Agricultural Systems Management-Related Industry Perceptions of Knowledge and Skill Needs for Beginning Managers in West Texas

Kyle W. McGregor, Tarleton State University
Steve Fraze, Texas Tech University
Matt Baker, Texas Tech University
Chad Davis, Texas Tech Universtiy

Abstract

Staying current with the ever-changing landscape of technology and industry needs have been traditional challenges for all agricultural disciplines, and agricultural systems management is no exception. Where will we go next and whom do we ask for direction? The purpose of this study is to assist us in answering such questions. This study attempted to determine the skill and knowledge areas that were most valuable to managers entering an agricultural systems-related business. Agricultural systems management-related practitioners identified specific skills and knowledge areas that were important to beginning managers, and disclosed trends in general course areas that evolved from multiple skills and knowledge areas in selected course areas. Findings indicate what prior research has suggested in agricultural disciplines: current managers believe that a broad-based general education is more important than an overly specific and specialized degree. Also, the authors suggest that departments of agricultural mechanization, agricultural systems management, agricultural engineering, and agricultural education focus their efforts on the inclusion of scientific and mathematic principles in their curricula that can be readily transferred across the agricultural industry by students who are seeking employment.

Introduction

Change is inevitable, so why then do we resist? During the last three decades the discipline commonly referred to as Agricultural Mechanics has been challenged with a paradigm shift from vocational training to a highly technological systems management approach (a.k.a. Agricultural Systems Management). Shinn (1998) describes a developing paradox in which increased technology in the agricultural industry has been contradicted by a decreasing technology emphasis in teacher preparation institutions in agricultural education. Others involved with agricultural education, agricultural mechanization, and other related traditionally vocational disciplines have cautioned and called for change in their disciplines and respective curricula in order to avoid being left behind (Buriak, 1992; Harper, Buriak, & Hilton, 1995; McCarthy, 1985; Scanlon, Bruening, & Cordero, 1996; Smith, 1999).

A change in curriculum is the battle cry for numerous branches of academia when a particular discipline seems threatened. "College curriculum modification occurs in response to deficiencies in the programs caused by course and personnel changes, the need to add new subject matter, college and university requirements, and concern for meeting contemporary societal needs" (Merritt & Hamm, 1994, p. 112). The latter seems to be the consensus for radical change with most departments and professionals associated with agricultural mechanization and agricultural education—more specifically, the need to meet or align with industry expectations for employee skills and knowledge. There is also a trend in departments of agricultural systems management and agricultural mechanization to focus more on scientific and mathematic foundations that underlie the curriculum and can be transferred throughout careers in agriculture (Harper, Buriak, & Hitchings, 2001; Heger, 2000; &Shinn, 1998). In a Delphi study, Shinn (1998) developed fifteen in-service strategies, five of which were directly related to industry, to bolster the agricultural mechanics skills of secondary agriscience teachers. Shinn also recommends that teacher educators develop stronger ties to industry in order that preservice teachers enter the field prepared. Numerous studies have recommended utilizing industry as a major source of input for developing programs, curricula, and degrees (Baker & McLaughlin, 1996a, Baker & McLaughlin, 1996b; Belcber & McCaslin, 1997; Bingharn Catrl, 1998; Brown, 1999; Daniels, McKenna & Parker, 1992; Harbstreit, Stewart & Birkenholz, 1988; McCarthy, 1985; Merritt, 1994; Scanlon, Bruening, & Cordero, 1996; & Vamadore & Iverson, 1991).

It is imperative that industry serves as a cornerstone for development of appropriate and up-to-date curriculum. Who, then, in industry do we seek out as a source of information? According to a study conducted by Harbstreit et al. (1988), "Manager/supervisor perceptions were believed to be the most indicative of future educational/training needs" (p. 12). Baker and McLaughlin (1996a, 1996b) utilized current managers in California's nursery industry in order to determine horticultural needs for beginning managers. Therefore, industry managers are considered a viable source of information when considering occupational needs.

Purpose and Objectives

The purpose of this study was to determine the skill and knowledge areas that were most valuable to managers entering an agricultural systems-related business. The objectives of the study were to:

1. Describe the background and demographic characteristics of current managers of an agricultural systems management-related business in the Panhandle, Permian Basin, and South Plains regions of Texas;
2. Determine the knowledge and skill areas that were most important for beginning managers in individual agricultural systems-related business in the Panhandle, Permian Basin, and South Plains regions of Texas (cotton gins; cotton gin services; mechanized equipment dealers; peanut buying, selling, and end-points; equipment manufacturers; grain elevators; irrigation equipment retailers/manufacturers; and packing plants); and
3. Determine course area trends resulting from multiple knowledge and skill items in single-course areas.

Methodology

This descriptive study utilized a stratified random sample in order that each business type (strata) have proportional representation, which is defined as proportional allocation (Hinkle, Wiersma, & Jurs, 1998). Random samples were taken from each strata, utilizing procedures suggested by Krejcie and Morgan (1970). Cotton gins (N = 216, n = 140); cotton gin services (N = 124, n = 97); mechanized equipment dealers (N = 83, n = 70); peanut buying, selling, and end-points (N = 16, n = 15); equipment manufacturers (N = 30, n = 28); grain elevators (N = 65, n = 56); irrigation equipment retailers/manufacturers (N = 65, n = 56); and packing plants (N = 4, n = 4), which yielded an overall sample of n = 466 participants from a total population of N = 603. The population for the study was developed utilizing membership in business associations (cotton gins, cotton gin services, peanut buying, selling, and end-points, and equipment manufacturers), dealership directories (mechanized equipment dealers and irrigation equipment retailers/manufacturers), and Texas Department of Agriculture listings (grain elevators and packing plants).

A questionnaire was developed utilizing current course curriculum, catalogs, and descriptions from departments of agricultural mechanization, agricultural systems management, agricultural engineering, and agricultural education from across the nation. The instrument was representative of all of the course areas from universities. These included electricity, electronics, and computers; agricultural structures; land improvement and irrigation; mechanical power; processing, and storage; metal technologies; and cropping equipment. Also added to the instrument were general categories that were apparent in university degree plans for agricultural mechanization-related majors and applicable to managerial positions, which included general business knowledge; management, marketing and sales knowledge; and governmental compliance. Finally, the instrument collected follow-up and demographic data. Table 1 indicates the name of each course area as well as the number of competencies or skills in each area.

Table 1: Representative course areas and competencies for each in order of appearance in the instrument

Course Area	Number of Competencies
General Knowledge (GK)	7
Management, Marketing, & Sales Knowledge (MMS)	12
Electricity, Electronics, & Computer Knowledge (EEC)	7
Agricultural Structures Technology Knowledge (AS)	7
Land Improvement & Irrigation Technologies Knowledge (LII)	6
Mechanical Power Technologies Knowledge (MP)	9
Governmental Compliance (GC)	4
Processing & Storage Technologies Knowledge (PS)	12
Metal Technologies Knowledge (MT)	4
Cropping Equipment Technologies Knowledge (CE)	6

Participants were asked to indicate the amount of importance they placed on individual items in each course area. Respondents marked the level of importance for their respective business according to a four-point Likert scale. Skill/knowledge items were indicated as important, somewhat important, somewhat unimportant, or unimportant. Responses were coded with 4 representing important and 1 representing unimportant.

The instrument was developed and administered according to Dillman's tailored design method (Dillman, 1999). The instrument was reviewed by a panel of agricultural mechanization and agricultural education experts from universities and businesses in the state of Texas for face and content validity. The instrument was adjusted according to the recommendations of the expert panel before being pilot tested. Pilot test participants consisted of population members not chosen for the sample (N = 50) and were chosen for the pilot in the same manner as the sample participants. The reliability of the instrument was calculated using Cronbach's alpha, which yielded a reliability coefficient of r = .84 or greater for each course area.

The instruments, cover letters, and return envelopes were mailed to the sample during the spring of 2001. One week later, reminder postcards were mailed to non-respondents. Approximately two weeks later, a second round of instruments were mailed to non-respondents. The combined response rate from all stratified samples was 57%.

Non-response error was controlled using a comparison of early and late respondents, in which no significant differences were detected. According to Ary, Cheser Jacobs, and Razavieh (1996), if no significant differences exist between early and late respondents, the non-respondents were believed to be typical of the late respondents. All data were analyzed using SPSS for Windows statistical software program.

Results

A number of demographic variables explain the current situation for current managers of an agricultural systems management-related business in the Panhandle, Permian Basin, and South Plains regions of Texas. Most respondents were exposed to postsecondary education, 33% had some college, while 40.7% had earned a bachelors degree. High school graduates accounted for 19.6% of the managers, while only 4.1% held degrees beyond a bachelor's degree.

The respondents have been associated with their respective industry for an average of 27.9

years, (sd = 13.01), and have been employed by their current organization for 17.7 years, (sd = 11.45). A majority (63.1%) of the agricultural systems management-based businesses operated in one location only, and of those with multiple locations, most were primarily represented by two to three locations. When asked what types of business they were working for, 41.5% responded that they worked for a corporation and 24.9% were employed by some type of cooperative. Finally, most managers (69%) indicated that they were employed by organizations that employed one to fifteen full-time employees.

The following tables summarize skill/knowledge items within the course areas that were perceived to be the highest level of importance. Each table represents a different business type within the agricultural systems management-related businesses of the Panhandle, Permian Basin, and South Plains regions of Texas. The general course areas created from the university departments of agricultural mechanization, agricultural systems management, agricultural engineering, and agricultural education were electricity, electronics, and computers (EEC); agricultural structures (AS); land improvement and irrigation (LII); mechanical power (MP); processing and storage (PS); metal technologies (MT); cropping equipment (CE); general business knowledge (GBK); management, marketing, and sales knowledge (MMS); and governmental compliance (GC).

Table 2 summarizes the most important skill/knowledge items from course areas according to current managers of cotton gins. Skill/knowledge items have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance.

Table 2: Skill/knowledge items of greatest importance according cotton gin managers (N = 140)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	3.63	.73
General Math Skills (GBK)	3.51	.69
Executive Leadership (MMS)	3.35	.78
Operations Management (MMS)	3.30	.75
Safety Training (GC)	3.29	.83

According to gin managers, customer service, general math skills, executive leadership, operations management, and safety training are of importance to beginning managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: general business knowledge (2 items), management, marketing, and sales (7 items), electricity, electronics, and computers (3 items), and governmental compliance (2 items). This indicates agreement of importance between managers according to course areas; therefore, managers of cotton gins see these general course areas as important.

Table 3 summarizes the most important skill/knowledge items from course areas according to current managers of cotton gin services. Skill/knowledge have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance

Table 3: Skill/knowledge items of greatest importance according cotton gin service managers (N = 97)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	3.81	.54
Safety Training (GC)	3.44	.51
General Math Skills (GBK)	3.31	.87
OSHA Regulations (GC)	3.20	.68
Principles of Sales(MMS)	3.19	.98

According to gin service managers, customer service, safety training, general math skills, OSHA regulations, and principles of sales are of importance to beginning managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: management, marketing, and sales (5 items) and governmental compliance (3 items). This indicates agreement of importance between managers of cotton gin services in relation to course areas.

Table 4 summarizes the most important skill/knowledge items from course areas according to current managers of mechanized equipment dealers. Skill/knowledge items have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance.

Table 4: Skill/knowledge items of greatest importance according to managers of mechanized equipment dealers (N = 69)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	3.64	.87
Principles of Sales (MMS)	3.46	.68
General Math Skills (GBK)	3.46	.72
Equipment Maintenance & Selection (CE)	3.45	.65
Equipment Adjustment & Calibration (CE)	3.42	.64

According to managers of mechanized equipment dealers, customer service, principles of sales, general math skills, equipment maintenance and selection, and equipment adjustment and calibration are important for beginning managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: general business knowledge (2 items), management, marketing, and sales (10 items), mechanical power (4 items), governmental compliance (2 items), and cropping equipment (5 items). This indicates agreement of importance between managers according to course areas; managers of mechanized equipment dealers see these general course areas as important.

Table 5 summarizes the most important skill/knowledge items from course areas according to current managers of peanut buying, selling, and end-points. Skill/knowledge items have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance.

Table 5: Skill/knowledge items of greatest importance according to peanut buying, selling and end-point managers (N = 15)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	3.67	.52
Organizational Management (MMS)	3.67	.52
Executive Leadership (MMS)	3.50	.55
Quality Control (PS)	3.50	.57
Transportation (PS)	3.50	.68

According to peanut buying, selling, and end-points managers, customer service, organizational management, executive leadership, quality control, and transportation are of importance to beginning managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: general business knowledge (2 items), management, marketing, and sales (10 items), governmental compliance (2 items), and processing and storage (5 items). This indicates agreement of importance between peanut buying, selling, and end-point managers according to course areas; these general course areas are seen as important.

Table 6 summarizes the most important skill/knowledge items from course areas according to current equipment manufacturer managers. Skill/knowledge items have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance.

Table 6: Skill/knowledge items of greatest importance according equipment manufacturer managers (N = 28)

Skill/Knowledge Item & Course Area	Mean	SD
General Math Skills (GBK)	3.43	.79
Economics (MMS)	3.17	.75
Customer Service (MMS)	3.13	.83
Agricultural Marketing (MMS)	3.00	.82
Arc Welding Operations (MT)	3.00	1.1

According to managers of equipment manufacturers, general math skills, economics, customer service, agricultural marketing, and arc welding operations are all of importance to beginning managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: management, marketing, and sales (4 items) and metal technologies (2 items). This indicates agreement of importance between managers according to course areas; equipment manufacturer managers see these general course areas as important.

Table 7 summarizes the most important skill/knowledge items from course areas according to current grain elevator managers. Skill/knowledge items have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance.

Table 7: Skill/knowledge items of greatest importance according grain elevator managers (N = 56)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	3.74	.66
General Math Skills (GBK)	3.63	.72
Organizational Management (MMS)	3.41	.80
Safety Training (GC)	3.33	.89
Principles of Sales (MMS)	3.29	.87

Customer service, general math skills, organizational management, safety training, and principles of sales are of importance to beginning managers according to current grain elevator managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: general business skills (2 items), management, marketing, and sales (8 items), governmental compliance (3 items), and processing and storage (2 items). This indicates agreement of importance between managers according to course areas; grain elevator managers see these general course areas as important.

Table 8 summarizes the most important skill/knowledge items from course areas according to current irrigation equipment retailers/manufacturers managers. Skill/knowledge items have been ranked by level of importance, in which a level of 4.0 indicates the highest level of importance.

Table 8: Skill/knowledge items of greatest importance according to irrigation equipment retailers/manufacturers managers (N = 56)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	3.73	.67
General Math Skills (GBK)	3.62	.57
Organizational Management (MMS)	3.58	.70
Principles of Sales (MMS)	3.54	.76
Water Control Structures & Irrigation Equipment (LII)	3.46	.86

According to irrigation equipment retailers/manufacturers managers, customer service, general math skills, organizational management, principles of sales, and water control structures and irrigation equipment are of importance to beginning managers. Other than high-ranking individual skill/knowledge items, trends have developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. The following course areas show trends of high-ranking skill/knowledge items: general business knowledge (2 items), management, marketing, and sales (8 items), electricity, electronics, and computers (2 items), and land improvement and irrigation (2 items). This indicates agreement of importance between managers according to course areas; irrigation equipment retailers/manufacturers managers see these general course areas as important.

Table 9 summarizes the most important skill/knowledge items from course areas according to current packing plant managers. Skill/knowledge items have been ranked by level of

importance, in which a level of 4.0 indicates the highest level of importance.

Table 9: Skill/knowledge items of greatest importance according to packing plant managers (N = 4)

Skill/Knowledge Item & Course Area	Mean	SD
Customer Service (MMS)	4.00	.00
Eight additional skill/knowledge items	3.50	.71

According to packing plant managers, customer service is important to beginning managers. The authors were reluctant to report the remaining skill/knowledge items with means of 3.5 (sd = .71) because of a low response rate in relation to a small population and sample for packing plants. Other than high-ranking individual skill/knowledge items, trends were developed according to the number of highly important skill/knowledge items among the course areas. Individual skill/knowledge items in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important were recorded. Although response rate was low, the following course areas show trends of high-ranking skill/knowledge items: general business knowledge (2 items), management, marketing, and sales (7 items), electricity, electronics, and computers (4 items), agricultural structures (2 items), governmental compliance (4 items), and processing and storage (8 items).

Conclusions/Recommendations

Managers of agricultural systems management-related businesses are in a position to offer a unique perspective of the diverse and exciting operations they serve. These individuals typically possess educational levels above the secondary level and hold numerous years of experience. The respondents represent a wide range of organizations, but have indicated that the primary organizational structure in which they are employed are corporations or cooperatives. A vast majority of these businesses operate in one to three locations and employ approximately one to fifteen full-time employees.

Managers of agricultural systems management-related businesses in the Panhandle, Permian Basin, and South Plains regions of Texas have indicated that skills and knowledge areas that are broad-based or general in nature were most important to beginning managers. This is indicated by managers throughout all of the different business types consistently identifying items in the more general areas such as general business knowledge and management, marketing, and sales, rather than areas that are specific to their business type alone. This finding is consistent with those of Baker and McLaughlin (1996a), Merritt and Hamm (1994), and Scanlon, Bruening, and Cordero (1996). This is not to say that managers believe that specific skills and knowledge areas represented by their organization are not important. Perhaps managers feel that areas of skill and knowledge can be better attained through on-the-job experience. It should be noted that areas of skill and knowledge specific to a manager's individual business type were shown to be important to beginning managers areas, but not as important as the general course areas. This finding was made evident when trends were developed according to the number of highly important skill/knowledge items among the course areas in which 75% or more (a mean ≥ 3.0) of the respondents marked somewhat important or important for a selected skill/knowledge area item.

The individual skill/knowledge items of customer service and general math skills were of

great importance for beginning managers. This is consistent with the findings of Shinn (1998), Heger (2000), and Harper, Buriak, and Hitchings (2001), when considering the call for increased emphasis in mathematics. Other important items included principles of sales, organizational and operational management, and governmental compliance items. It is recommended that secondary agriscience program's departments of agricultural mechanization, agricultural systems management, agricultural engineering, and agricultural education focus on these items for students who may choose related career paths. The findings of this study also validate the efforts of faculty nationwide that are concerned with a curriculum that focuses on a principle/systems approach rather than skills/competency approach. Departments of agricultural mechanization, agricultural systems management, agricultural engineering, and agricultural education should focus their efforts on the inclusion of scientific and mathematic principles in their curricula that can be readily transferred across the agricultural industry by students who are seeking employment.

Finally, the authors caution the reader not to overgeneralize the findings in this study. Although finds support prior research in this area, the study was focused on a localized population that may not be generalizable to the rest of the nation. Also, increasingly in-depth research and replication studies should be conducted in order that findings might continue to be reinforced and further generalized to larger populations.

References

Ary, D., Cheser Jacobs, L., & Razavieh, A. (1996). *Introduction to research in education* (5th ed.). Fort Worth, TX: Harcourt Brace.

Baker, M., & McLaughlin, P. (1996a). Nursery industry perceptions of knowledge needs for beginning managers. *NACTA Journal*, *40*, 20-23.

Baker, M., & McLaughlin, P. (1996b). Nursery industry perceptions of horticultural needs for beginning managers. *NACTA Journal, 40* (4), 27-30.

Belcber, G., & McCaslin, N. L. (1997). Ohio agricultural education teachers' attitudes toward national skill standards. *Journal of Agricultural Education, 38* (1), 29-37.

Bingharn Catrl, D. (1998). *Vocational education's image for the 21st Century* (EDO-CE-98-188). Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education.

Brown, B. L. (1999). *Vocational certificates and college degrees* (EDO-CE-99-212). Columbus, OH: ERIC.

Buriak, P. (1992, March). Filling the gap in agriculture. *The Agricultural Education Magazine, 64,* 4, 23.

Daniels, W. L., McKenna, J. R., & Parker, J. C. (1992). Development of a B.S. degree program in environmental science. *Journal of Natural Recourses and Life Science Education, 21* (1), 70-74.

Dillman, D. A. (1999). *Mail and Internet survey: The tailored design method* (2nd ed.). New York: Wiley, John & Sons, Inc.

Harbstreit, S. R., Stewart, B. R., & Birkenholz, R. J. (1988). Manager/supervisor perceptions of the educational needs of urban agribusiness employees. *Journal of Agricultural Education, 29* (2), 10-17.

Harper, J. G., Buriak, P., & Hilton, J. W. (1995). Expert's opinion concerning the agricultural engineering technology/mechanization component of agricultural education in agriculture. *The Journal of Applied Engineering in Agriculture, 11* (1), 54-55.

Harper, J., Buriak, P., & Hitchings, B. (2001). University faculty perceptions of the technology education needs in the food, environmental and natural resources system. ASAE Annual International Meeting, Paper No. 01-8029, 12p.

Heger, R.A. (2000). Identifying the concepts, principles, and applications of technology needed by entry-level workers in food, environmental, and natural resource systems in 2010. Unpublished master's thesis, Department of Agricultural Education, Texas A&M University.

Hinkle, D. E., Wiersma, W., & Jurs, S. G. (1998). *Applied statistics for the behavioral sciences* (4th ed.). Boston: Houghton Mifflin Co.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*, 607-610.

McCarthy, D. A. (1985). Utilizing industry's support for two-year programs in agricultural machinery . *NACTA Journal, 29* (2), 13-15.

Merritt, R. H., & Hamm, M. W. (1994). Agricultural and natural resources curriculum renewal at Cook College, Rutgers University. *Journal of Natural Resources & Life Sciences Education, 23* (2), 112-118.

Scanlon, D. C., Bruening, T. H., & Cordero, A. (1996). An industry perspective on changes needed in agricultural education curricula. *Journal of Agricultural Education, 37* (2), 17-23.

Shinn, G. C. (1998). Transforming agricultural mechanics curriculum through expert opinion to model technologies in food, environmental and natural resource systems. Paper presented at the American Vocational Association Convention. New Orleans, LA.

Smith, B. C. (1999, July). Labor: A study of the automotive industry's scarce resource. *Automotive Manufacturing & Production, 111*, No. 7, 62-63.

Vamadore, W. L., & Iverson, M. J. (1991). Projecting meat industry characteristics in the 21st century using Delphi: Extrapolating curriculum content in agricultural education. *Journal of Agricultural Education, 32* (2), 29-33.

Agricultural Systems Management-Related Industry Perceptions of Knowledge and Skill Needs for Beginning Managers in West Texas

M. Craig Edwards
Oklahoma State University

The researchers followed the tradition of Ralph Tyler and others by soliciting the input of practitioners (i.e., "society") to determine *valuable* competencies that should be held by beginning managers of agricultural systems-related businesses with implications for curriculum development. (The term "valuable" was used in the study's purpose and thereafter it was operationalized as "importance.") In a conceptual or "substantive" (see Camp, 2001) fashion, relevant and important literature was cited. However, less attention was given to what appeared to be the larger, undergirding foundation or "frame" of the study—change and, specifically, change in the context of curriculum reform.

A stratified random sampling procedure was used to ensure "proportional representation" of selected industries; the approach was sound. Contact information was derived from membership-driven sources, however, no mention was made of the possibility of coverage error (i.e., overlooking non-members). Admirably, the researchers cautioned readers to avoid overgeneralizing their findings. Dillman's (2000) recommended follow-up procedures for mail questionnaires were followed. An expert panel and a pilot test were employed to ensure content validity, and a reliability estimate was reported but one could not discern if $r = .84$ was also the overall estimate. The returns of early and late responders were compared; no statistically significant differences were found.

The study's conclusions were supported by literature that comprised the investigation's conceptual base, thus strengthening the manuscript. As a service to the reader, the authors are urged to include a table or a figure describing, in a comprehensive fashion, the "trends of high-ranking skill/knowledge items" to which frequent references were made. Selected questions follow:

1) Should the "focus" on infusing more mathematics and science into the curriculum at the post-secondary level be limited to an integrative approach, or is the issue more fundamental? That is, do the findings of this study as well as supporting literature suggest a need for "reconfiguring" the undergraduate experience as it relates to science and mathematics course taking? Or, can this be accomplished effectively through the redesign and/or development of courses by departments within colleges of agriculture (see Conroy & Trumbull, 2000), i.e., through coursework that should be contextually robust?

2) Should the call for integrating additional mathematics and science into the secondary agriscience curriculum, and concomitant preparation of preservice teachers, also extend to inservice education efforts directed toward practicing agriscience teachers?

3) Based on the study's findings and supporting literature, what are the researchers' positions regarding "a curriculum that focuses on a principle/systems approach rather than [a]

skills/ competency approach" in the context of agricultural systems management?