, industry and marketing system score, energy system score, structure system score, environmental and natural resource system score, a summated written exam score (all five system area exam scores), team activity score, and overall individual contestant score.

Data Collection

Data were directly converted from Microsoft Excel® spreadsheets and entered into SPSS 16.0 for Windows® for analysis. Analyses for objectives one, two, and three were conducted using frequencies, percentages, means, and standard deviations. Pearson product–moment and correlation coefficients were calculated, as appropriate to meet objectives four and five. An alpha level of .01 was established *a priori* to evaluate for statistical significance of all bivariate correlation coefficients. Based upon recommendations (Pallant, 2001) the .01 alpha level was selected as the critical standard for exploratory regression analysis.

The data were analyzed using a General Linear Model Procedure (Buriak et al., 1985) for a simple analysis of variance (ANOVA) when data was compared by region. Alpha was set a priori at $p < .01$. Post hoc (Tukey HSD) analysis was conducted to determine which regions were significantly different.

Pearson Product–Moment Correlation Coefficients were calculated in an effort to establish the strengths and directions of the relationships between each sub–event skill area and the individual overall event scores. The procedure was accomplished for all contestants with accessible scores. Stepwise multiple regression techniques were used to perform calculations. The researcher assumed the scores represent all of the contestants and teams that participated in the national CDE during the years of interest, therefore the findings are not to be generalized to any other population.

Findings

Evaluation Objective 1

The first objective was to identify the top–ranking states competing in the National Agricultural Mechanics CDE for the years 1996 through 2006. For this analysis, only states finishing in the top–ten placing of each year were presented. The National FFA Organization (2008) groups each state into one of four national regions: Central Region (12 states); Eastern Region (18 states); Southern Region (12 states, Includes Puerto Rico), and Western Region (12 states). The state of Missouri (Central Region) ranked in the top–ten states in all years of analysis, garnering top honors in five of eleven years (1996, 1999, 2003, 2004, & 2006). Teams from the state of Minnesota (Central Region) recorded nine top–ten rankings; twice as national champion (2000 & 2005). Teams from Montana (Western Region) placed nine times in the top–ten, and claimed one national title (1998). Both Iowa (Central Region) and Texas (Western Region) have had teams finish in the top–ten eight times each. Oregon (Western Region) and North Dakota (Central Region) each have placed teams in the top–ten six times. The states of Wisconsin (Central Region), Pennsylvania (Eastern Region), and Illinois (Eastern Region) respectively, each hold one national title, and appeared in the top–ten a minimum of four times; Wisconsin finished five times. Other states with four top–ten finishes include California (Western Region), North Carolina (Southern Region), South Dakota (Central Region), and Washington (Western Region). Kansas (Central Region) and Nebraska (Central Region) each have three top–ten placing, and Connecticut (Eastern Region) and Wyoming (Central Region) each have two. The states of Florida (Southern Region), Georgia (Southern Region), Maryland (Eastern Region), and Oklahoma (Central Region) all have one top–ten finish (Table 1).

A comparison of performance by region reveals Central Region states placed more teams in the top ten over the period from 1996–2006 than any other region (*f* = 61; 55.5%), and experienced a national winning team more times than any other region (*f* =8; 72.7%). The Eastern Region tied with Western Region in the number of states finishing in the top ten (*f* = 21; 19.10%). Eastern Region (*f* = 2, 18.20%) led Western Region (*f* =1, 9.0%) with the number of national champions. Southern Region ranks fourth among the national regions with seven top –ten finishers (6.30%), and no national champions (Table 2).

Table 1
Rankings Of Top Ten States and Region Affiliation In National Agricultural Mechanics CDE From 1996–2006

Rank	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1st	MO[a]	PA[b]	MT[a]	MO[a]	MN[a]	WI[a]	IL[b]	MO[a]	MO[a]	MN[a]	MO[a]
2nd	TX[d]	MN[a]	MO[a]	IA[a]	WA[d]	MO[a]	TX[d]	MN[a]	TX[d]	TX[d]	ND[a]
3rd	MN[a]	MO[a]	IA[a]	ND[a]	TX[d]	IA[a]	IA[a]	WA[d]	IA[a]	IL[b]	NC[c]
4th	CT[b]	OR[d]	OK[a]	TX[d]	PA[b]	MT[a]	ND[a]	ND[a]	MN[a]	MO[a]	CT[b]
5th	OR[d]	IA[a]	NE[a]	KS[a]	WY[a]	TX[d]	WA[d]	IL[b]	KS[a]	NY[b]	MT[a]
6th	IA[a]	SD[a]	TX[d]	MN[a]	WI[a]	CA[d]	MT[a]	FL[c]	WI[a]	ND[a]	PA[b]
7th	IL[b]	WI[a]	WI[a]	MT[a]	MT[a]	OR[d]	OH[b]	PA[b]	MT[a]	NC[c]	OH[b]
8th	VA[b]	OH[b]	OH[b]	MD[b]	KS[a]	KS[a]	MN[a]	MT[a]	IN[b]	CA[d]	IA[a]
9th	MT[a]	WA[d]	NC[c]	AL[c]	OR[d]	NE[a]	SD[a]	OR[d]	OH[b]	KY[b]	MN[a]
10th	CA[d]	NE[a]	CA[d]	SD[a]	MO[a]	WY[a]	NC[c]	SD[a]	ND[a]	PA[b]	GA[c]

Note: [a] Central Region; [b] Eastern Region; [c] Southern Region; [d] Western Region, Source: National FFA Organization, 2008.

Table 2
Comparison Top–Ten State Placings by National FFA Regions

	Champions		Top–Ten Finishes	
Region	*f*	%	*f*	%
Central	8	72.7	61	55.5
Eastern	2	18.2	21	19.1
Western	1	9.0	21	19.1
Southern	0	0.0	7	6.3
Total	11	100.0	110	100.0

Evaluation Objective 2

The second objective was to describe the contestant scores for the five system–areas and written exam and team activity scores by National FFA regions for the ten year period of 1996 to 2006. The mean scores and standard deviations of contestant's scores by CDE area by FFA regions are presented in Table 3. The data represents that the means scores associated with the Central Region and Western Region are numerically higher than Eastern Region and the Southern Region in all sub–event areas. Western Region was numerically higher than the Central Region in the sub–event area, structures systems.

Table 3

Means and Standard Deviations of Contestant Scores by Sub–Event Area by FFA Region for 1996–2006

	Central Region			Eastern Region			Southern Region			Western Region			Total		
Sub Event Areas	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*N*
Exam[a]	64.70	11.18	305	55.73	12.75	423	56.20	12.24	196	61.36	12.65	227	59.30	12.82	1151
M&E[b]	21.03	6.44	305	17.24	7.17	423	18.08	7.32	196	18.65	7.21	227	18.66	7.17	1151
I&M[c]	15.91	8.03	305	12.38	8.91	423	12.34	8.24	196	13.11	8.62	227	13.46	8.63	1151
Energy[d]	19.44	8.17	305	17.29	8.30	423	17.68	8.50	196	18.69	8.60	227	18.20	8.40	1151
Struct.[e]	18.38	5.75	305	15.20	6.04	423	16.19	6.20	196	19.28	5.80	227	17.01	6.17	1151
E&NR[f]	21.51	7.20	305	17.84	7.77	423	19.04	7.47	196	19.63	7.77	227	19.37	7.70	1151
Team[g]	56.88	13.18	305	46.09	18.33	423	46.19	16.42	196	51.72	13.71	227	50.08	16.73	1151
Total	217.28	34.98	305	181.32	43.74	423	185.26	41.55	196	201.93	38.00	227	195.59	42.75	1151

Note. System area scores are out of 30 points; written exam total is 100 points; team activity is 250 points total. [a] Written Exam Total; Total; [b] Machinery and Equipment System; [c] Industry and Marketing Systems; [d] Energy Systems; [e] Structures System; [f] Environmental and Natural Resource System; [g] Team Activity

Evaluation Objective 3

The third objective of this study was to determine if a significant difference exists among national regions. An analysis of variance (ANOVA) was conducted to determine if the observed differences were statistically significant (Buriak et al., 1985). A one–way between–group ANOVA conducted to examine the impact of national region on the dependent variable on all sub–event area scores and overall individual event scores. There was a statistically significant difference at the $p < .01$ level in overall individual score for the four different regions (F (3, 1731) = 64.2, p = .01). The effect size, calculated using omega squared, (Field, 2009) was .10. Post–hoc comparisons using Tukey HSD test revealed that mean score for Central Region (M = 212.67, SD = 38.70) was significantly different from Eastern Region (M = 179.01; SD = 45.22), Southern Region (M = 181.94; SD = 41.42), and Western Region (M = 197.49; SD = 41.57). Western Region was significantly different from both Eastern and Southern Regions (Table 4). Table 5 presents the F–values of sub–event areas scores and overall individual event scores by FFA Region. All sub–event area scores were found to be significant.

Table 4
One–Way Analysis of Variance for Comparison of Individual Overall Event Scores by FFA Region

Source	*df*	*SS*	*MS*	*F*	*p*	ω^2
Between Groups	3	342678.58	114226.20	64.16	.000	.10
Within Groups	1731	3081858.72	1780.39			
Total	1734	3424537.31				

** p<.01

Table 5
F– Values Generated by Analysis of Variance of Individual Sub–Event Scores & Overall Individual Event Scores by FFA Region

Activities	*F*–Value **
Written Exam Total	38.08
Machinery and Equipment Systems Exam	22.08
Industry and Marketing Systems Exams	16.89
Energy Systems Exam	18.45
Structural Systems Exam	27.62
Environmental & Natural Resource Systems Exam	19.65
Machinery and Equipment Systems	17.74
Industry and Marketing Systems	11.94
Energy Systems	4.42
Structural Systems	30.84
Environmental & Natural Resource Systems	14.05
Individual Team Activity Score	31.36
Overall Individual Event Score	53.87

Note. ** $p < .01$

All sub–event area scores had a significant (p. < .01) positive correlation with overall individual event score. The Pearson correlation analysis revealed a significant, positive relationship between the dependant variable of overall individual event score and all of the independent variables: written exam–total score (.79), machinery and equipment systems (.54), industry and marketing systems (.63), energy systems (.50), structural systems (.52), environmental and natural resource systems (.57) and team activity (.70). Table 6 presents correlation coefficients and effect size for the relationship between each of the six sub–event scores and individual written exam system area components.

Table 6
Relationship Between Sub–Event Area Scores And Overall Individual Event Score

Sub–Event Areas	*r*	Effect Size [a]
Written Exam Total	.79**	High correlation
Machinery and Equipment Exam	.61**	Moderate correlation
Industry and Marketing Exam	.63**	Moderate correlation
Energy Systems Exam	.63**	Moderate correlation
Structural Systems Exam	.62**	Moderate correlation
Environ. and Natural Resource Sys Exam	.49**	Low correlation
Machinery and Equipment Systems	.54**	Moderate correlation
Industry and Marketing Systems	.63**	Moderate correlation
Energy Systems	.50**	Moderate correlation
Structural Systems	.52**	Moderate correlation
Environmental and Natural Resource Systems	.57**	Moderate correlation
Team Activity [a]	.70**	High correlation

Note. [a] Team activity score is composite of three team members.
** $p < .01$

As expected, the variable written exam total shows a strong positive correlation with overall individual event score. The written exam total is a composite score (100 points) of the five system areas (20 points each). Further analysis examined the individual components of the written exam. The seven independent variables were further analyzed to determine if a model could be constructed which would explain a significant portion of the variance associated with overall individual event score. The first step in the process was to determine the inter–correlation between each pair of potential predictor variables (Ferguson, 1981). In order for a variable to serve as a good predictor in a regression model, the variable needs to possess two characteristics: a high correlation with a variable to be predicted and little or no correlation with other potential predictor variables (Pedahazur, 1982). These correlation coefficients are presented in Table 7.

Table 7
Inter–Correlations Between Potential Predictor Variables, Written Exam Total Score, System Area Skills, and Team Activity

Measure	1	2	3	4	5	6	7
1. Written Exam–Total	–						
2. Mach and Equip Mgnt. Systems	.46**	–					
3. Industry and Mark. Systems	.48**	.24**	–				
4. Energy Systems	.24**	.18**	.27**	–			
5. Structural Systems	.37**	.27**	.25**	.21**	–		
6. Environ. and Nat. Res. Systems	.40**	.35**	.20**	.26**	.17**	–	
7. Team Activity	.38**	.13**	.30**	.18**	.25**	.24**	–

Note. ** $p < .01$

Both the machinery and equipment management system portion (r =.46) and the industry and marketing system portion (r =.48) showed relatively moderate positive correlation with the written exam–total score, and neither reveal a strong correlation with other system portions of the written exam.

Table 8
Analysis of Variance for the Stepwise Multiple Regression Analysis of Overall Individual Event Written Exam System Area Scores

Source	*df*	*SS*	*MS*	*F*	*p*
Regression	5	1392546.89	278509.38	443.04	.000 [a]
Residual	1145	719782.32	628.63		
Total	1150	2112329.21			

Note. [a] Predictors: (Constant) E&NR exam score, Indus exam score, Struct exam score, Mach exam score, Energy exam score.

Evaluation Objective 4

The aim of the fourth evaluation objective was to explain the proportion of variance in overall individual event scores by the sub–event system area skill and exam portion scores.

The mean of the total overall individual event score was used as the dependent variable in this analysis. The written exam has accounted for the largest proportion of the total variance explained in overall individual event score (Buriak et al., 1985). Since the overall point value of the written exam is higher than the point values of the system area skills, the system area sections that make up the written exam were analyzed to determine how much variance in overall individual event score could be explained by scores on the system area portions of the written exam. Table 9 presents the means, standard deviations and correlations for the five system area portions of the written exam and the overall individual event score.

Table 9
Means, Standard Deviations, and Correlations for Overall Individual Event Score and Written Exam System Area Predictor Variables

Variable	*M*	*SD*	1	2	3	4	5
Overall Individual Event Score	192.07	44.44	.62**	.63**	.63**	.62**	.49**
Predictor variable							
1. Mach Score	12.51	3.25	–				
2. Indus Score	13.22	2.98	.47**	–			
3. Energy Score	11.34	3.26	.43**	.49**	–		
4. Struct Score	12.10	3.46	.39**	.44**	.53**	–	
5. E & NR Score	10.13	4.26	.45**	.39**	.43**	.43**	–

Note: ***p*<.01.

Four of the five system area skills achieved correlations of greater than 0.6 (r =.6), and showed little correlation with other system skill areas. The four system area skill variables (machinery and equipment system score, industry and marketing system score, energy systems score, and structures system score) were entered into a stepwise, multi linear regression model (Table 11). The full model was significant p = .001). The variable of industry and marketing system score, explained 40% of the variance in the overall individual event score. Structures system exam score accounted for 14.5% unique variance, machinery and equipment system exam score accounted for 7.8% unique variance, and energy system exam score accounted for 3.7% of unique variance. An examination of the residuals showed assumptions were not violated (the lowest tolerance factor = .62, and the highest VIF = 1.61). Table 11 is a presentation of the summary of the dependent variable overall individual event score regressed on each of the independent variables.

Table 10
Summary of Stepwise Regression Analysis for System Area Variables Explaining Overall Individual Event Score (N=1151)

Variable	*B*	*SE B*	*ß*	*t*	*p*
Industry and Marketing System Score	3.80	.31	.27	12.42	.00
Machinery and Equipment System Score	3.75	.29	.26	12.43	.00
Energy System Score	3.19	.29	.26	13.91	.00
Structure System Score	3.25	.26	.28	11.08	.00
(Constant)	23.06				

Note. Full Model: R^2 =.40; *Adjusted* R^2 =.40; F = 551.75; p =.001

Conclusions/ Implications/ Recommendations

Based on the objectives that guided this inquiry and the findings reported the following conclusions were drawn. The first objective was to identify the rankings of the top–ten states participating in the National Agricultural Mechanics CDE from 1996–2006. Previously reported research of national agricultural mechanic CDE scores for the period 1979–1984 (Buriak, et al., 1985) suggested a *regional bias* existed based on a review of scores by national FFA region performance. Scores of contestants from the Central Region were found to be higher than scores of contestants from the three other national regions. An observation of the present study revealed that on the surface, this trend continued: Central Region states and the state of Missouri in particular, continued to perform at a high level in the national agricultural mechanics CDE. From 1996 to 1998, the national CDE was conducted in the state of Missouri. Did this provide a *home field* advantage for teams competing from Missouri? Further examination reveals that contestants from the state Missouri continued to score well enough to remain in the top–ten teams nationally after the CDE moved from Kansas City, MO to Louisville, KY in 1999. Are there other variable that should be considered? Are contestants from Missouri coming from the same school or prepared for national competition by the same coach or teacher? Does performance at the state–level CDE have an effect on national–level performance? Other states from the Central Region have success in the CDE: the states of Minnesota, Montana, and Iowa each have placed in the top–ten several times during the period of study.

The mean total event score was 195 points (78%) out of the 250 points. Mean total event scores for the Central Region and Western Region were higher than the Southern and Eastern Region. Central Region scores were higher in all sub–event system areas except Systems – Structures (Western Region). Are states in the Western Region better prepared in skills related to the Structures System skill area?

Does this suggest that teams from the Central and Western regions are better prepared than teams from the Southern and Eastern Region? Are the system area skills to narrow in scope for a national–level CDE? Conclusions from previous agricultural mechanic CDE evaluation recommended that (then) system area Power and Machinery Skills and Construction and Maintenance skills should be “modified to increase the variability of scores” (Buriak, et al., 1985, p. 32), and the written examination accounted for the largest proportion of the total variance explained in overall individual event score. An attempt was made to dissect the written exam total score and analyze the five system area components to determine factors which contribute to success on the written exam portion of the overall individual event score.

The *National Research Agenda of Agricultural Education and Communication* (Osborne, 2007), RPA 5 Determine the effects of agricultural education instruction, indicated the need to identify the professional development needs of agricultural educators.

This analysis was conducted with all contestant scores in the National Agricultural Mechanics Career Development Event for the ten–year period 1996–2006. Could additional data collected from states such as demographics of contestants (i.e., gender, age, and years of agricultural education) aid researchers in identifying variables that may contribute to student success? Similar research of student performance in agricultural mechanics CDE (Franklin & Miller, 2005; Johnson 1991, 1993) identified level of high school math, years in agricultural education, and grade in agricultural education as potential variables contributing to student success in state–level CDE.

A question raised by this study based on the record of performance of one state, is how state FFA associations certify teams to compete at the national level. Do team members come from the same school, or are they the top contestants from the state–level event?

Agricultural production equipment used for system area skill activities are provided by local producers or regional equipment dealers based on local supply and logistics. Does this present an *advantage* to teams from states residing within the same geographical region? These findings were generally consistent with the Buriak, et al, (1985) research study. Just as the national Agronomy CDE rotates among five cropping regions with specific plants (National FFA, 2008), the team activity for the agricultural mechanic CDE should consider adopting a regional application while continuing to use the rotational theme of animal systems, plant systems, material handling systems, integrated pest management systems, and processing systems. A scenario describing a specific plant or crop and related equipment may be posted to the national agricultural mechanics CDE Website in mid–summer. Teams have six months to research the information posted on the website and prepare reports for a presentation to a panel of judges on the first day of the event.

Research should be conducted at the FFA region–level to explore the format and contents of state–level agricultural mechanic CDE. Do all states follow the format of the national agricultural mechanic CDE? Do state events follow the annual theme announced at the national level? Does a relationship exist between the number of times a contestant competes in agricultural mechanics CDE within a state and the level of success at the state–level? One challenge of conducting a national–level CDE is developing activities that are relevant and appropriate to contestants in all states across the nation.

A model for conducting evaluations of CDE using ADDIE is proposed. Figure 3 shows the process of moving from each of five stages. The *Design* stage occurs immediately following the CDE. The following year's theme is announced. Potential system area skills are presented and industry resources identified. During the *Development* stage, both cognitive and psychomotor competencies are identified and developed by organizing committee. Information posted to the national CDE Website is updated and finalized. During the *Implementation* stage, activities come together and the written exam is developed. Communication between committee members, industry members, and National FFA staff becomes critical for planning and implementation. The CDE is conducted, scores tabulated, analyzed, and awards & recognition occurs. The *Evaluation* stage occurs both during and after the CDE. During a meeting conducted with the coaches and teachers, suggestions for future skill activities are solicited by the committee members. A contestant evaluation survey is administered during the final round of the system area skill activity on the last day of the CDE. Finally, the organizing committee meets with members of National FFA Organization prior to the end of the five–year revision process. *Analysis* is the final stage where industry members communicate with organizing committee members to identify relevant and rigorous competencies to update the CDE handbook.

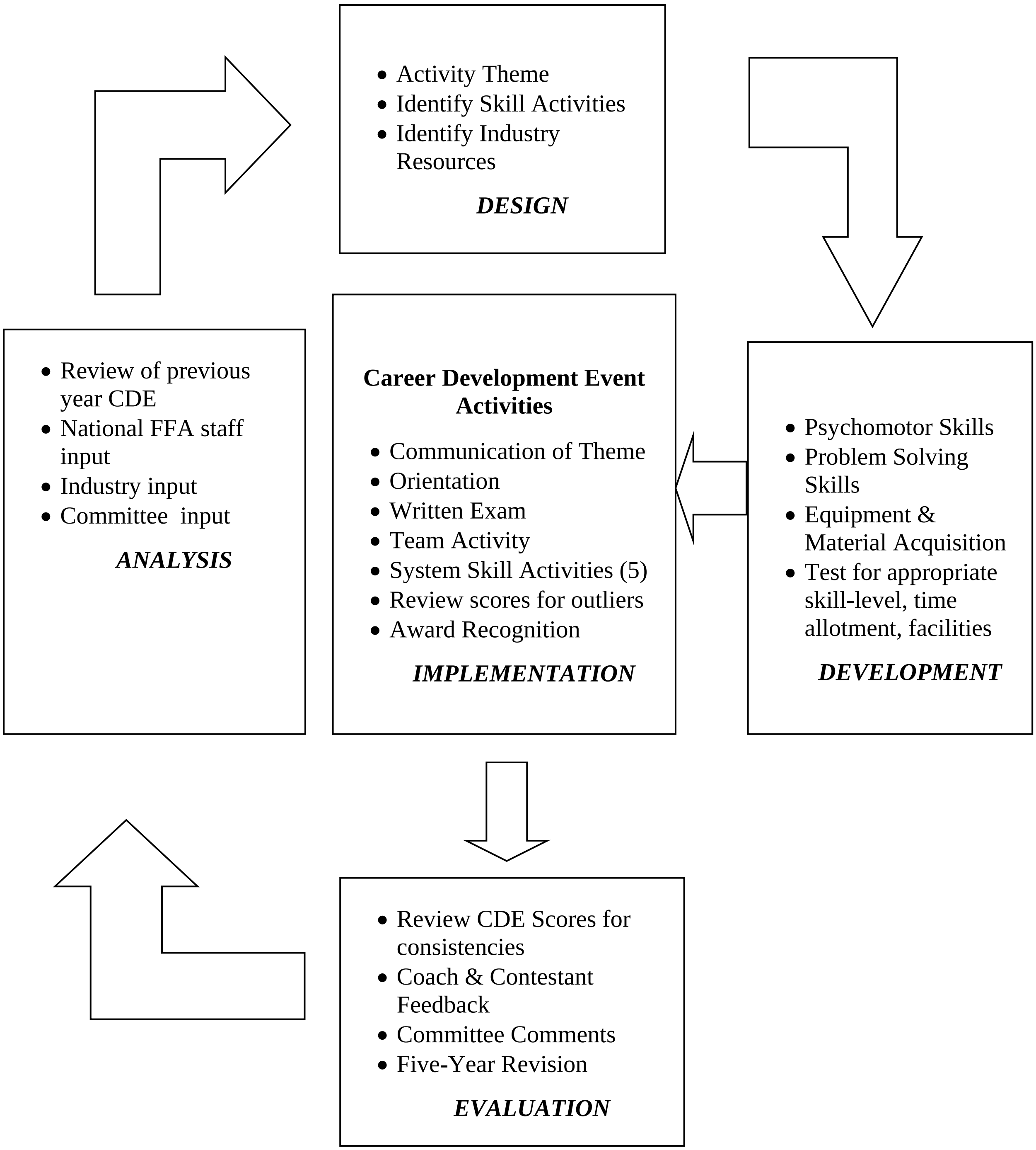

Figure 3. Proposed ADDIE Model for conducting an evaluation of the national agricultural mechanics CDE.

Future analysis of national agricultural mechanic CDE scores should continue and follow the five–year national CDE revision process to determine if recent changes made in the event format and system area scoring have any effect on student performance. The review should begin with scores obtained during the period of 2007 to 2011. A study of the performance of states from the Central Region should be conducted to determine factors that have contributed to student success. Perhaps an ethnographic study of the coaches and advisors responsible for training successful teams may reveal effective training methods employed to prepare students for national competition. A question to ask is should the CDE organizing committee consider developing a regional rotation of themes, similar to the national Agronomy CDE? For the team activity, should a scenario be developed reflective of a regional agricultural mechanics situation for teams to research, address, and present at the national event? Additional research should address the percentage of teachers using the agricultural mechanics CDE Website hosted by the University of Missouri for locating updated information about forthcoming national competition.

Further analysis should be conducted to determine if undetermined variables such as contestant age, gender, years of agricultural education, supervised agricultural education (SAE) experience level of preparedness, experience of instructor/coach, following directions, or group order in event rotation have any effect on individual or team performance. This data can be gathered as part of the post–CDE evaluation administered to the contestants during the final round of the system area skill activity.

Event superintendents of the 23 other national CDE should consider conducting a similar internal evaluation of individual and team scores to determine trends and patterns which may be evident in their own CDE.

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