The Use of Virtual Reality Simulations in Agricultural Education

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Innovative Idea Poster

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Introduction/Need for Innovation or idea

Technology is becoming a necessity in classrooms across the U.S. as it allows curriculum to push past situational barriers and creates opportunities for learners to achieve a broadened scope of the topics they are being introduced to. Studies have shown that the inclusion of such technologies promotes engagement in students through active and collaborative learning, as well as student interaction (Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T, 2014).

Perhaps chief among present innovations matching technological advancement and learner-centered education is Virtual Reality programing (Merchant & Goetz, 2014). Virtual reality remains at the forefront of technological advancement within industry and education, being largely utilized in medicine, automotive, aerospace, and entertainment fields. VR technology follows three key principles: immersion, interaction, and imagination (Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T., 2014). It can be described from the human-centered perspective as "a medium composed of interactive computer simulations that sense the participant's position and actions and replace or augment the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation" (Sherman & Craig). This ability of the VR technology to transport a participating individual into a simulated reality opens the doors to implementation within educational demonstrations that otherwise couldn't take place within the context of a traditional classroom. Within agricultural classrooms, VR has the ability to take students on "virtual field trips" where they gain experiences they might not otherwise be introduced to in class due to the safety risk or logistical barriers. However, while proven to be beneficial, VR technology is not currently being utilized to its full extent within agricultural education contexts as research regarding the integration of such programing is lacking.

Just as VR is well documented for its use within medical procedure training because it allows for errors to be made without risk of detrimental consequences, VR can also be a pivotal component of agricultural safety education. Students can enter and react to potentially hazardous situations where they learn from their mistakes and reinforce valuable safety concepts without the fear of injury. This can be especially useful in curriculum interventions regarding tractor rollover safety and prevention. Simulations involving a students' own ability to navigate a tractor through lifelike obstacles on the farm provides the opportunity to stress the importance of preventative measures such as the use of cost-effective rollover protective structures (CROPS) on tractors.

How it works/ methodology/program phases/steps

The University of Kentucky's College of Agriculture, in partnership with the College of Engineering and College of Public Health, take advantage of today's high end virtual reality technology to give students an opportunity to learn about a common agricultural safety issue with an unusual and innovative approach. The researchers have created a virtual simulation program, where students are put behind the wheel of a virtual tractor, and face some of the everyday obstacles of an average farmer. The program uses the Oculus headset and sensors to place participants into the virtual world that the researchers have created. Once immersed, participants can make observations of their entire surroundings with a 360-degree view. They then use the Microsoft steering wheel and foot pedals to control the tractor and drive through a virtually simulated pasture. Once participants have completed their virtual simulation, a survey with Likert type scales will be administered to inquire about their experiences.

This innovative idea takes advantage of the growing interest in virtual reality to increase success in the classroom. Students are presented with an alternative method of

learning, which in turn can increase student engagement and interest in the topic being presented. Allowing students to explore a simulated world with the potential hazards and obstacles they face working on a farm, creates opportunities for them to realize their risk of having a roll over tragedy without the physical danger present. More specifically, the VRCROPS program was designed to provide students within a traditional classroom setting the opportunity to view and experience scenarios outside the scope of their physical environment and into simulated environments they might not otherwise be able to experience.

Results to date/implications

A beta program has been established and field-tested by various teachers, students, professors and community members. Feedback has been taken and implemented to make the program more effective. To date, there is a running program that captures the importance of tractor safety, specifically in avoiding rollovers and placing an importance on the use of CROPS.

Future plans/advice to others

The VRCROPS simulation is still in the developmental stage, but it is receiving positive feedback from participants regarding its impact and overall purpose. With the input received thus far, the VRCROPS research team plans to enhance the virtually simulated farm environment by expanding the exploration area, increasing the number of hazards present, and improving the authenticity of the simulated tractor's responses while increasing the program's overall quality.

In an effort to continue improvements and progression toward full curriculum integration of the VRCROPS program, surveys will be administered to students and teachers in attendance at agriculturally related conferences, such as the National FFA Convention, following their involvement in a simulated tractor driving experience. Completed surveys will then be analyzed on the basis of three categories: quality of the virtually simulated environment, perceived risk and severity, and tractor operation self-efficacy. The VRCROPS research team plans to synthesize the results of the surveys to finalize the virtual simulation program and implement it into an already established CROPS curriculum intervention for youth in Appalachia. More research will then be conducted to explore the broader implication of VR technology within agricultural education.

Costs/resources needed

Expenses for the creation of the VRCROPS program were provided through a larger, nationally-funded CROPS research grant. Costs associated with this system included the following: VR Ready laptop ($1300), Oculus VR System ($399), G920 gaming handle system ($299), and Unity VR software (Free for personal license).

References

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