

**School-Based Agricultural Education Students' Affinity Toward and Perceptions of
Welding Skills**

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Introduction and Need for Research

The U.S. Bureau of Labor Statistics (2024) predicts an estimated 45,800 annual job openings in welding within the next eight years. In order to meet these demands, career and technical education (CTE) must provide experiences for youth to develop skills in this area, and all power, structural, and technical (PST) areas (Heibel et al., 2021). However, PST areas are underserved within school-based agricultural education (SBAE); despite 23.4% of Minnesota SBAE students being enrolled in PST courses (Minnesota Department of Education, 2024), there is only one PST-centric FFA CDE (National FFA Organization, 2025). In light of this, the Minnesota FFA Association has established partnerships with welding companies so *all* SBAE students, not just FFA members, can develop their welding skills and recognize achievement in welding competitions, as recognition can benefit students' career and skill development trajectory and self-efficacy (Bünning et al., 2022; Chang et al., 2016). This work is needed to better understand the skills and perceptions of SBAE students related to welding, a high-demand trades career. The purpose of this pilot study was to evaluate SBAE students' affinity toward and perceptions of their welding skills. This purpose was guided by two objectives: 1) to measure students' identity, personal interest, self-concept of ability, and attitudes toward welding, and 2) to determine if there is a relationship between the scales and student achievement in welding competitions.

Theoretical Framework

The mastery- and performance-approach orientation of achievement goal theory serves as the theoretical framework. Developed in the 1980s, achievement goal theory posits one's degree of motivation is influenced by their approach to achieving a goal (Ames, 1992; Dweck & Leggett, 1988; Urdan, 1997). Mastery approach students focus on developing skills and to maximize their learning, while performance approach students are driven by the chance to compete for recognition and appearance of superiority (Urdan & Kaplan, 2020; Wolters, 2004). The welding competitions allow students to develop skills (mastery approach) while providing an opportunity for recognition (performance approach). Likewise, the items within the instrument were designed to measure students' affinity toward their own perceived welding skills (mastery approach) and their perceptions in how they perform relative to their peers (performance approach).

Methods

An IRB-approved instrument adopted from Yoon & Ryu (2024) was utilized for this study. Their instrument contained four scales that achieved high Cronbach's alpha coefficients, including the personal interest scale ($\alpha = 0.86$) (Barbera et al., 2008), self-concept of ability scale ($\alpha = 0.81$) (Else-Quest et al., 2013), and the attitudes scale ($\alpha = 0.94$) (Germann, 1988). These coefficients establish the validity of the instrument, and are above the recommended minimum value of 0.70 prescribed by Nunnally (1978). Forty-three students (34 male; 9 female) and their parents consented to their participation; the population of interest was SBAE students who attended one of the three 2024-2025 Minnesota welding competitions. Participants were given a hard copy of the instrument to voluntarily complete, consisting of 25 Likert-type scale items, with 1 meaning "strongly disagree" and 5 meaning "strongly agree." After each competition, 5 winners were identified and names were removed to ensure confidentiality. Data were entered into SPSS, and the scales were calculated based on the procedures in Yoon & Ryu's (2024) study. Statistical processes such as one-way ANOVAs and descriptive statistics were calculated and interpreted.

Results

Objective 1 sought to measure students' identity, personal interest, self-concept of ability, and attitudes toward welding. For the purposes of this study, *identity* is one's own perceptions of what others think about them in regard to their welding skills, *personal interest* is one's level of fascination with welding, *self-concept of ability* is one's perceived level of skill related to welding, and *attitudes* are one's personal views of welding. Table 1 indicates the average scores and standard deviations for each scale; participants have the highest overall rating in their attitudes of welding ($\mu = 4.24$; $\sigma = 0.60$), followed by their personal interest ($\mu = 3.97$; $\sigma = 0.52$).

Table 1: All Participants' Average Scores on Each Scale ($n = 43$)

Scale	μ	σ
Identity	3.77	0.47
Personal Interest	3.97	0.52
Self-concept of Ability	3.62	0.69
Attitudes Toward Welding	4.24	0.60

Note. Scores of 1 (strongly disagree) to 5 (strongly agree) were used for items in each scale

Objective 2 aimed to determine if there was a relationship between the students' scores using the four scales measured in Objective 1 and their level of achievement in PST competitions. Table 2 indicates average scores for individuals based on their winner vs. non-winner status, along with the corresponding degrees of freedom (*df*) and p-values (*p*) comparing each of the populations.

Table 2: Participants' Average Scale Scores Based on Winner vs. Non-Winner Status ($n = 43$)

Scale	Winners ($n = 9$)		Non-Winners ($n = 34$)		<i>df</i>	<i>p</i>
	μ	σ	μ	σ		
Identity	3.53	0.61	3.83	0.41	42	0.077
Personal Interest	3.67	0.52	4.05	0.49	42	0.045*
Self-concept of Ability	3.48	0.63	3.66	0.71	42	0.506
Attitudes Toward Welding	3.95	0.64	4.32	0.57	42	0.086

*Statistical significance is achieved with $p \leq 0.05$.

Conclusions and Recommendations

Regarding objective 1, students had the most positive attitudes toward welding ($\mu = 4.24$; $\sigma = 0.60$), with the reduced self-concept of ability ($\mu = 3.62$; $\sigma = 0.69$). This may be attributed to a desire to focus on skill development rather than winning (Ames, 1992; Dweck & Leggett, 1988; Urdan, 1997), or perhaps a lack of experience, the need to build more confidence, or age (Wolters, 2004). As for objective 2, the scale scores were consistently higher for non-winners than for winners, with a statistical difference in personal interest between both groups. However, this may be attributed to a small sample size; a larger sample size may reduce standard deviations and better reveal relationships between scales and variables. Research recommendations include conducting interviews with students to learn more about their career aspirations, and the degree to which their PST classroom, life, or work experiences have influenced these. One limitation of this study was a small sample size and not having a pre-post model. This study should be conducted again with a larger sample and a pre-post model to reveal additional trends or relationships, especially in regard to affinity and skills as students progress in their skill development over the years. For professional practice, more states should host PST invitationals for SBAE students. These invitationals recognize students who may not otherwise be recognized for their skills, and provide additional encouragement for students to pursue future careers to satisfy the projected PST career demands (U.S. Bureau of Labor Statistics, 2024).

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