Innovative Idea

Increasing student welding comprehension utilizing an instructor-led, blue tooth welding hood camera: Students perceptions of technology innovations

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Introduction

Based upon suggestions by the National Research Agenda for Agricultural Education (Roberts, Harder, & Brashears, 2016), as a country, the U.S. lacks a sufficient scientific and professional workforce that can address the Science, Technology, Engineering, and Mathematics (STEM) challenges of the 21st century workforce. According to Sargent (2017) "the U.S. Bureau of Labor Statistics (BLS) projects that the number of science and engineering (S&E) jobs will grow by 853,600 between 2016 and 2026, a growth rate (1.1% Compound Annual Growth Rate - CAGR) that is somewhat faster than that of the overall workforce (0.7%)." To assist with this growing need for workers, many communities rely on secondary education programs, i.e. career and technology education, to teach a future workforce. One such career field within STEM is the welding and metal fabrication industry. Research has indicated that the manufacturing industry has a significant need for skilled welders during the 21st century, many of which are retiring or lost to attrition (Stone, Kaminski, & Gloeckner, 2009; Wang, Goodrum, Haas, & Glover, 2009; Wright, 2013). In order to prepare a new generation of welders, educators must not only must understand the educational challenges of this group but also the technology used for training purposes (Pate, Warnick, & Meyers, 2012). This project sought to increase student welding comprehension and decrease the time for knowledge transfer by introducing students to a welding hood that could be used the supplement traditional welding instruction.

Program Phases

To better instruct secondary and undergraduate students, a battery operated, Bluetooth enabled camera was mounted inside an autodarkening welding hood. The purpose of this technology was to allow the instructor the ability to demonstrate to students the proper methods of welding with various processes in varying welding positions. Students could utilize cellphones, tablets, or other devices to view what the teacher was seeing through the welding hood, thus eliminating distance or overcrowding as an obstacle to learning. The camera also had the ability to record both video and audio to a microSD card or to a cell phone/tablet app associated with the camera. This technology allowed for students to be able to download the welding procedure for later observation and learning.

Results to Date

This welding hood mounted camera system was used for instructional purposes with secondary students during the 2018-2019 academic year at Douglass High School in Douglass, TX. Listed below are some comments of the use of this technology as described by the agricultural, food, and natural resources teacher:

- "I am able to connect my Wi-Fi Enabled Smart Device to the projector in the classroom and, if in range, can play a live feed view of a student or instructor welding in the lab."

- “Students are able to hear what the welder is hearing and see what they are seeing and can begin to develop the skills of an active troubleshoot or diagnosis of a weld.”
- “I am also able to have a student who may be struggling with a specific skill perform their weld while wearing the Helmet Cam and record their session. After completion, the student and I are able to play back the recording and review and critique their technique while having the finished product in their hand.”
- “For advanced students, I can have them view a set of pre-recorded videos and based on what they see in the video they will match them to the appropriate weld coupons. This enhances the student’s skills of being able to recognize common errors in a completed weld and match them to the error in technique during the welding process. This also helps students in being able to articulate what they are seeing how to describe it to someone else or help teach someone else.”
- “This system allows for the unique opportunity to record a guest lecturer or industry professional performing various welds and to have a “perfect view” of what they are doing. Students can then watch this footage as many times as necessary to assist them in improving their own skills.”

Cost/Resources Needed

The total cost of this system was $105.38. An autodarkening welding hood was purchased from Home Depot ($59.97), and the remaining items were purchased from Amazon.com: a super mini camera ($36.99), 3M command strips ($2.99), and 3M vinyl tape ($5.43). Students can utilize a smart phone or tablet to download the app for the camera at no cost.

Future Plans

Future plans for this technology include: hosting CTE teacher workshops to display the instruction, construction of welding hoods, and utilize this technology for future secondary student instructional purposes. Additionally, this technology will be used for undergraduate teacher instruction and review. A large Bluetooth enabled television monitor will be installed in the welding laboratory for instructional purposes. Additionally, a social media instructional series for career and technology teachers could be recorded using this technology.

References

Pate, M., Warnick, B., & Meyers, T. (2012). Determining the critical skills beginning agriculture teachers need to successfully teach welding. *Career and Technical Education Research*, *37*(2), 171-184. doi: 10.5328/cter37.2.171

Roberts, T. G., Harder, A., & Brashears, M. T. (Eds.). (2016). American Association for Agricultural Educational national research agenda: 2016 – 2020. Gainesville, FL: Department of Agricultural Education and Communication.

Sargent, Jr., J. F. (2017). *The U.S. science and engineering workforce: Recent, current, and projected employment, wages, and unemployment* (CRS Report R43061). Washington, D.C.: Congressional Research Service.

Stone, K. B., Kaminski, K., & Gloeckner, G. (2009). Closing the gap: Education requirements of the 21st century production workforce. *Journal of Industrial Teacher Education*, *45*(3), 5-33.

Wang, Y., Goodrum, P. M., Haas, C. T., & Glover, R. W. (2009). Analysis of observed skill affinity patterns and motivation for multiskilling among craft workers in the U.S. industrial construction sector. *Journal of Construction Engineering and Management*, *135*(10). doi: 10.1061/(ASCE)CO.1943-7862.0000072

Wright, J. (2013). *America's skilled trades dilemma: Shortages loom as most in demand group of workers age*. Retrieved from: https://chooseyourfuture.cps.edu/wp-content/uploads/2015/08/Americas-Skilled-Trades-Dilemna.pdf