

**Trial By Arc:
Exploring AR Welding Simulators In Agricultural Technology Laboratories**

James “JD” Kelley¹, Justin Womack², Garrett T. Hancock³

¹Author is an Undergraduate Student in the Department of Agriculture
at Stephen F. Austin State University,
kelleyjd@jacks.sfasu.edu

²Author is an Undergraduate Student in the Department of Agriculture
at Stephen F. Austin State University,
womackjd1@jacks.sfasu.edu

³Author is an Assistant Professor in the Department of Agriculture
at Stephen F. Austin State University,
garrett.hancock@sfasu.edu
<https://orcid.org/0000-0002-5012-8171>

Introduction

Agricultural mechanics courses often give students their first experience with welding and fabrication. In many cases, what students think they can do does not always match what they actually know or how they perform (Wells & Miller, 2022). Augmented reality welding systems provide a safe way to practice and also give scores that can be used to compare performance. Rooted in experiential learning (Kolb, 1984), these systems have been shown to improve performance (Wells & Miller, 2020), shape confidence (Pulley et al., 2025), and lower anxiety for beginners (Heibel, Anderson, & Drewery, 2023; McCubbin, 2018).

This pilot study used Bandura's (1997) concept of self-efficacy, focusing on how confidence influences performance. The purpose of this pilot was to compare how students rated their own ability, how they answered a knowledge check, and how they scored on the simulator.

Methods

Fifty students in the Fundamentals of Agricultural Technology course at Stephen F. Austin State University completed two practice welds on the Miller Augmented Arc simulator. Students also rated their welding ability on a five-point scale (1 = None, 5 = Very High) and answered one knowledge question about the process they had just completed. The data was then compared across self-ratings, knowledge accuracy, and simulator outcomes.

Results

Performance was different across self-ratings. The *Below Average* group scored the highest ($M = 84.55$, $SD = 9.85$), followed by *Above Average* ($M = 82.00$, $SD = 0.50$). Lower averages came from the *None* group ($M = 72.86$, $SD = 19.12$) and the *Average* group ($M = 70.83$, $SD = 14.11$). Students who answered the knowledge check correctly scored higher ($M = 77.35$, $SD = 13.57$) than those who answered incorrectly ($M = 73.97$, $SD = 19.73$). The largest subgroup was *No Experience-Incorrect* ($n = 23$, 46%) with an average of $M = 73.17$ ($SD = 20.57$). The *Below Average* group stayed strong no matter their answer, with incorrect ($M = 86.00$, $SD = 6.50$) and correct ($M = 84.19$, $SD = 10.49$) scores both above the overall mean.

Discussion/Conclusion

These results show that how students rate themselves does not always line up with how they perform. Some groups scored better than expected while others struggled, and the largest group had only moderate results. This matters because confidence can help or hurt depending on how it lines up with skill. Using Bandura's self-efficacy theory, the findings suggest that students who rated themselves modestly may have been more focused, while both overconfidence and inexperience created barriers.

This study is limited to one course, one simulator, and one group of students. The results are not generalizable beyond this setting, but they do provide useful insight into how [University] can better implement augmented reality welding into its courses. In the end, this "Trial" shows that measuring both confidence and skill together can spark new ways to support student learning in agricultural mechanics.

References

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