Using Virtual Reality Simulations for Teaching Fire Safety in the Secondary Agricultural Mechanics Setting

McKenna Skidmore
Tarleton State University
Box T-0040
Stephenville, TX 76401
254-968-0595
mckenna.skidmore@go.tarleton.edu

G. Curtis Langley
Tarleton State University
Box T-0040
Stephenville, TX 76401
254-968-9601
langley@tarleton.edu

J. Chris Haynes
Tarleton State University
Box T-0040
Stephenville, TX 76401
254-968-0595
chaynes@tarleton.edu

Chandra Andrew
Tarleton State University
Box T-0040
Stephenville, TX 76401
254-968-1641
candrew@tarleton.edu

Using Virtual Reality Simulations for Teaching Fire Safety in the Secondary Agricultural Mechanics Setting

Introduction

In a wood shop class in Utah, a 17-year-old student was life-flighted to a hospital after being severely burned and shocked when working on a project (Bolerjack, 2017). A student at Elmond in Florida, a students' hair was ripped out when her hair got pinned in the drill press the student was using (Roberts, 2012). Instances like these provide support for the opportunity and need for teaching about safety. CTE classes hold a potentially higher risk for injuring CTE educators, administrators, and students for the sheer fact that the academic counterparts in the CTE curriculum provides more physical and hands on interactions in the classroom (Thomas V. Toglia, 2009). "Most important, a comprehensive safety program where safety is incorporated into every lesson, activity, and laboratory demonstration will help to minimize the potential for student injuries" (Toglia, 2009, p. 21). The *National Science Education Standards* emphasize that teachers must "teach students how to engage safely in investigations inside and outside the classroom" (Barrier, 2005, p. 30).

There isn't just a need for safety in high school CTE programs but globally as well. The Occupational Safety and Health Act was passed in 1970, with the purpose of regulating commerce and providing for the general welfare, as well assuring men and women a safe and healthful working condition, and to preserve our human capitol. Even with Acts' like OSHA, work related injuries day in and day out are still being talked about on news broadcasts shared on social media.

Within a study looking at the impact virtual reality (VR) has on career and technology education, results indicated that the impact of virtual reality programs in CTE in higher education is worthy of consideration as instructional designers plan for the use of instructional technologies. What is more, "Virtual reality programs can contribute to the academic success, motivation, and level of satisfaction of the American workforce" (Catterson, 2013, p. 72). A meta-analysis done by Sitzmann (2011) and Vogel et al. (2006) found a statistically significant positive impact on learning outcomes by analyzing the effects of interactive computer-based games and simulation.

How it Works

The innovation is to integrate virtual reality simulations in the classroom, in this instance using the LION BullEx Bullseye Laser-Driven fire extinguisher to teach fire safety in the secondary agricultural mechanics lab. This model is portable allowing you to train safety in any setting whether it be in the teachers' lounge, in a classroom, etc. It is easy to set up and tear down with virtually no cleanup which allows this model to be time effective in training more people in a smaller amount of time. Its elements are designed to teach a variety of lessons including how to use a fire extinguisher, how to dial 9-1-1 and talk to communications via telephone, how to pull a fire alarm and how to reset it, and it also has the ability to teach with a

weighted fire hose shooting real water. Features provided for this set include: a screen with digital flame generation, a patented sensor technology, a variety of VR fire extinguishers some weighing 5lbs., 10 lbs., or 20lbs, a telephone with voice recording and dial tone, smoke detector, fire alarm, and a weighted fire hose. The fire extinguishers allow you to teach the P.A.S.S. application; Pull the trigger, Aim the nozzle at the bottom of the fire, Spray the chemical (or in this instance, the laser emission), and Sway side to side putting out the flames. If you would like to do an outside lesson the fire hose feature is weighted like a real fire hose and sprays water at the screen to put out the virtual flames. To keep the screen from falling or being moved by the power of the hose, a bucket that hold about 400lbs. of water is placed behind the screen for this exercise. By using a virtual reality fire extinguisher set up, you have the opportunity to teach "fire safety" by eliminating the safety hazards of the harmful chemicals in a fire extinguisher and the harmful flames in a live fire.

Results to date/Implications

The results to date by utilizing the VR simulation to teach fire safety, by observing students I have found that they seem to be more comfortable with using the VR fire safety training versus training with a live fire. We have witnessed that it might be more effective to teach fire safety with a live fire but it is safer to use the VR simulation when teaching. Through conversation, students have discussed how they believe that teaching fire safety at the secondary level has the possibility to lower the number of shop related injuries happening in the workforce globally.

Future Plans/Advice to Others

Future plans for this innovation include professional development for educators as well as other professional staff on how virtual reality simulations can positively influence their programs. Future plans for research include the use of VR in agricultural mechanics programs to determine if its use will lower anxiety in students or if it plays a role in students comfort levels about learning new things? Advice to others would include the inclusion of virtual reality instruction in the secondary classroom environment as well as through professional development to reinforce the use of STEM based technology in the classroom. With the need for emphasis of STEM curriculum in all subjects, this is a great way to incorporate teaching about and with technology.

Cost/Resources

The VR equipment ranges from $10,000 to $12,000 depending on the safety elements you intend to emphasize in the lab setting. Additional costs include instruction provided by faculty from the Weatherford College Fire Academy in the use of the BullEx Fire Extinguisher VR simulation, travel and in state per diem costs for the instruction, dependent upon state requirements and guidelines.

References

Allen, S. (2017, October 30). Edmond North student injured in shop class accident. Retrieved from https://newsok.com/article/5570125/edmond-north-student-injured-in-shop-class-accident

Barrier, R. (2005). Making Sense of Safety: Cooperative Learning Activities Allow Students Time to Reflect on the Implications of Lab Safety Rules. *Science Teacher*, *72*(6). Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ727871&site=ehost-live

Bolerjack, D. (n.d.). Teen shocked, burned in school shop accident facing difficult recovery. Retrieved from https://kutv.com/news/local/teen-shocked-burned-in-school-shop-accident-recovering

Catterson, A. J. (2013, January 1). *The Impact of Virtual Reality Programs in Career and Technical Education*. *ProQuest LLC*. ProQuest LLC. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED552504&site=ehost-live

Occupational Safety and Health Act - (1970). (2004, January 1). Retrieved November 19, 2018, from http://www.historyspeak.com/Occupational Safety and Health Act - (1970).pdf

Roberts, C. (2018, April 10). Florida teen's hair ripped from scalp during shop class - NY Daily News. Retrieved from http://www.nydailynews.com/news/national/florida-teen-hair-ripped-scalp-shop-class-article-1.1160840

Toglia, T. V. (2009). Keeping It Safe: Safety and Liability Advice for CTE Programs. *Tech Directions*,*68*(6),17–21.Retrievedfrom http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ836678&site=ehost-live

UNITED STATES DEPARTMENT OF LABOR. (n.d.). Retrieved from

https://www.osha.gov/youngworkers/stories.html