

## Developing Industry Partnerships to Provide Welding Certifications

**Jacob D. Ramos**

Texas State University  
601 University Dr.  
San Marcos, TX. 78666  
512-245-2130  
[Jdr300@txstate.edu](mailto:Jdr300@txstate.edu)

**Ryan G. Anderson**

Texas State University  
601 University Dr.  
San Marcos, TX. 78666  
512-245-3325  
r\_a461@txstate.edu

**Bradley D. Borges**

Texas State University  
601 University Dr.  
San Marcos, TX. 78666  
512-245-7106  
b\_b518@txstate.edu

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### **Introduction**

Agricultural mechanics educators are in high demand across the country due to an aging secondary teacher population and inexperienced post-secondary graduates. Agricultural mechanics educators' knowledge and skill can be improved through professional development opportunities such as welding certificates during undergraduate welding courses (Wells & Hainline, 2021). As noted by Stone et al., (2011) welding is a task that requires training and specific skill development. As younger generations pursue less physically demanding careers such as welding (Brat, 2006), there is predicted welder deficit of over 375,000 jobs by the year 2026 (Guerra, 2018). This demand can be combatted through agricultural education and agricultural mechanic graduates joining the workforce. Through agricultural mechanics courses, students can either begin or further their welding skill development and possibly earn welding certificates authorized by an American Welding Society (AWS) accredited certified welding instructor (CWI).

### **How It Works**

The Introduction to Agricultural Engineering course at Texas State University is a sophomore level class that is a prerequisite for all upper-level agricultural mechanics classes. The course consisted of underclassmen interested in industry management/agricultural education, and upperclassmen that typically represented other agricultural majors. This class introduces students to a variety of topics such as metal fabrication, construction and manufacturing, electrical systems, engine systems and machinery management. During the welding portion of the course, students are expected to learn and apply many objectives in the welding trade. These objectives cover, but are not limited to, different weld processes/positions, principles of metallurgy, machine settings/variables, weld quality, shop safety/production, tool identification, and skill development.

A total of four weeks of laboratory activities are dedicated towards welding in this course. Making this the most time extensive topic of the semester. The practice of welding requires more time in the automaticity phase of skill acquisition for students to further grasp the skill of welding (DeKeyser, 2015). Partnering with a CWI can validate students' skills at the end of this course and can create further educational opportunities. Students enrolled in the spring 2021 Introduction to Agricultural Engineering course had the ability to earn a welding certificate by a CWI from a local industry partner. Students trained during their scheduled lab time with their classroom instructor and lab assistant. Students of practice a 2F T joint weld using the gas metal arc welding (GMAW) process. Welding machines were preset using .035" solid wire in the short arc transfer method. It is concluded by Byrd et al. (2015), and Stone et al. (2013) that the simplicity of the 2F position tends to be easier for both novice and experienced welders. Students spend the last week with an industry welding instructor where they receive additional demonstrations, and continuous welding feedback. It is during this time that the students submit their highest quality weld to be graded by a CWI. If the students fabricated a competent weld, the CWI granted them a welding certificate proving the student's ability to produce an industry standard weld.

## **Results To Date**

This innovative idea was implemented in the 2021 spring semester of the Introduction to Agricultural Engineering course at Texas State University. Forty-four students developed their skills over the course of four weeks. The last week consisted of training with industry partners where they submitted their best weld to be graded by the CWI. Of the forty-four students that submitted a weld, thirty students passed visual inspection and received a welding certificate. This resulted in a 68.18% passing rate for the class. In addition to students gaining additional confidence in their welding abilities, the students were able to add a certifiable skill to their resumes. Furthermore, the welding educator and CWI were able to work directly with students to build a professional pathway as some students were offered hourly positions and summer internships.

## **Future Plans/Advice to Others**

Many students in the Introduction to Agricultural Engineering course are on the path to being welding educators or working in industry which makes partnering with a local welding industry an important asset for future success. Students learn what is required of a competent welder and gain insight into the welding industry with these partners.

We recommend school-based agricultural education teachers, welding teachers, and agricultural mechanics professors foster partnerships with industry CWIs and instructors early in their careers to help improve the quality of welding instruction in their classrooms. Developing industry partnerships can lead to additional benefits for both the school and industry by creating career pipelines, advisory roles for the program, sponsor students in the welding course by providing personal protective equipment, safety training, opportunities for potential financial support to update facilities and process and supply consumables. We also recommend developing additional partnerships with other industry experts and industry recognized certifications. These additional resources could be incorporated within other areas of agricultural mechanics including Occupational Safety & Health Administration (OSHA) training and National Coalition of Certification Center training programs. Doing so will further strengthen courses, grow external educational opportunities, and potentially create departmental partnerships which can help with student funding.

## **Cost and Resources Needed**

Excluding the traditional costs associated with teaching the welding portion of the class (welding wire, shielding gas, contact tips, and steel), there was no additional cost during our implementation of this idea. The local industry partner donated their time to assist with this project. If this partnership had not existed, the work would need to be contracted. CWI and welder instructor rates vary per location. In our area CWI rates in fabrication shops range from \$21/hr - \$35/hr, while weld instructors/welders range from \$20/hr - \$29/hr. The CWI and welding instructor spent ten hours each assisting with this project which would have resulted in \$640. Third party and independent CWIs have rates of \$50/hr - \$75/hr in this area. There would be additional costs to calculate if the welds went through non-destructive and destructive testing

through an outside party that did not volunteer their time and equipment. The cost of future certifications depends on industry relationships, location rates, and lab times.

### References

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