# Metal Fabrication Knowledge Needed by Beginning Agriculture Education Teachers

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## Introduction/Need for Research

The importance of agricultural mechanics to school-based agricultural education programs has been well documented (Burris, Robinson, & Terry, 2005) and continues to be popular among secondary agriculture students (Hubert & Leising, 2000; Oklahoma Department of Career and Technology Education (ODCTE, 2012). Counterintuitively, however, teacher preparation programs require relatively few credit hours of agriculture mechanics for graduation. The majority of agricultural teacher preparation programs require fewer than 12 credit hours for graduation (Burris et al., 2005). While increasing the credit hour requirements may not be an option to better prepare agriculture teachers (Blackburn, Robinson, & Field, 2015), identifying the needs of teachers may provide a guide teacher education programs can reference to structure their course offerings to maximize instruction in agricultural mechanics. Therefore, the objective of this study was to identify the metal fabrication knowledge needed by beginning agriculture education teachers.

## Conceptual Framework

The conceptual framework guiding this study was modeled after Buriak and Shinn (1989) who employed the Delphi method to identify a research agenda for agricultural education through the insights of content experts. Creating consensus among experts to identify teacher needs is a common use of the Delphi method (Stackman, 1974). The opinions of experts are used in the absence of a knowledge base to make decisions (Helmer, 1966).

## Methodology

The Delphi method is reliant upon the selection of an expert panel (Dalkey, 1969). For this study, agricultural education faculty who taught metal fabrication courses at the post-secondary level were selected to participate as panelists. The identified faculty were sent an email request to participate. Of the 28 instructors invited to participate, 13 accepted and returned the initial instrument. Thirteen completed the second and third round questionnaires. When Delphi studies include groups of 13 or larger, reliability is greater than .80 (Dalkey, 1969).

In the first round, the panelists offered their response to one open-ended question. The question reflected the objective of the study, and remained unchanged throughout. In the second round, the panelists reviewed the responses from round one and assigned a value rating based upon the level of agreement with the item. A seven-point Likert-type scale was employed with items ranging from 1 “Very Strongly Disagree” to 7 “Very Strongly Agree”. Panelists were encouraged to further refine statements by adding comments and suggestions. Round three was used to further refine statements and build consensus among the panelists. Frequency distributions were used to refine further responses from round two. A 66% consensus level was established for this phase *a priori*. Only those statements on which 66% of the panelists selected “Strongly Agree” (rating of 6), and “Very Strongly Agree” (rating of 7) were retained for the third round. Descriptive statistics were used to summarize the collected data. Means, frequency distributions, and percentages were calculated for the statements on the third-round instrument.

## Findings

Panelists identified 12 areas of metal fabrication knowledge required by beginning agriculture education teachers. The responses were consolidated into three categories, 1) metal fabrication equipment, 2) metal fabrication production, and 3) teaching and management. Within the metal fabrication equipment category panelists indicated beginning teachers need to be able to identify parts and components and operating procedures of welding and cutting equipment including SMAW, GMAW, and Oxy-fuel. In addition, teachers need to demonstrate understanding of the proper use of power and hand tools used in metal fabrication. Metal fabrication production knowledge included the ability to distinguish weld joints, welding positions, and create project bills of materials. Creating authentic performance assessments and implementing laboratory management plans including safety, first-aid, ordering materials, and equipment maintenance were areas of knowledge identified in the teaching and management category.

## Conclusions

A panel of experts identified eight essential metal fabrication knowledge areas that beginning agriculture education teachers should possess prior to starting a career as a school-based agriculture educator. These knowledge areas ranged from knowledge of metal fabrication equipment and production practices to teaching and laboratory management.

As a result of this study, several questions arose: Are preservice institutions preparing prospective agriculture teachers with the needed metal fabrication knowledge areas to successfully gain employment? If the answer to this question is no, why are teacher educators not adequately preparing these students? Is the drawdown in credit hour requirements for graduation impacting this issue? If so, what professional development workshops are being provided to in the area of metal fabrication for current agriculture teachers? Furthermore, as we assess the viability of metal fabrication education in the agricultural mechanics laboratory are incorporating the technology and techniques used by modern professional metal fabricators? Future research will be necessary to answer these questions.

## Recommendations

Based upon the results of this study, several recommendations were developed. Institutions which prepare preservice agriculture teachers should use the findings from this study to determine if students are being adequately educated in metal fabrication. Teacher educators and state professional development staff should conduct professional development needs of current agriculture teachers in the area of metal fabrication. Using findings from the previously suggested research, teacher educators and state professional development staff should develop and provide educational opportunities for teachers to increase their capacity to provide competent instruction in metal fabrication. Finally, to further improve metal fabrication instruction to preservice and inservice teachers, advisory groups consisting of industry professionals should be created and utilized to review curriculum to determine what improvements can be made to improve metal fabrication instruction to better reflect industry standards.

## References


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