3-2-4-1: Teaching Critical Thinking and Communication Skills Through Skill-based Performance Evaluation

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Introduction

School-based agricultural education (SBAE) uses a variety of methods to prepare students for experiences in and around the agricultural industry, including career preparation, leadership education, and more (National FFA Organization, 2015; Phipps, Osborne, Dyer, & Ball, 2008). These methods include classroom and laboratory instruction that utilize and promote live, real-world, hands-on experiences and skill development in numerous areas related to agriculture, as well as opportunities to showcase and demonstrate talents and abilities that have been developed over a period of time (National FFA Organization, 2015; Phipps et al., 2008). As a significant portion of SBAE is related solely to laboratory-based instruction, much of which traditionally includes agricultural mechanics content, the hands-on nature of the curriculum is often appealing to students and creates new opportunities for teaching and learning (Burris, Robinson, & Terry, 2005; Wells, Perry, Anderson, Shultz, & Paulsen, 2013).

As a popular portion of agricultural mechanics curricula, welding remains a prominent area of instruction (Anderson, Velez, & Anderson, 2014). Welding content can include various metalworking processes and training methods that offer a diversity of opportunities for students (Anderson et al., 2014; Herren, 2015). Moreover, such diverse training methods can potentially be used to emphasize different aspects of welding education, such as formative self-evaluation of performance-based criterion (e.g., welding beads). More specifically, formative self-evaluation can potentially allow opportunities for students to use critical thinking and small-group communication skills to compare personal achievements, such as progress toward welding proficiency, to standards used in the real world, such as weld quality standards set by the American Welding Society (AWS). In addition, formative assessment could, in the context of welding, be used to identify issues related to skill development and, in turn, help to correct deficiencies earlier in the learning process (Phipps et al., 2008).

How it Works

Agricultural mechanics content at Fayette County High School in Fayette, Alabama consists largely of welding and metal fabrication, with several weeks of each academic year dedicated to the teaching of the content. During the 2015-2016 academic year, the agricultural education teacher at Fayette County High School worked with a faculty member at Iowa State University to develop and implement a learning activity instrument that utilized concepts similar to livestock evaluation competition practices. The purpose of the activity was to create a practical and useful evaluation tool that could be used by students to assess their own progress toward proficiency and grant opportunities to develop and hone various critical thinking and communication skills that may be useful beyond the walls of an SBAE program. This resulting activity, the Welding Project Oral Reasons Assignment, was piloted during the welding content within an introductory-level course, Fundamentals of Agriscience. In order to fully complete this formative assessment tool, two days were designated for this assignment. On the first day, students were asked to complete four flat position welding beads on a mild steel welding coupon. The teacher designated the parameters of the assignment, such as welding electrode selection,

travel direction of the welds, etc., that were to be used to guide this activity. After all students in the course had completed their assigned four welding beads, all of the coupons were cooled, marked for identification purposes, and were to be used during the next day's course meeting.

At the beginning of the second day, students were instructed to retrieve their welding coupons from the prior day's work. Afterward, students were given the Welding Project Oral Reasons Assignment worksheet to complete. Within the worksheet, students were asked to take thorough and detailed notes on each of their welding beads, describing such traits as the presence of porosity, penetration, etc. Next, students were instructed to provide a placing of their welds from best to worst (i.e., 1-2-3-4, etc.), using their detailed notes as a guide. Afterward, instructions were given to provide complete reasons for their placings decisions. This section included sorting welding beads by pairs and providing reasons for such placings, grants, and faults. After all written activities were completed, students were instructed to stand before their peers, show their welding coupons, and verbally share their placings and reasons for each of their welding beads, much like the oral reasons portion of a livestock evaluation competition.

Implications

Anecdotal evidence from this activity noted that the students appeared to become heavily involved and genuinely interested in this experience. As described by the agricultural education teacher, engagement was consistently high throughout the two-day experience. It was noted that after this assignment, many students became less dependent on the teacher to help identify and correct issues associated with their welding beads. Instead, it appeared that students became better able to positively identify their deficiencies themselves. As a result, the teacher was allowed greater flexibility and time to assist students who were struggling with learning the psychomotor skills associated with welding. Based upon this anecdotal evidence, perhaps this type of activity should be considered for further adaptation and use in additional content areas.

Future Plans & Advice to Others

The agricultural education teacher expects to continue implementing this activity during the welding and metalworking portions of the program's coursework. There currently exist plans to adapt this activity and its approach to other SBAE content as well, including woodworking, animal evaluation, plant evaluation, and more. This ease of adaptability can help to provide greater curriculum diversity and ease of use. It is recommended that agricultural education teachers, as well as other career and technical education (CTE) teachers, at other programs consider the adaptation and adoption of this method as well, regardless of the content taught within other programs. In addition to secondary-level coursework, post-secondary coursework that emphasizes skills-based training should consider adopting this instructional approach so as to help the future workforce to build valuable and vital critical thinking and communication skills useful within the world of work.

Costs

Besides the costs associated with the welding consumables, which were already available prior to this activity, there were no additional costs to implement these procedures.

References

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