Virtual Reality as a Tool for Expanding Opportunities and Diversifying Student Audiences in School-Based Agricultural Education

Savanna Young
University of Tennessee, Knoxville
2431 Joe Johnson Dr.
Knoxville, TN 37996
865-974-3522
syoung97@vols.utk.edu

Taylor Ruth
University of Tennessee, Knoxville
2431 Joe Johnson Dr.
Knoxville, TN 37996
865-974-3522
truth3@utk.edu

Tyler Granberry
University of Tennessee, Knoxville
2640 Morgan Circle Dr.
Knoxville, TN 37996
865-974-8256
tgranber@utk.edu

Jamie Greig
University of Tennessee, Knoxville
2431 Joe Johnson Dr.
Knoxville, TN 37996
865-974-8553
jgreig@utk.edu

Nathan Conner
University of Nebraska-Lincoln
P.O. Box 830947
Lincoln, NE 68583-0947
402-472-3938
nconner2@unl.edu

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Introducing virtual reality (VR) technology in school-based agricultural education (SBAE) courses has offered multiple benefits to students, including improved knowledge acquisition and retention, engagement, and overall performance (Abich et al., 2021; Srinivasa et al., 2021). VR also has the potential to present new career exploration opportunities for diverse audiences of prospective students, such as individuals who have minimal agricultural experience, have impairments or disabilities, are interested in other career and technical education (CTE) subjects, and others. Previous literature has identified how the ability to personalize VR is beneficial to individuals with various physical and cognitive challenges, noting that it can increase educational inclusion and better accommodate various learning styles (Chalkiadakis et al., 2024; Michalski et al., 2021). Studies have also shown that VR helps promote interest and motivation in career exploration in technical fields (Dascalu et al., 2024). However, research exploring the use of VR in SBAE is emerging, and opportunities related to reaching diverse student audiences may be thwarted due to teachers' limited knowledge or access to VR equipment for education (Pulley et al., 2024; Wells & Miller, 2020; Wells & Miller, 2022). To overcome these barriers and provide teachers with VR training and resources, the Agriscience Metaverse Academy (AMA) was offered in the summer of 2024 to agricultural teachers in Nebraska and Tennessee. For the purpose of this study, we wanted to answer the question, "What were participants' perceptions of using VR as a tool for expanding student opportunities in SBAE?"

Conceptual Framework

Stumpf's (1983) process model for career exploration provided the conceptual lens for this study. Stumpf (1983) defined career exploration as an individual's intentional actions that lead to gaining information about different occupations that were not previously known to the individual. The process model contains three dimensions that all have reciprocal influence: (1) beliefs, (2) the exploration process, and (3) reactions to exploration (Stumpf, 1983). In the context of this study, beliefs constituted students' perceptions of agriscience careers and exploration outcomes; the exploration process referred to how and how often students were exploring agriscience career opportunities; and reactions to exploration related to students' satisfaction with, and intent to continue, career exploration in agricultural disciplines (Stumpf, 1983). Given the immersive nature of VR, this tool could support the exploration process described in Stumpf's (1983) model.

Methods

This study utilized qualitative methods in the form of focus groups on the final day of AMA, which was an immersive professional development program offered to SBAE teachers from Nebraska and Tennessee in the summer of 2024. This program included asynchronous onboarding modules and a 5-day in-person training in each state. During the in-person training, teachers participated in VR lessons as if they were students, collaborated to identify existing VR resources and content, and practiced developing their own 360-degree VR experiences. At the end of the program, each teacher submitted a draft of a VR-enhanced lesson plan and was provided a class set of 12 Meta Quest 2 VR headsets and a GoPro Max 360-degree camera. A total of 28 participants, nine in Nebraska and 19 in Tennessee, attended the AMA program; however, one participant had to leave before the focus groups, leaving 27 participants in this study. Participants had between one and 27 years of teaching experience and were between the

ages of 22 and 51. The majority were female (66.7%). Three focus groups were divided to have between nine and 10 participants in each group, and a semi-structured moderator's guide was used to facilitate discussion (Douglas, 1985). The focus groups were recorded and transcribed for accuracy before using NVivo software for analysis. Two coders analyzed the transcripts using an emergent coding process, and codes were identified and defined using a code book. Codes were later connected and collapsed into the theme of *expanding student opportunities*. To improve the credibility of the findings, we used member checking, peer debriefing, audit trails, and thick and rich descriptions of our findings (Creswell, 2013).

Findings

Throughout the focus groups, participants pointed out that VR could "create ... better [opportunities] for ... a wider array of students in our classrooms" (Benjamin, NE), specifically related to students who have limited experience with agriculture, diverse learning styles, different socioeconomic backgrounds, and disabilities. One participant identified how VR could generate agricultural interest in students who have minimal exposure to the industry. Zoey (NE) said, "I have a lot of students who aren't necessarily interested in agriculture, but they're required to be [in those classes]. So, this was ... an opportunity for me to get equipment that [could] kind of [appeal them to agriculture]." Another participant highlighted how VR can engage diverse learners, saying, "It creates opportunities for maybe some of those kids [who] are not your traditionally good students…[by] asking them to be interactive [and not just] sit down at their desks," (Benjamin, NE). Other potential student audiences were identified as "low-income students," with Olivia (TN) stating that having VR in her classroom could provide "exposure to the different new technologies that are coming out ... when [students] may not have that opportunity outside of school," as well as "[students with IEPs, because VR is] able to give them exposure to labs that typically ... their IEPs would literally not allow them to do." Additionally, one participant discussed using VR as a recruitment tool for students of all backgrounds. William (TN) said, "We can bring items with us, but we can't bring the experience. ... my initial goal was to have [VR] technology to recruit quality, interested, engaged students who understood what they were signing up for [in SBAE]."

Conclusions & Recommendations

The findings from this research indicate that AMA participants perceived VR as another resource that can be utilized to reach more diverse student audiences in SBAE courses. Similar to past research (Michalski et al., 2021; Chalkiadakis et al., 2024), AMA participants discussed how VR can support diverse learners and accommodate various disabilities. However, new findings emerged that suggest VR could diversify SBAE student audiences by appealing to those who have had minimal exposure to agriculture, as well as being used as a recruitment tool for students of all backgrounds. This study demonstrates that VR could be a useful tool to support the exploration process outlined by Stumpf's (1983) process model for career exploration. Teacher educators should consider these findings and develop teacher professional development aimed at tailoring VR programs to diverse student learning styles. Teachers should also be encouraged to use VR lessons in general education courses, where classes are most diverse in terms of student backgrounds and interests. Additionally, future research should employ Stumpf's (1983) career exploration survey to examine students' perceptions of using VR for career exploration. Interviews with teachers after VR implementation could also reveal additional insight into how to effectively use this teaching tool to engage new students in SBAE.

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