Identifying Technical Content Training Needs of Georgia Agriculture Teachers

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ABSTRACT

The continuing trend toward increasing diversity of curriculum offered within secondary agricultural education programs is driving a change in pre-service and in-service technical training for agriculture teachers. This study looks at agriculture teachers' perceived importance of, and competence in, traditional technical competencies such as welding and small engines, as well as more recent technical competencies such as biotechnology and computer technology integration. A revised version of Joerger's (2002) needs assessment instrument was used to gather data from Georgia agriculture teachers - data was used to prioritize competencies where agriculture teachers need supplemental training as represented by a mean weighted discrepancy score (MWDS). Findings indicate that Georgia agriculture teachers' greatest need for in-service training is in the following: integrating current advances in agriculture technology into the curriculum; teaching skills and concepts in electricity, small animal care and veterinary technology; and teaching skills and concepts in animal biotechnology and aquaculture.

Introduction

Joerger (2002) emphasized the need for appropriate and timely pre-service and in-service activities for agriculture teachers to ensure that they are properly equipped to contend with changing conditions in agriculture education. The Committee on Agricultural Education in Secondary Schools Board on Agriculture of the National Research Council (1988) stated "…in-service education programs must be revised and expanded to develop more competent teachers… in and about agriculture" (p. 7). While researchers can agree that appropriate pre-service and in-service training need to be provided to teachers, it is much more difficult to identify what trainings are most appropriate and most needed.

With the need to identify training needs of agriculture teachers, researchers have used several different methods to investigate various constructs related to pre-service and in-service needs. Edwards and Briers (1999) evaluated the competencies of facilitating student learning in classroom and laboratory settings, facilitating student learning in leadership and personal growth, facilitating student learning in student agricultural experiences, teacher competencies related to student services, program management, personal roles and relationships, and planning and managing educational tools. Dobbins

and Camp (2000) indicated a needed understanding in curriculum development, learning styles, technical areas, teaching methods, teaching techniques, and academic integration methods. Joerger's (2002) categories of professional teaching competencies needed for success and survival were classroom management, leadership and supervised agricultural experience (SAE) development, technical agriculture, and program design and maintenance. Roberts and Dyer (2002) conducted a Delphi study of expert teachers, administrators, state FFA supervisory staff, and university faculty to determine the characteristics of an effective agriculture teacher. In addition to the aforementioned competencies of a successful teacher, one must possess the ability to prepare students to be successful in career development events (CDEs), and understanding student evaluation.

Theoretical/Conceptual Framework

The theoretical framework for this study is based on the theory espoused by Baker and Trussell (1981) as cited in Findlay (1992, p. 28) that the gap between theory and practice could be eliminated by reducing theory to what was needed to perfect the practice (teaching). The prospective teacher would then be trained (prepared) to reach competence in each of the tasks in order to cope with whatever situation may be encountered in the school.

As agricultural technology advances, agricultural education teachers are constantly challenged to introduce and demonstrate new technologies to their students to better prepare them to enter the work force. In order to meet industry needs, agricultural education teachers must continue to stay on the forefront of technology and pedagogy. To meet this demand, these teachers need annual in-service training opportunities from both educational institutions and industry. It is through in-service training that agricultural education teachers are able to expand their knowledge and improve their pedagogical skills so they are better able to serve their students and the community in which they teach.

In-service opportunities were often orchestrated by teacher educators and state agricultural education staff to meet the needs of the teachers (Barrick, Ladewig & Hedges, 1983). As previously mentioned, in more recent years teacher educators have begun developing methods of identifying what agricultural education teachers perceive to be pertinent to their educational needs for the classroom, laboratory, and FFA (Joerger, 2002).

One proven method of identifying agricultural education pre-service and in-service needs assessments utilizes a descriptive survey based on the Borich Needs Assessment - 5-point Likert scale (Garton & Chung, 1996; Joerger, 2002; Layfield & Dobbins, 2002). Most researchers use a modified version of the Borich Needs Assessment Model to evaluate the "perceived level of importance" and "perceived level of competence" of teachers regarding professional competencies that were identified by previous research and related to the issues of their respective states. In 1997, Garton and Chung used a

modified version of the Borich Needs Assessment Model and a quadrant analysis to survey the in-service needs of beginning agriculture teachers.

While Garton and Chung (1997) utilized a quadrant analysis, Edwards and Briers (1999) sought to compare the ranking of in-service needs as determined by direct assessment to a ranking based on a mean weighted discrepancy score (MWDS), i.e., the Borich model. Consequently, they determined that the discrepancy method, like the Borich Model or a version of it, is more effective than a direct assessment.

In 2002 Joerger modified Borich's Needs Assessment instrument and created a new instrument which was modeled after Garton and Chung's (1996, 1997) research. The categories of teaching and classroom management, leadership and SAE development, technical agriculture, and program design and management, identified by Joerger, best represent the needed competencies associated with the total program philosophy of agricultural education. Due to Edward's and Brier's finding that an assessment tool similar to the Borich model was more effective than direct assessment, and Joerger's, Garton's and Chung's continuing revision and refining of the Borich Needs Assessment instrument, it was determined to be the best instrument to achieve the purposes of this study.

Purpose and Objectives

The purpose of this study was to determine Georgia agriculture teachers' perceived levels of importance and competence as they relate to specific technical competencies, both for beginning and veteran teachers, and use that information to determine the pre-service and in-service needs of Georgia agriculture teachers. More specifically, the following objectives guided this study:

1. Determine the demographic characteristics and educational background of Georgia agriculture teachers;
2. Identify agriculture teachers' perceived importance of specific technical areas;
3. Identify agriculture teachers' perceived competence in specific technical areas; and
4. Determine in-service needs of Georgia agriculture teachers in specific technical areas.

Procedures

The population of this study included all (N = 348) middle school and/or high school agriculture teachers employed during the 2004-2005 school year in the state of Georgia. Surveys were distributed and collected at the Georgia Vocational Agriculture Teachers Conference, regional agriculture teacher meetings, and via an online version of the instrument.

A modified version of the *Minnesota Beginning Agricultural Education Teacher In-service Programming Needs Assessment* (Joerger, 2002) was used to survey the teachers.

The Joerger instrument was modeled after the 1996/1997 Garton and Chung instrument which was based on the Borich Needs Assessment Model (Borich, 1980). The face and content validity were evaluated by a panel of experts consisting of four University of Georgia faculty, two graduate students, three regional coordinators of agricultural education in Georgia, and four Georgia agriculture teachers. The 24 items of the instrument were constructed with two Likert-type scales ranging from one to five.

Collected data were entered into SPSS 12.0™. Cronbach's alpha was calculated to determine the reliability of importance ($\alpha = 0.91$) and competence ($\alpha = 0.88$) scales for the technical agriculture training needs. The importance and competence scores were used to calculate the teacher preparation and in-service needs by calculating a mean weighted discrepancy score (MWDS) for each item. The MWDS score was calculated by subtracting the competency score from the importance score and by multiplying that number times the mean importance rating for each competency (Borich, 1980; Joerger, 2002).

A total of 212 participants completed the instrument, resulting in a response rate of 61%. To address non-response early respondents ($n = 121$) were compared to late respondents ($n = 91$) using an independent samples t-test. Lindner, Murphy, and Briers (2001) showed that responses of late respondents are often similar to non-respondents. It is reasoned that if there is not a difference between early respondents and late respondents, then there is little need to pursue additional efforts to increase responses from non-respondents. Therefore, a comparison was made between early respondents and late respondents to the survey based on data received to determine the level of probability in which non-respondents differed significantly from respondents (Lindner, Murphy, & Briers, 2001). Early responding teachers ($M = 3.94$, $SD = .46$) showed no significant difference from late responding teachers ($M = 3.94$, $SD = .44$); $t(207) = -.026$, $p<0.05$, $d = 0.004$. Therefore, the responding sample was deemed to be representative of the population from which it was drawn.

Findings

Objective One: *Determine the demographic characteristics of Georgia agriculture teachers*

As indicated in Table 1, 74.5% of the teachers were male. Twenty-eight percent of the teachers were 25-34 years of age; 27% were 45-54; and 24% were 35-44 years of age. Nearly 35% of the teachers reported having less than five years teaching experience. Approximately 42% had obtained a bachelor degree; 36% reported having a master degree; 15% a specialist degree; and 5% had earned a doctorate.

Table 1

Selected Teacher Demographics

Demographic Characteristics	*N*	*P*
Gender		
Male	158	74.5
Female	54	25.5
Age		
Less than 25	28	13.3
25 to 34	60	28.4
35 to 44	50	23.7
45 to 54	57	27.0
55 to 64	15	7.1
More than 65	1	0.5
Teaching Experience		
Less than 5 years	74	34.9
6 to 10 years	36	17.0
11 to 15 years	26	12.3
16 to 20 years	20	9.4
21 to 25 years	26	12.3
26 to 30 years	25	11.8
More than 30 years	5	2.4
Highest Degree Earned		
Bachelor	90	42.5
Master	78	36.8
Specialist	32	15.1
Doctorate	12	5.7

Objective Two: Identify the perceived level of importance Georgia agriculture teachers place on competencies associated with technical agricultural education

Agriculture teachers were asked to rate 24 statements using the following scale: Not Important (*M* = 1.0-1.49), Of Little Importance (*M* = 1.5-2.49), Somewhat Important (*M* = 2.5-3.49), Important (*M* = 3.5-4.49), and Very Important (*M* = 4.5-5.0). As reported in Table 2, Georgia agriculture teachers view all technical competencies to be either "somewhat important" or "important". The top five competencies include teaching about the environment, plant sciences, using computers and multimedia equipment in the classroom, and teaching agriscience.

Table 2

Mean and Standard Deviation for Level of Importance on Selected Technical Competencies

Competency	*n*	*M*	*SD*
Teaching about agriculture's relationship with the environment	209	4.35	0.62
Teaching skills and concepts in the plant sciences	209	4.29	0.78
Using multimedia equipment in teaching	209	4.29	0.63
Using computers in classroom teaching	209	4.27	0.81
Teaching agriscience (integrating science and agriculture)	209	4.21	0.73
Integrating current advances in agriculture technology into the curriculum	208	4.20	0.73
Teaching skills and concepts in landscape design and maintenance	209	4.09	0.65
Teaching skills and concepts in soils and soil management	209	4.09	0.66
Teaching skills and concepts in the animal sciences	209	4.08	0.66
Teaching skills and concepts in forestry	209	4.04	0.71
Teaching agribusiness skills and concepts	209	4.00	0.77
Teaching skills and concepts in electricity	209	3.94	0.76
Teaching skills and concepts in marketing agricultural products	209	3.94	0.91
Teaching skills and concepts in wildlife management	209	3.89	0.73
Teaching skills and concepts in welding	208	3.88	0.93
Teaching plant biotechnology skills and concepts	209	3.87	0.77
Teaching skills and concepts in animal biotechnology	209	3.84	0.77
Teaching skills and concepts in crop production	209	3.81	0.80
Teaching skills and concepts in small animal care/veterinary technology	209	3.74	0.86
Teaching skills and concepts in construction management	209	3.73	0.84
Teaching skills and concepts in food products processing, operations, & mgt	207	3.66	0.90
Teaching skills and concepts in relationship to small engine systems	209	3.65	0.90
Teaching skills and concepts in aquaculture	208	3.47	0.89
Teaching skills and concepts in equine science	209	3.34	0.89

Note. Scale: 1 = Not Important; 5 = Very Important.

Objective Three: Identify the perceived level of competence Georgia agriculture teachers have for competencies associated technical agricultural education

Agriculture teachers were asked to rate the same 24 statements using the following scale: Not Competent (*M* = 1.0-1.49), Little Competence (*M* = 1.5-2.49), Somewhat Competent (*M* = 2.5-3.49), Competent (*M* = 3.5-4.49), and Very Competent (*M* = 4.5-5.0). As reported in Table 3, teachers perceived that they were "competent" in only five of the twenty-four statements. Four of the top five competencies were also identified as "important" in Table 2: teaching skills in the plant sciences, teaching about the environment, using computers and multimedia equipment in the classroom.

Table 3

Mean and Standard Deviation for Level of Competence on Selected Technical Competencies

Competency	*n*	*M*	*SD*
Teaching skills and concepts in the plant sciences	211	3.87	0.83
Using computers in classroom teaching	210	3.79	0.76
Using multimedia equipment in teaching	210	3.78	0.81
Teaching about agriculture's relationship with the environment	210	3.78	0.71
Teaching skills and concepts in the animal sciences	210	3.70	0.99
Teaching skills and concepts in soils and soil management	210	3.70	0.79
Teaching agriscience (integrating science and agriculture)	210	3.62	0.78
Teaching skills and concepts in landscape design and maintenance	210	3.43	0.90
Teaching skills and concepts in forestry	210	3.39	1.02
Teaching skills and concepts in wildlife management	211	3.34	0.90
Teaching skills and concepts in marketing agricultural products	211	3.32	0.94
Teaching agribusiness skills and concepts	210	3.31	0.91
Teaching skills and concepts in crop production	211	3.30	0.95
Integrating current advances in agriculture technology into the curriculum	210	3.26	0.85
Teaching skills and concepts in welding	211	3.24	1.19
Teaching plant biotechnology skills and concepts	211	3.22	0.88
Teaching skills and concepts in electricity	210	3.15	1.19
Teaching skills and concepts in food products processing, operations, & mgt	211	3.14	1.02
Teaching skills and concepts in construction management	209	3.11	1.12
Teaching skills and concepts in animal biotechnology	209	3.11	1.02
Teaching skills and concepts in relationship to small engine systems.	211	3.02	1.15
Teaching skills and concepts in small animal care/veterinary technology	209	2.95	1.06
Teaching skills and concepts in equine science	210	2.74	1.12
Teaching skills and concepts in aquaculture	210	2.66	0.99

Note. Scale: 1 = Not Competent; 5 = Very Competent.

Objective 4: *Determine in-service needs of Georgia agriculture teachers in specific technical areas*

Pre-service/in-service need is represented by the mean weighted discrepancy score (MWDS). The highest rated pre-service/in-service training need was integrating current advances in agriculture technology into the curriculum (Table 4). Teachers also indicated a need for pre-service/in-service training in teaching skills and concepts in electricity (2nd highest need) and small animal care and veterinary technology (3rd highest need). Rounding out the five most important needs were teaching skills and concepts in animal biotechnology (4th highest need) and aquaculture (5th highest need). The remaining pre-service and in-service training needs are listed in Table 4.

Table 4

Pre-service and In-service Training Needs of Agriculture Teachers

Competency	MWDS[1]
Integrating current advances in agriculture technology into the curriculum	3.61
Teaching skills and concepts in electricity	2.97
Teaching skills and concepts in small animal care/veterinary technology	2.87
Teaching skills and concepts in animal biotechnology	2.71
Teaching skills and concepts in aquaculture	2.63
Teaching skills and concepts in landscape design and maintenance	2.55
Teaching agribusiness skills and concepts	2.53
Teaching skills and concepts in forestry	2.50
Teaching agriscience (integrating science and agriculture)	2.33
Teaching about agriculture's relationship with the environment	2.33
Teaching plant biotechnology skills and concepts	2.32
Teaching skills and concepts in marketing agricultural products	2.26
Teaching skills and concepts in welding	2.25
Teaching skills and concepts in construction management	2.24
Teaching skills and concepts in relationship to small engine systems	2.19
Using multimedia equipment in teaching	2.08
Using computers in classroom teaching	1.95
Teaching skills and concepts in wildlife management	1.93
Teaching skills and concepts in equine science	1.93
Teaching skills and concepts in crop production	1.75
Teaching skills and concepts in food products processing, operations, and mgt	1.60
Teaching skills and concepts in the plant sciences	1.60
Teaching skills and concepts in soils and soil management	1.46
Teaching skills and concepts in the animal sciences	1.44

Note. [1]Mean Weighted Discrepancy Score.

Conclusions

The purpose of this study was to collect Georgia agriculture teachers' perceived importance of and competence in various technical areas within agricultural education and use that information to determine the pre-service and in-service needs of Georgia agriculture teachers. Teachers considered all of the technical competencies at least "somewhat important." Most important to teachers was teaching about agriculture's relationship with the environment. Teachers felt most competent in their ability to teach skills and concepts in the plant sciences (horticulture, agronomic crops, etc.), and least competent in their ability to teach aquaculture.

According to the Georgia agriculture teachers in this study, the most important pre-service and in-service training need is their ability to integrate current advances in agriculture technology into the curriculum. Joerger's (2002) assessment of two consecutive years of agricultural education graduates listed teaching about technological advancements in agriculture as an important in-service need. Additionally, Kotrlik, Redmann, Harrison, and Handley (2000) reported agriculture teacher inadequacies in general and software specific knowledge and skill.

Georgia teachers also identified training needs in electricity, small animal/veterinary care, animal biotechnology, and aquaculture. Researchers could find no other research identifying this specific combination of training needs in other states; however, Layfield and Dobbins (2002), Joerger (2002), Edward and Briers (1999), and Garton and Chung (1997) all found trends in training needs that suggest teachers need help with integrating science and other emerging technologies into agriculture education classes.

Recommendations

The recommendations from this study are specific to and appropriate for agricultural education in Georgia, but other states may also benefit from the findings and suggestions that follow. Georgia agriculture teachers identified their ability to integrate current advances in agriculture technology into the curriculum as their primary pre-service/in-service need. Georgia agricultural education faculty and Georgia agricultural education state staff need to modify curricula to include more integration of current advances in agriculture in teacher pre-service and in-service training. While this study is specific to Georgia, it is also recommended that other states examine their current pre-service and in-service training to determine if this need also exists in their states.

According to the findings of this study, teachers identified the following: teaching skills and concepts in electricity; teaching skills and concepts in small animal care and veterinary technology; teaching skills and concepts in animal biotechnology; and teaching skills and concepts in aquaculture to be their second, third, fourth and fifth pre-service and in-service needs respectively. One may conclude that teachers need additional in-service training in teaching concepts in electricity due to the fact that UGA doesn't offer a course in this field of study. University faculty and state agriculture education staff need to review their existing training curriculum and revise it to accommodate these areas where their curriculum is failing to equip teachers with the skills they need to be successful. Additionally, university faculty and state staff from other states may need to evaluate their own training programs to determine if they are meeting the needs of their agriculture teachers in these areas.

Garton and Chung (1996, 1997) and Dormody and Torres (2002) recommended other states replicate their research by evaluating the in-service needs of beginning agriculture teachers as perceived by those teachers and state agricultural education staff. Thus far data related to this recommendation has been collected by Edwards and Briers (1999) in Texas; Joerger (2002) in Minnesota; Peiter, Terry, & Cartmell (2003) in Oklahoma; and Layfield and Dobbins (2002) in South Carolina. As the number of states which have timely and relevant needs assessment data increases, researchers should analyze this data to identify national trends in agricultural education. Identifying these trends may prove useful in determining the direction agricultural education is heading and may help leaders in agricultural education provide better pre-service and in-service training.

Discussion and Implications

With the number of middle school and high school agricultural education positions on the rise in Georgia, there is an increasing number of inexperienced agriculture teachers in the state. This rise of inexperienced teachers indicates an immediate need for re-evaluating the pre-service agricultural education programs and the professional development opportunities offered by the Georgia state agricultural education staff. Also, as previously mentioned, there was no current research or data that identified Georgia agriculture teachers' pre-service and in-service needs.

According to this study, the most important pre-service/in-service need is training that addresses integrating current advances in agriculture technology into the curriculum. This competency should be addressed in university teacher preparation curricula in Georgia as well as by the Georgia agricultural education state staff. Georgia state staff can increase in-service training in this area for current agriculture teachers, as well as update their existing curriculum resources, to include recent advances within the curriculum.

The state of Georgia currently requires a five-day independent study of selected problems in instructional technology for all new teachers in order to equip them with the technology skills they will need once they are teaching. Additionally, the agricultural education teacher educators in Georgia are currently developing courses specifically designed to increase integration of current advances in agriculture technology into the curriculum (greenhouse management for teachers, forestry for teachers, agriscience for teachers, etc.). Further examination of how the current data relates to the teachers' demographic characteristics may provide evidence whether less experienced or more experienced teachers are in the greatest need of additional training. Examination of those results along with additional evaluations of the independent study and "for teachers" courses may provide a better understanding of where teachers are receiving their training in integration of current advances in agriculture technology.

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