Evaluating Self-Assessed Versus CWI Welding Scores by Gender

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Introduction

As several researchers have suggested, welding is a highly demanded skill that is prevalent throughout many industries including agricultural mechanics (Abrams et al., 1974; Stone et al. 2011; Wells & Miller, 2020). Abrams et al. (1974) indicated that evaluation is necessary in the welding training process to accurately identify successful performance. Through self-evaluations, students display comprehensive knowledge that requires high cognition when critically evaluating the quality of their own work, specifically when engaging in a task, in this case, welding (Ghaicha, 2016). However, males have been identified to overestimate the quality of their self-perceived performance both prior to and after completing a task when compared to actual performance as evaluated by an expert; conversely, women have been identified to underestimate the quality of their self-perceived performance both prior to and after completing a task when compared to actual performance as evaluated by an expert (Reuben et al., 2014). In a recent study, undergraduate physics students were asked to evaluate their self-efficacy related to physics, where it was revealed that self-efficacy towards course success was derived more from students' perceptions rather than actual performance, with males identifying their own performance higher than the actual quality displayed (Marshman et al., 2018). Lichtenstein et al. (1982) also found men to be overconfident in their success in uncertain situations and their relative performance in a task. As such, researchers determined benefit would be provided by comparing self-assessed welding scores to a Certified Welding Inspector (CWI), by gender, as no such studies currently exist.

Theoretical Framework

The underlying theoretical framework that guided this study was constructed using the self-efficacy model. This model focuses on perceiving one's capabilities, performance, and confidence when performing tasks (Bandura, 1983). Self-efficacy is known to be influenced by the behaviors of the environment, goal achievements, feedback from instructors, and comparison among their peers by their performance (Schunk, 2012). Negative and positive feedback can affect self-efficacy but will not change the interpretation of one's capabilities (Schunk, 2012). To achieve adequate skills and attain a positive learning experience, self-efficacy is the key to motivate, self-evaluate, and achieve their goals in a task or situation (Schunk, 2012). Multiple behaviors can influence the increase or decrease of one's self-efficacy, affecting how one perceives their capabilities.

Purpose and Objectives

The purpose of this study was to compare the self-assessed welding scores of students, by gender, when compared to the CWI assessment. This study aligns with the American Association for Agricultural Education National Research Agenda Research Priority Area 4: Meaningful, Engaged Learning in All Environments (Roberts et al., 2016). Providing a meaningful and engaging learning experience to beginner welders by practicing self-evaluation and developing welding skills will be beneficial in advancing welding education. The objectives for this study are (1) determine if a difference exists between female and male scores on self-assessments of their welding performance (2) determine if a difference exists between the self-assessment and CWI welding scores for both females and males.

Methods

Participants were exclusively students enrolled in the Introduction to Agricultural Engineering course (n = 42), and were allowed one, one-hour-and-fifty-minute lab period to practice welding using ¼" mild steel in the 2F position. The students were granted access to a virtually unlimited supply of steel and were encouraged to produce as many welds as possible during the lab, submitting their highest quality weld for grading. At the conclusion of the lab period, a grading criterion developed by Herren (2009), was used independently by the students, course instructor, and an American Welding Society (AWS) accredited certified welding inspector (CWI) to score the submitted weld. Scores provided by the students and CWI were stored, then analyzed via an independent T test to accurately compare between values of multiple data sets.

Results

This study collected data from 42 participants, with a majority identifying as female (f = 23; 52.3%). Table 1 reports the mean scores between males and females for the self-assessment of their own welds. Males presented a higher self-assessed score of (M = 86.32, SD = 10.33) compared female self-assessed scores (M = 72.70, SD = 18.89). There was a statistically significant ($p < 0.05$) difference between the male and female self-assessed scores.

Table 1

Self-Assessment of Welding Scores by Gender

Gender	*n*	*M*	*SD*	*t*	*df*	*p*
Male	19	86.32	10.33	2.81	40	0.01
Female	23	72.70	18.89			

Table 2 reports the mean scores between males and females for the CWI's evaluation. On average, males presented a higher self-assessed score (M = 86.32) than the welding score provided by the CWI (M = 84.68). In comparison, the females evaluated their welds lower (M = 72.70) than the score assessed by the CWI (M = 79.00).

Table 2

Welding Scores by Gender as Assessed by Certified Welding Inspector (CWI)

Gender	*n*	*M*	*SD*	*t*	*df*	*p*
Male	19	84.68	6.47	1.79	40	0.08
Female	23	79.00	12.50			

Conclusion, Discussion, and Recommendation

Although there were no statistically significant differences identified in performance of males and females when compared to an industry expert's evaluation, on average, male self-assessment scores were higher than actual performance and female self-assessment scores were lower than actual performance. As such, researchers concluded that females are more critical of their own performance when compared to males. It is recommended to replicate the study with a larger sample size to accurately draw conclusions regarding the population. It is also recommended to target participants with more extensive welding knowledge and experience.

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