An Examination of the Agricultural Mechanics Professional Development Needs of Texas School-Based Agricultural Science Teachers

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Introduction

- It is estimated that 40% to 66% of instructional time, in many agricultural education programs, involves agricultural mechanics education (Saucier & McKim, 2011).
- Skilled teachers are critical to student achievement (Sorensen, Lambert, & McKim, 2014).

- Well prepared and knowledgeable agriculture teachers can guide agricultural education students safely and effectively in the development of practical, hands-on skills and agricultural mechanics education (Saucier & McKim, 2011).
- The need to provide effective professional development is essential for improving student learning (Sorensen, Lambert, & McKim, 2014).

Purpose and Research Questions

Purpose

Quantitative study to determine the agricultural mechanics professional development needs of Texas, school-based agricultural science teachers and their personal, professional, and program demographic characteristics.

Research Questions

1. What are the personal, professional, and program demographic characteristics of Texas agricultural science teachers who taught agricultural mechanics related curriculum?
2. What are the agricultural mechanics skill professional development needs of Texas, school-based agricultural science teachers who taught agricultural mechanics related

Conceptual Framework

- The Borich Needs Assessment Model was utilized to create a Mean Weighted Discrepancy Score (MWDS) by comparing scaled measurements of importance, knowledge, ability to perform, and ability to teach others to perform (Borich, 1980).

Results

Mean Weighted Discrepancy Scores for Competencies Related to the Performance Competence (*n* = 154)

Rank	Agricultural Mechanics Competency	MWDS	Importance			Ability to Perform		
			M	SD	Mo	*M*	SD	Mo
1	Modern Machinery Technology	1.60	3.65	1.07	4	3.23	1.08	3
2	Hydraulics	1.58	3.55	1.07	4	3.09	1.10	3
3	Pneumatics	1.43	3.44	1.08	3	3.03	1.11	3
4	Gas Tungsten Arc Welding (GTAW)	1.39	3.80	0.97	4	3.43	0.99	3
5	Multi-Cylinder Engines	1.15	3.47	1.11	3	3.15	1.11	3
6	Construction Methods	0.82	4.26	0.81	5	4.07	0.82	4
7	Carpentry	0.69	4.43	0.72	5	4.27	0.76	4
8	Small Gas Engines	0.58	3.64	1.03	3	3.49	1.01	4
9	Gas Metal Arc Welding (GMAW)	0.56	4.75	0.55	5	4.64	0.64	5
10	Employability/ Career Skills	0.45	4.57	0.70	5	4.47	0.68	5
11	Electrical	0.40	4.24	0.78	5	4.14	0.86	4
12	Shielded Metal Arc Welding (SMAW)	0.34	4.74	0.56	5	4.67	0.61	5
13	Handheld Power Tools	0.03	4.78	0.54	5	4.77	0.56	5
14	Oxygen/Fuel Cutting	0.03	4.70	0.61	5	4.69	0.61	5
15	Plumbing	0.00	4.11	0.80	4	4.11	0.88	4
16	Plasma Arc Cutting (PAC)	-0.03	4.40	0.78	5	4.40	0.75	5
17	Stationary Power Tools	-0.10	4.74	0.56	5	4.77	0.56	5
18	Cold Metal	-0.14	4.32	0.86	5	4.37	0.76	5
19	Supervised Agricultural Experience (SAE)	-0.19	4.09	0.89	4	4.13	0.86	4
20	Hand Tools	-0.31	4.67	0.62	5	4.74	0.63	5
21	Oxygen/Fuel Brazing	-0.64	3.61	1.01	3	3.79	0.99	4
22	Oxygen/Fuel Welding	-1.09	3.98	1.11	5	4.26	0.89	5
23	Fencing	-1.52	3.82	0.91	4	4.23	0.86	5

Mean Weighted Discrepancy Scores for Competencies Related to the Consequence Competence (*n* = 154)

Rank	Agricultural Mechanics Competency	MWDS	Importance			Ability to Teach Others to Perform		
			M	SD	Mo	*M*	SD	Mo
1	Hydraulics	1.84	3.55	1.07	4	3.03	1.13	3
2	Modern Machinery Technology	1.70	3.65	1.07	4	3.21	1.13	3
3	Pneumatics	1.69	3.44	1.08	3	2.97	1.16	3
4	Gas Tungsten Arc Welding (GTAW)	1.57	3.80	0.97	4	3.39	1.07	3
5	Multi-Cylinder Engines	1.22	3.47	1.11	3	3.13	1.17	3
6	Employability/ Career Skills	1.19	4.57	0.70	5	4.31	0.82	5
7	Construction Methods	1.12	4.26	0.81	5	4.01	0.88	4
8	Electrical	1.09	4.24	0.78	5	3.97	0.98	4
9	Small Gas Engines	0.94	3.64	1.03	3	3.39	1.10	4
10	Carpentry	0.86	4.43	0.72	5	4.24	0.83	5
11	Gas Metal Arc Welding (GMAW)	0.74	4.75	0.55	5	4.59	0.72	5
12	Plumbing	0.65	4.11	0.80	4	3.95	0.99	4
13	Handheld Power Tools	0.54	4.78	0.54	5	4.67	0.67	5
14	Shielded Metal Arc Welding (SMAW)	0.51	4.74	0.56	5	4.64	0.70	5
15	Stationary Power Tools	0.44	4.74	0.56	5	4.65	0.68	5
16	Plasma Arc Cutting (PAC)	0.38	4.40	0.78	5	4.32	0.77	5
17	Cold Metal	0.32	4.32	0.86	5	4.26	0.87	5
18	Supervised Agricultural Experience (SAE)	0.30	4.09	0.89	4	4.01	0.91	4
19	Oxygen/Fuel Cutting	0.25	4.70	0.61	5	4.65	0.70	5
20	Hand Tools	0.12	4.67	0.62	5	4.65	0.73	5
21	Oxygen/Fuel Brazing	-0.60	3.61	1.01	3	3.77	1.04	4
22	Oxygen/Fuel Welding	-0.97	3.98	1.11	5	4.22	0.96	5
23	Fencing	-1.36	3.82	0.91	4	4.17	0.93	5

Methods

- The population for this study were all Texas, school-based agricultural science teachers during the 2014-2015 academic school year **(*N* = 1,754).** Sample size **(*n* = 315)**.
- Based on a review of research, an online instrument was developed and then reviewed by a panel of experts **(*N* = 7)**.
- Prior to the study, a pilot test **(*N* = 17)** was conducted.
- A reliability analysis (Cronbach's alpha coefficient) of the scales of measurement was conducted and resulted in Importance = **.916**, Ability to Perform = **.936**, and Ability to Teach = **.937**.
- Usable responses were collected **(*n* = 154)** for a **48.89%** response rate. Non-response error was addressed using *Method 1 – Comparing Early to Late Responders* – no differences existed (Linder, Murphy, & Briers, 2001).
- Data was then analyzed using the Borich (1980) Needs Assessment Model and IBM SPSS Statistics 22.

Conclusions, Implications, & Recommendations

- The majority of teachers were mid-career, in their early 40's, of white ethnicity, and male, who taught four classes of agricultural mechanics during a school year.
- Across both the performance and consequence competence, teachers indicated a professional development need in the majority of the agricultural mechanics skill areas.
- The skill areas of Modern Machinery Technology, Hydraulics, and Pneumatics arose to the top.
- Adequate and timely professional development opportunities can and should be enacted by state staff.

- Stakeholders should consider in-service opportunities, salary/workplace improvements, and pre-service education advancements.

References

- References available upon request.