

**PERSPECTIVES OF SUCCESSFUL AGRICULTURAL
SCIENCE AND TECHNOLOGY TEACHERS ON THEIR
PREPARATION TO TEACH AGRICULTURAL MECHANICS**

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Abstract

Mechanization is integral to American agricultural industry. Like the industry, technical knowledge and processes continue to evolve to better fit emerging physical conditions and economic circumstances. Instructional strategies have integrated project methods, problem-solving, and applications of mathematics and technical science as core elements of the secondary school curriculum. However, exigencies have led to dramatic reductions of course offerings by universities that are publicly responsible for the education and professional development of teachers.

This dilemma gave rise to the need to examine the perspectives of successful agricultural science and technology (AST) teachers and the education and experiences that are associated with their teaching success. Qualitative research methods were selected to investigate factors that enabled successful AST teachers to be more successful than were their peers. What factors motivate teachers to excel and what decision-rules influence how curriculum is selected, organized and delivered? Finally, this study focused on the recommendations of expert teachers regarding curricular improvements needed to prepare future teachers for this technical subject matter. Data were collected, analyzed, and reported using accepted qualitative protocols to develop emergent themes.

Successful AST teachers agreed that undergraduate course work did not adequately prepare them to teach the current curriculum. Unanimously, respondents expressed concern for the lack of scope, depth, and technical skills in agricultural mechanics or engineering technology being taught to future AST teachers. This concern about the pre-service curriculum led teachers to agree that three-week agricultural mechanics certification workshops are essential for successful instruction of agricultural mechanics. Furthermore, successful teachers recommended a formal mentoring program to assist in the professional development of AST teachers. Finally, the respondents recommended more quality workshops on the part of the state department of education, the professional teachers' organization, and the agricultural education community to improve the quality, scope, depth, and technical skills in secondary schools.

Introduction

McLean and Camp (2000) noted that “agricultural teacher educators have experienced significant pressure over the past 15 years to reform the process by which the teachers are prepared in the profession” (p. 25). Spurred on by a blue ribbon commission headed by Ross Perot, the passage of 1984 Texas Education Reform Bill (Texas House Bill 72), brought changes to curriculum and course content, as well as demanding more accountability. HB 72 established the Legislative Education Board to oversee the implementation of state-mandated education reforms and to reset public education policy.

Twelve teacher education programs in Texas offer course work designed to prepare teachers to instruct within the area of agricultural mechanics. These universities provide encouragement, advice, and expertise through in-service education and graduate courses after graduation; yet many teachers refuse to attempt instruction in the field of study, or omit units from course content to match their own knowledge and skill levels. Though this phenomenon occurs across all levels of experience, it is more prevalent among AST teachers with 10 years or less experience. This trend is compounded by a reduction of required instruction in agricultural mechanics during the undergraduate degree program. Hubert and Leising (2000) concluded that “research has shown that those teachers new to or preparing for the agricultural teaching profession often express anxiety for and a lack of preparedness to teach agricultural mechanics subject matter”(p. 18).

When observed in the schools, many AST teachers appear to lack competence in basic knowledge and skills included in the agricultural mechanics curriculum. Baker and Malle (1995) and McLean and Camp (2000) concluded that AST teachers are least competent in agricultural mechanics content when compared to other fields of study taught in high school agricultural sciences. These perceptions were confirmed by Hubert and Leising (2000) finding “numerous studies indicated that teacher knowledge of agricultural mechanics was in need of improvement both prior to and after accepting teaching positions” (p. 18).

Further evidence was found by the principal researcher while reviewing Texas FFA Career Development Event results. Younger or less experienced AST teachers do not successfully prepare students for the rigor of the event. Upon review of the 2003 Texas FFA Agricultural Mechanics CDE results, the principal researcher found competitive teams in the event (i.e., those in the top six placings) were coached by teachers who had an average tenure of 23.8 years.

Previously integrated into a four grade-level curriculum, agricultural mechanics units became nine stand-alone semester courses in an array of 42 approved semester courses. After several years of teaching or monitoring these courses, it was evident to teachers and college faculty alike that not all of the content of each course were included in “frequent” instruction. Current Texas AST teachers are expected to provide basic skills and knowledge in a broad range of topics. Units of instruction and course content vary from very basic to very specialized content areas.

Review of Literature

While Texas colleges and universities continue to amend degree plans to cope with changing legislation, demographics, and financial issues, Franklin (2001) found that universities are not adequately preparing teachers to instruct effectively in psychomotor skill instruction. He recommended “utilizing student teacher candidates to present demonstration skills in agricultural mechanic courses in college and university undergraduate courses can be a successful training experience that benefits both the student teachers and the college and university students” (p. 9-10). Baker and Malle (1995) concluded that the national average of eight semester hours of collegiate-level agricultural mechanics courses for an agricultural education certification did not prepare young people to teach in this highly technical discipline. Croom (2003) concluded that “the teaching profession is one of the most visible professions in the world” (p. 1). When any major component of the curriculum is deleted or ignored, the discrepancy quickly becomes apparent.

Dyer and Andreason (1999) concluded that the lack of preparation to teach within the field of study, coupled with a great anxiety for safety instruction to prevent possible litigation, has driven young teachers away from the agricultural mechanics curriculum. Dyer and Andreason noted voids in teacher preparation in laboratory safety. Foster, Bell, and Erskine (1995) stated “the findings of this study agree with the earlier reported position of Klein (1991). He stated that ‘total teacher responsibility demands too much based upon traditional teacher training and the inherent teaching culture’” (p. 7).

Buriak and Harper (2001) agreed that more training is necessary to adequately prepare pre-service teachers. “Teaching is a craft. To learn a craft, apprentices observe, work, and practice with a master craftsman, usually over some extended period of time” (p. 2). Harper, Buriak and Hitching (2001) found when recently certified Illinois agricultural science instructors were given the Agriculture Single Subjects Assessment Test (ASSAT) they performed best on the “Agriculture and Society” portion with an 80% competency level. These same instructors scored lowest on the “Agricultural Mechanics” portion with a 46.97% competency level. Harper, Buriak, and Hitchings concluded that significant changes in the university curriculum coupled with the reduced scope of college-level instruction have made it too expensive for teachers to instruct effectively in our present competency-based agricultural mechanics curriculum model. Ullrich, Hubert, and Murphy (2001) revealed “an element of weakness in curricula utilized by the teacher, and in the teacher preparation programs failing to prepare these individuals for the challenge of integrating safety and health concepts throughout the curriculum” (p. 9).

Beginning in 2005, all Texas AST teachers are mandated by Texas Education Agency and the State Board for Educator Certification to pass an exit exam produced by National Evaluation Systems. Twelve percent of the examination questions relate to agricultural mechanics content and deal with theoretical concepts as well as technical skill knowledge (National Evaluation Systems, 2004). The NES exam requires comprehension and application in agricultural machinery; internal combustion engines; land leveling and measurement, plumbing tools and skills; power tools and maintenance; tool identification and safety; and wood and metal fabrication. Current Texas university degree plans for AST teacher certification do not develop the theory and understand of these topics, let alone develop minimum technical skills.

Theoretical Framework

There are many factors related to teacher success. Some teachers are confident and competent in their instructional abilities to teach agricultural mechanics. Therefore as researchers, we assumed a very pragmatic approach to the research questions. Pragmatists view experience and reasoning as major sources of knowledge. Outcomes and results are useful to clarify the stated or desired reality (Driscoll, 2000). The reality is that some teachers with similar education and preparation are much more successful in the instruction of agricultural mechanics in a high school curriculum than are their peers. Consequently, a systematic inquiry should recognize the interactions of economic, educational, physical, psychological, and social events that affect success. This research searched for reasons that explain teacher success from among current agricultural mechanics instructors. The inquiry sought consensus among successful teachers concerning how to better prepare future teachers to instruct in a technical subject.

Statement of Problem

One must ask if the present scope and sequence of today's university undergraduate courses and the current in-service and professional development activities effectively preparing AST teachers for success in teaching agricultural mechanics.

Research Questions

Research Question 1. What education and experiences enable certain teachers to develop successful agricultural mechanics programs? This question identified what formal education and related experiences teachers would explain their recognized success in teaching agricultural mechanics, be it formal education, previous course experience, industry experience, post-graduate workshops, advanced degrees or a combination of the mentioned experiences.

Research Question 2. What influences teachers to include certain portion of the agricultural mechanics curriculum? And what influences teachers to discard certain portions of the curriculum? Recognizing that some units of instruction are not attempted or taught within the curriculum, this question attempted to clarify why some teachers omit units from their instructional program.

Research Question 3. What steps should the agricultural education community take to increase quality instruction in agricultural mechanics in the future? This question probed ideas, perceptions, and recommendations of experts necessary to improve performance in teaching agricultural mechanics.

Assumptions

Four assumptions were identified during the planning and implementation of the research project. First, a qualitative study seeking to describe observations within case boundaries cannot be generalized to other populations. Second, a personal interview process is more likely to identify gestalt experiences and events that shape successful AST teachers careers. Third, a step-

wise interview would achieve saturation of data required for sound qualitative research (Lincoln and Guba, 1985). Finally, interpretations of data through transcribed interviews and member checks would accurately capture the respondents' thoughts and experiences.

Delimitations

This study was delimited to recognized, successful instructors of high school agricultural mechanics throughout Texas, with no regard for geographic region, ethnicity, or gender. Therefore, this study was delimited to a pool of teachers with five or more years of teaching experience. Teaching experience included instruction in the general agricultural mechanics pre-employment laboratory, instruction in several agriculturally related courses, and/or consistent success in the Texas FFA Agricultural Mechanics CDE or Texas FFA Tractor Technician CDE.

Limitations

Experiences and events confirming success of the AST teacher were carefully defined. Successful instruction in the agricultural mechanics portion of AST curriculum included: (1) success in FFA CDE team preparation; (2) increased student enrollment in courses; and/or (3) the implementation of new agricultural mechanics courses into the curriculum.

Methodology

This qualitatively-designed inquiry encapsulated the perceptions of successful AST teachers (respondents) who were widely recognized in Texas for their successful instructional programs in agricultural mechanics. Qualitative research techniques included archival research, personal interviews, and member checking to provide for triangulation (Lincoln and Guba, 1985). This inquiry was conducted during the late spring and summer. This prolonged engagement and persistent observation were employed to increase trustworthiness (Erlandson, 1993). Interviews were confidentially conducted by the principal researcher after informed consent using IRB protocols.

Target Population and Pool Size

Erlandson (1993) concluded, "Purposive sampling requires a procedure that is governed by emerging insights about what is relevant to the study. . ." (p. 148). The pool was drawn using four criteria: (a) have coached an agricultural mechanics CDE team that competed in state-level contests at least three of the last five years, (b) have coached a tractor technician CDE team to compete in state-level contests at least three of the last five years, (c) have taught an agricultural mechanics pre-employment laboratory that had increased enrollment the last five years, and (d) have taught a successful agricultural mechanics program to include implementing a new TEA approved agricultural mechanics related course in the last five years.

Instrumentation

The qualitative research instrument was constructed by the researcher and approved by the Texas A&M University Institutional Review Board. The instruments focused on the

education and previous industry experiences of the respondents, their independent perceptions of the teacher preparation certification as it related to agricultural mechanics, and the respondents' ideas on how teacher preparation could be improved. The respondents were asked to provide demographic data to verify they met the qualifications for the pool.

Data Collection and Analysis

Six interviews were conducted at local high schools beginning in June and concluding in August, four interviews were conducted during the Texas FFA state degree check, and 10 were completed during the Texas FFA Convention. All interviews were scheduled at the convenience of the respondent. The principal researcher conducted each interview privately with time allocated for a complete discussion. All conversations were audio taped to insure accuracy in the transcription of the findings as recommended for quality research (Berg, 1989). Transcriptions were provided to each respondent for verification of accuracy as a member check (Lincoln and Guba, 1985). To insure anonymity, respondents were sequentially coded using a notation (R1, . . . R 19) assigned at the onset of the transcription process and kept separately from names or other identifying information. Data were collected, recorded and analyzed by the principal researcher. Constant comparative analysis was used comparing each new interview with previous statements or themes to conceptualize the possible relationships. All quotations, inferences, or remarks used in the interviews were recorded confidentially. Finally, the principal researcher analyzed the responses to report all recurring themes.

Three basic research questions guided the interview: (1) What education or experiences enable certain teachers to develop successful agricultural mechanics programs? (2) What influences teachers to instruct in the portion of the agricultural mechanics curriculum they do teach? (3) What steps should the agricultural education community engage in to assure quality instruction in agricultural mechanics in the future?

Findings

Archival research through the Texas FFA CDE results and the Texas teachers' directory identified 26 successful AST teachers who met the research criteria and were recognized for high quality instruction and having substantial success with agricultural mechanics in their communities.

Nineteen experts were sequentially interviewed. Redundancy confirmed saturation of the data in the latter stage of interviews (Lincoln and Guba, 1985). Of the qualified respondents, the number of years teaching experience ranged from five to 32 years. Twelve were recognized early through archival research as successful in preparing agricultural mechanics CDE and/or tractor technician CDE teams among the top six in the state. Four AST respondents taught pre-employment laboratories. Three respondents had initiated new Texas Education Agency approved courses in agricultural mechanics during the last five years. Six of the respondents were Texas A&M University graduates, four from Texas A&I University (now Texas A&M University-Kingsville), four graduated from Tarleton State University, and two from Texas Tech University. The remaining three respondents completed undergraduate degrees at East Texas

State University (now Texas A&M University-Commerce), New Mexico State University, and Southwest Texas State University (now Texas State University), each with one graduate.

There were two themes that emerged early in the inquiry: (1) Current Texas university agricultural education degree plans do not offer enough agricultural mechanics courses to effectively prepare respondents. Consequently each successful respondent had obtained technical and pedagogical training elsewhere; and (2) AST teachers often omit topics of instruction from the state adopted curriculum due to a lack of familiarity, comfort or because of safety and liability issues.

Findings: Research Question 1

What education or experiences enable certain teachers to develop successful agricultural mechanics programs? Successful respondents held similar views concerning the education received by AST teachers to instruct in agricultural mechanics. Most of the respondents admitted that they did not receive enough instruction during their undergraduate programs to provide adequately for their students or the subject. “Did your undergraduate course work adequately prepare you to teach the current agricultural mechanics curriculum?” Thirteen of 19 interviewees answered the question with “no” (R1, 3, 4, 5, 6, 8, 10, 11, 12, 14, 15, 16, 17). All of the recognized instructors attributed previous industry experience, postgraduate education, or a three-week certification workshop as major factors contributing to their successes. None of the respondents professed to have become adequately acquainted with the field of study during their undergraduate programs that were similar to the current nine-hour program offered at most universities.

Undergraduate Curriculum

Five respondents viewed their education in agricultural mechanics to be adequate for them to instruct in the current curriculum. However, of the five (R2, 7, 9, 13, 18), all had at least 15 hours of agricultural mechanics instruction during their undergraduate degree. Their successes were attributed to advanced courses beyond minimum requirements, previous industry experiences, or the influence of key mentors within the community of practice.

Of those who answered the question with a “no,” eight had attended a three-week pre-employment laboratory workshop with being the greatest influence on their successes (R1, 4, 5, 8, 12, 14, 15, 16). Six had previous industry experience and credited it as the largest factor contributing to their success, more so than any undergraduate coursework (R4, 7, 9, 11, 16, 17). R17 concluded, “My B.S. degree exposed me to about 30% of what I teach today.”

Three-Week Short Course

To explain their successes in teaching agricultural mechanics, eight respondents (R1, 4, 5, 8, 12, 14, 15, 16) pointed to the three-week agricultural mechanics pre-employment laboratory certification workshop as the greatest single influence on their ability to teach agricultural mechanics. R1 characterized the experience as “without a doubt, the best career experience for me to improve my teaching was the three-week certification workshop with Dr. Billy Harrell.”

Industry Experience

Four of the responders (R7, 9, 11, 16) cited previous industry experience before their undergraduate coursework as a major criterion for their success. R9 stated unequivocally that 15 hours of undergraduate course work prepared him to teach the curriculum. He then shared a caveat: “after returning back to college, I was a certified welder. I had worked offshore in the oil industry for four and a half years. I choose to attend Texas A&I University because of its location and the opportunity to continue work in that industry. I was very fortunate to have very good instructors . . . that actually took me to the next level.” Industry experience was frequently referenced as an important factor (R7, 9, 11, 16)

Mentoring

All respondents described a mentoring process that was essential to them to become successful in the profession—whether that relationship was with former teachers, current university faculty, teaching peers, industry colleagues or family members. R3 observed “You’ve got to have somebody help you be creative with the material you’re presenting and the way you’re presenting it. . . . you don’t get it at the universities” (R3, 4, 10, 13). R4 summed up the emerging theme; “I think the mentor relationship is imperative—it has to be there. . . . I’ve picked up the phone in the middle of the night and called Dr. Harrell and asked him how to solve a problem. . . .” Nine of the 19 individuals (R1, 2, 4, 5, 6, 8, 9, 10, 12) recognized Dr. Billy Harrell at Sam Houston State University and relied on him for guidance and direction as much as technical support. Eight of the 19 individuals identified Dr. Lon Shell of Southwest Texas State University for his teaching and motivation of AST teachers (R3, 4, 5, 6, 10, 13, 14, 17). Six other Texas professors were recognized for their mentoring roles. Ten interviewees also included local business or industry personnel as mentors, motivators and enablers (R3, 6, 9, 11, 12, 13, 14, 16, 17, 18). Mentors make a difference.

Findings: Research Question 2

What influences teachers to instruct in the portion of the agricultural mechanics curriculum they do teach? Also perceived through the interviews was a theme that most instructors do not include all of the topics in the state adopted curriculum. When asked specifically, sixteen respondents stated very confidently that most of their peers do not teach all the recommended topics within the curriculum (R1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18). Only two individuals, when asked if they thought those peers adequately covered all topics in the curriculum, answered the question in a manner complimentary to their peers (R5, 9). Respondents recognized a variety of reasons for their peers not to teach the complete curriculum: allotted time, limited knowledge and confidence of the teacher, a lack of interest or effort and safety issues.

R10 noted that “. . . very few teachers in Texas cover agricultural mechanics the way it should be covered. And I feel very strongly on this, I feel that agricultural teachers cover what they know and what’s easy and what’s comfortable and are very scared of newer technology or something that they did not know or that they think the kids may not want to learn. Because it

takes some classroom time or book time or lecture time to learn it, before you go out in the shop. Outside of welding, or electricity, or maybe some engines, teachers will balk at anything else.” R17 agreed saying “. . . no. I think they are probably exposed to about 85% of the material and come away with about 60% of it.”

Nine of the 19 respondents (R3, 4, 6, 7, 10, 13, 15, 17, 18) recognized a general lack of knowledge to allow the instructor to be comfortable teaching across the curriculum. R7 commented “students are pretty bright. I guess every school has them and I get a lot of students in the program that already have some background; they either grew up on a farm or their dad’s a welder or whatever the case might be so they already have some skills. If you can’t show them that you have those skills or can expose them to some new techniques or technology, I think your credibility is affected.”

Three respondents (R1, 14, 16) concluded that a general lack of interest or effort by the instructor was the major shortcoming. R17 added “. . . no experience, and they don’t feel capable.” R18 agreed “. . . no background, they are scared and don’t want people in town to know how little they do know.” R14 summed up an emerging theme with “so many (teachers) fall into those traps . . . too intent on teaching a contest and building projects . . . or just doing fabrication. Some of the kids that are good at one thing, they just let them do that for everybody. I don’t know how they have time to teach it all.”

Findings: Research Question 3

What steps should the agricultural education community engage in to assure quality instruction in the agricultural mechanics discipline in the future? During the interview process, the very qualified respondents contributed several meaningful ideas for the agricultural education community to consider for future preparation of agricultural science instructors. Among these recommendations was the consistent theme that the universities must bolster the agricultural mechanics or engineering required for certification, that the pre-lab certification workshops must remain intact, and that a mentoring system would improve teacher success in agricultural mechanics.

Several respondents recommended more core courses in agricultural mechanics or engineering for certification to bolster pre-service teachers’ confidence and credibility. R1 questioned if the current university instruction in agricultural mechanics is going in the right direction. “I doubt if they offer an adequate amount or if the instruction in the courses is working toward helping those teachers cover the TEKS they are going to have to teach.” R3 commented “. . . “not discrediting my fellow teaching partners . . . (but they) didn’t get any agricultural mechanics in college. . . . They need some competency level to go out there and teach and a lot of our kids (young teachers) don’t have it now.” R5 confirmed that “. . . “I have had several student teachers and I think some of them really come out lacking in some of the agricultural mechanics areas. There’s a lot of them that seem to be lacking in basic things.” R6 noted that “every one of the TEKS curriculums calls for a certain amount of safety and yet they (teachers) haven’t had it themselves, and yet they are to be responsible for a (safe) lab environment.” R15 agreed “. . . more preparation at the collegiate level.” The respondents with the most formal

education in the field of agricultural mechanics or engineering felt that beginning instructors were ill-prepared to the point of encountering personal liability issues.

Successful AST respondents unanimously recommended systematic mentoring for young teachers to nurture their professional development. Respondents valued a three-week short course for agricultural mechanics to certify beginning teachers for the technical and skill-oriented curriculum. At the same time, respondents requested professional development workshops for themselves as well as less experienced teachers.

Summary, Conclusions, And Recommendations

Baker and Malle (1995) and Harper, Buriak, and Hitchings (2001) warned about the lack of preparedness and confidence on the part of AST teachers induction into teaching agricultural mechanics. Harper, Buriak, and Hitchings (2001) concluded “. . . during the last twenty years, programs have diminished scope and many have undergone significant change” (p. 1). They went on to warn that when we “. . . couple this change with the reduction in engineering technology or mechanization credits required for certification . . . it is obvious that competency-based guidelines are too expensive and cannot be met by prospective teachers of agriculture” (p. 1).

Archival research found 28 AST teachers who were successful in their instruction of agricultural mechanics and met initial criteria as a successful group. Interview sampling was conducted until redundancy suggested saturation of the data (Lincoln and Guba, 1985). Findings were reported for each of the three basic research questions: (1) What education or experiences enable certain teachers to develop successful agricultural mechanics programs? (2) What influences teachers to instruct in the portion of the agricultural mechanics curriculum they do teach? and (3) What steps should the agricultural community engage in to assure quality instruction in agricultural mechanics in the future?

This inquiry validated other research literature (Baker and Malle, 1995; Buriak and Harper, 2001; Dyer and Andreason, 1999; Harper, Buriak, and Hitchings, 2001; Hubert and Leising, 2000; and McLean and Camp, 2000) that there is a lack of scope, depth, and technical instruction obtained in current Texas teacher education universities.

A successful teacher recommended a review of the strategic plan and the priorities for program development based on societal need. R6 recommended “. . . the agricultural education family as a whole needs to sit down and look at their curriculum and ask themselves what are we preparing our students for, what are we preparing them to do, what can we do to strengthen their competence level to go out and reach young people? They need to look at their budget, prioritize their academic areas of emphasis, and add more agricultural mechanics.”

Respondents felt strongly that agricultural mechanics courses should remain an integral part of the high school curriculum. Harper, Buriak, and Hitchings (2001) in their summation of Rosencrans and Martin work, recommended that “agricultural mechanization continue to be viewed as a viable component of secondary agricultural education to reflect emerging

technologies, problem-solving, critical thinking, systems approaches, as well as science and mathematics applications” (pp. 1-2).

Conclusions: Research Question 1

What education or experiences enable certain teachers to develop successful agricultural mechanics programs? Of the 19 respondents, thirteen professed not to be prepared to instruct in the agricultural mechanics curriculum at the onset of their teaching careers (R1, 3, 4, 5, 6, 8, 10, 11, 12, 14, 15, 16, 19). Of the remaining few who felt comfortable teaching, all had more class hours of agricultural mechanics than is currently required by universities for agricultural science certification. Currently Texas teacher education universities require from nine to 12 hours of agricultural mechanics or engineering for teacher certification.

Additionally, nine respondents recognized the TEA-approved workshops offered for certification in agricultural mechanics as the single biggest positive influence on their careers (R1, 4, 5, 8, 12, 14, 15, 16, 19). Three teachers cited previous industry experience as the greatest contributor to their teaching careers in agricultural mechanics (R7, 9, 11). Six others noted a combination of things including several additional hours of collegiate instruction and previous experiences (R2, 3, 6, 13, 17, 18) as the major reasons for their successes.

Conclusions: Research Question 2

What influences teachers to instruct in the portion of the agricultural mechanics curriculum they do teach? Seventeen of 19 successful teachers recognized that not all portions of the approved agricultural mechanics curriculum for high school agricultural sciences are adequately taught in depth, scope, and quality (R1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19).

Eleven respondents felt that a lack of preparedness of the teacher was the major reason units of instruction were omitted from the approved curriculum (R1, 3, 4, 6, 7, 10, 13, 15, 17, 18, 19). “They’re probably just like me, they have areas they feel very comfortable and confident in, and they probably spend more time in those areas than in others they feel least qualified” (R3).

Most of the respondents cited one of the current leaders in collegiate agricultural mechanics instruction as a major influence on their recognized success. Nine AST teachers noted Dr. Billy Harrell of Sam Houston State University was a major influence (R1, 2, 4, 5, 6, 8, 9, 10, 12) and nine credited Dr. Lon Shell of Southwest Texas State University as an exemplary mentor (R3, 4, 5, 6, 10, 13, 14, 17, 19).

When asked to explain some lack of instruction in all areas of the curriculum, six respondents noted a shortage of time and interest on the part of the teacher. Three of the respondents alluded to the issue of time. Three members mentioned the lack of interest or effort on the part of the instructor as a reason for failing to include all areas of the curriculum.

Conclusions: Research Question 3

What steps should the agricultural education community engage in to assure quality instruction in the agricultural mechanics discipline in the future? Eighteen of 19 teachers insisted that more instruction in agricultural mechanics or agricultural engineering was necessary for the bachelor's degree and agricultural science teacher certification. When asked if the teacher education universities offered enough courses in agricultural mechanics currently for future agricultural science teachers to successfully teach agricultural mechanics, 18 stated or implied that they did not (R1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19). Fourteen of the 19 respondents stated that more workshops in the field of teaching high school agricultural mechanics were imperative (R1, 3, 5, 6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 19). Additionally, all respondents felt that a mentoring process was critical in their personal development and should be promoted. "The mentoring process has got to be there" (R1). Also 12 of the respondents predicted a shortage of qualified university professors to teach and mentor agricultural science teachers (R1, 6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 19).

Conclusions

After a careful review and analysis of the interview transcripts used in this work coupled with a 23 year immersion in the community of practice by the principal researcher, several themes emerged. The teacher education universities in Texas must re-examine the number of agricultural mechanics courses in the degree plan. Preservation of the three-week agricultural mechanics certification workshop is crucial. The agricultural community as a whole should develop systematic mentoring whereby recognized experienced teachers tutor early-career AST teachers. Texas universities with teacher education programs, Texas Education Agency, and the Vocational Agriculture Teachers Association of Texas (VATAT) must collaborate to provide systematic, hands-on, technical skill enhancing professional development workshops. The agricultural community as a whole must continue to encourage pre-service teachers to advance their education and enter the teacher education profession.

Recommendations

As a result of this analysis, the researchers offer the six recommendations in no particular order for public action: 1) Provisions for systematic mentoring of early-career teachers tied to a public action plan must be made. This should be a commitment from the agricultural education community as a whole. 2) A commissioned comprehensive state-wide task force should be established to review the roles, scope and organizational delivery of knowledge and skills essential for students preparing for careers in contemporary agricultural industry. Task Force recommendations should address teacher preparation, certification, graduate education, industry internships and in-service education that advance student success and meet societal needs. 3) Research should be commissioned to identify alternative strategies necessary to develop critical competencies during pre-service teacher certification programs. The findings should be used to make critical modifications to pre-service teacher certification programs. 4) Commission research to identify contemporary "emphasis areas" of knowledge and skills, whereby degree plans are structured to encourage pre-service teachers to gain expertise in one or more knowledge domains. This research should couple degree plans with learning agreements,

communicate learning outcomes, and empower multiple forms of credit in several educational settings. 5) A statewide plan should be designed to include strategies to reward teachers for continue professional development, life-long learning and teaching excellence. Incentives should be identified and offered to reward student career success and teacher professional development. 6) Professional development should become a shared responsibility on the part of Texas public universities that prepare AST teachers, the Texas Education Agency, the State Board for Educator Certification, Texas Independent School Districts and the agricultural industry. This partnership would serve to better prepare AST teachers for the state of Texas.

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