Teachers' Perceptions of Using Virtual Reality to Enhance Agricultural Education

Introduction and Literature Review

The field of agricultural education increasingly faces the need to integrate innovative and emerging technologies to bridge the gap between traditional instruction and the experiential learning expectations of current students and workforce skillset demands (Pulley et al., 2024; Greig et al., 2024). To meet this need, educators are turning to a range of educational technologies. One of the most promising is virtual reality (VR) which uses computer-generated simulations or 360-degree videos to offer immersive and interactive learning experiences (Yu et al., 2009). Prior studies indicate that these experiences allow students to safely engage in agricultural environments such as livestock handling, tractor operation, or drone operation without leaving the classroom (Greig et al., 2024; Pulley et al., 2024). As such, VR is a mechanism to help overcome barriers related to cost, safety, and accessibility (Conrad et al., 2024; Farra et al., 2019). These benefits coupled with the increasing integration of VR in education and individual ownership of VR headsets especially among young people in the United States, make VR a promising alternative to expand access and enhance experiential learning in agricultural education (Pulley et al., 2024; Greig et al., 2024; Piper Sandler, 2022; Hamilton et al., 2020). However, despite this progress, few studies have examined agricultural educators' perceptions of VR integration in their classrooms. This study applied the Unified Theory of Acceptance and Use of Technology (UTAUT) model to explore how factors like performance expectancy, effort expectancy, social influence, and facilitating conditions influence the likelihood of successful VR adoption among agricultural educators.

Theoretical Framework

The study leaned on the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) to examine teachers' perceptions of farm-based VR as an educational tool for enhancing agricultural education. The model incorporates constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions to predict an individual's "behavioral intention and technology use" (Marikyan & Papagiannidis, 2025, p. 2). Within agricultural education, these constructs explain how teachers' perceptions of VR's usefulness, ease of integration, institutional support, and peer influence shape their intentions to use VR to promote agricultural literacy and experiential learning among students.

Purpose and Objectives

The purpose of this study was to evaluate teachers' perceptions of using immersive farm-based virtual reality (VR) to enhance agricultural literacy among middle and high school students. Given that, this study sought to: (1) document educators' prior participation in VR experiences, (2) assess their perceptions of immersive farm-based VR experiences demonstrated at the 2024 National FFA Convention and Expo, (3) evaluate how immersive farm-based VR enhanced their understanding of farming concepts, and (4) examine their willingness to recommend immersive farm-based VR to school leaders and peers.

Methodology

A quantitative intercept survey using convenience sampling was conducted with 23 agricultural educators at the 2024 National FFA Convention (Kuhn, 2018). With this design, the researchers were able to collect and analyze data describing educators' perceptions of the farm-based VR experiences that were demonstrated without testing any hypotheses or manipulating variables (Thomas & Zubkov, 2023). With the help of Tennessee State University faculty and students, Dr. Mandi Carr, a professor and veterinarian from the University of Adelaide (Australia) that designed CattleVR, and the VR experts at Think Digital, LLC (Australia), participants engaged in Think Digital's FarmVR or CattleVR simulations using Meta Quest 2 headsets, experiencing farm-based scenarios in dairy, sheep, and crop production. After the experience, teachers completed an anonymous survey assessing demographics, prior VR exposure, perceived benefits, challenges, and willingness to recommend VR as a teaching tool.

Results and Discussion

Teachers ($N = 23$) reported varying levels of prior educational farming-related VR exposure, with the average participant having *5.1* VR immersion experiences prior to this engagement. Additionally, most participants (61%) rated their VR experience as excellent and 35% as good. Educators highlighted real-world application (26%), interactive learning (23%), and visual simulation (23%) as top strengths of VR immersive experiences. A majority (83%) reported improved understanding of agricultural concepts while 87% indicated they would recommend VR to peers. Reported challenges included motion sickness (33%), unspecified "Other" (29%), technical issues (24%), and limited engagement (13%). These findings align with the UTAUT model, showing strong performance expectancy and perceived usefulness. This reinforces prior findings that demonstrate immersive VR in education increases engagement and knowledge retention (Krokos, Plaisant, & Varshney, 2019; Jensen & Konradsen, 2018). Nonetheless, technical and usability challenges underscore the need for educator training and infrastructure support (Conrad et al., 2024; Fowler, 2015).

Conclusions, Implications, and Recommendations

The educational farm-based VR experiences are perceived as useful by the educators who experienced them at the 2024 National FFA Convention and Expo. These findings support the idea that integrating VR into agricultural education could bridge the gap between abstract classroom concepts and tangible field experiences, fostering deeper engagement and retention. Agricultural educators and curriculum developers are encouraged to incorporate VR modules that emphasize real-world application and problem-solving in agriculture. To maximize effectiveness, teacher training and institutional support should accompany implementation to address technical and usability challenges. Lastly, we recommend developing agriculture-specific VR modules aligned to AFNR Career Cluster pathways. Future efforts should focus on teacher professional development, funding for VR content creation, and longitudinal research to measure learning outcomes over time.

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