Improving Teachers' Confidence to Integrate Virtual Reality in the Classroom through Immersive Professional Development

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Introduction

Virtual reality (VR) offers a variety of benefits for use in education, including skill and knowledge acquisition (Abich et al., 2021; Wells & Miller, 2022) and the ability to take students on virtual field trips that would otherwise be cost-prohibitive (Greig et al., 2024; Pulley et al., 2024). However, school-based agricultural education (SBAE) teachers have identified equipment cost and low knowledge due to a lack of experience with VR as primary barriers to adopting the technology (Pulley et al., 2024; Wells & Miller, 2020). Therefore, the *Agriscience Metaverse Academy* (AMA) was offered to SBAE teachers in Tennessee and Nebraska in the summer of 2024 to provide both VR experience and training to educators. As part of the program, all participants were initially shipped a Meta Quest 2 VR headset and a link to online onboarding modules to set up their headsets. Additionally, all participants were invited to attend a Metaverse meeting using the Horizon Workrooms VR application. This application allowed users to meet in a VR setting and engage in discussion via avatars. Upon completion of the onboarding activities, participants engaged in a five-day immersive AMA PD in their states. During AMA, participants engaged in VR lessons as students, learned how to find VR resources and develop VR-enhanced lessons, developed 360-degree content, and identified VR classroom management strategies. By the end of the week, each participant had created a new VR-enhanced lesson and was provided a GoPro 360-degree camera along with a class set of 12 Meta Quest 2 VR headsets. In order to understand how this PD helped to address barriers related to limited knowledge and experience with VR in education, the purpose of this study was to determine the influence of AMA on SBAE teachers' confidence in integrating VR into the classroom.

Conceptual Framework

Bandura's (1977) theory of self-efficacy guided this study. Broadly defined, self-efficacy is an individual's perception of their ability to perform or accomplish a given task, activity, or level of achievement (Bandura, 1977). In the context of this study, self-efficacy was examined in terms of participant's confidence in their ability to perform tasks associated with the VR technology in their classes. The AMA program was designed with the opportunity for participants to increase self-efficacy in mind through hands-on experiences with VR in an agricultural education setting.

Methods

We used quantitative methods via a *pre-then-posttest* design to fulfill the purpose of this study. AMA was facilitated in the Summer of 2024 with a total of 28 participants; 19 in Tennessee and nine in Nebraska. Participants completed an online pretest instrument distributed through unique Qualtrics links prior to receiving access to the onboarding modules. An online posttest, using a unique link, was emailed to participants on the last day of the in-person training and included the same key variables of interest as the pre-test. For this research, we analyzed the questions examining respondents' confidence in teaching with VR during both the pre and posttests, which was measured using the same 7-item, 5-point Likert-type scale (Cronbach's $\alpha = .91$). This scale was researcher-developed and reflected AMA's key learning outcomes, including both the online modules and in-person sessions. The seven items were averaged to create the index. All data were exported and analyzed in SPSS; descriptive statistics and a paired samples t-test was used for analysis.

Findings

After AMA, 92.6% or more of the respondents agreed or strongly agreed that they felt confident engaging in all the listed aspects of VR-integrated instruction. See Table 1 for details.

Table 1. *Respondents' Confidence in Teaching with VR Before and After AMA*

	Pre-Test			Posttest		
	SD/D	N	A/SA	SD/D	N	A/SA
I am confident I can…	*%*	*%*	*%*	*%*	*%*	*%*
Navigate the Meta Quest user interface	22.2	51.9	25.9	0	0	100
Develop lesson plans with integrated VR activities.	18.5	51.9	29.6	0	0	100
Teach using VR activities in the classroom.	14.8	55.6	29.6	0	0	100
Find existing VR content relevant to my curricula.	25.9	59.3	14.8	0	3.7	96.3
Set up a Meta Quest for use in the classroom.	18.5	44.4	37.0	0	3.7	96.3
Navigate the "Horizon Workroom" app.	25.9	59.3	14.8	0	7.4	92.6
Create a virtual field trip using a 360-degree camera.	33.3	48.1	18.5	0	7.4	92.6

Note. SD/D = *Strongly Disagree/Disagree;* N = *Neither Agree nor Disagree;* A/SA = *Agree*/*Strongly Agree*

On average, participants agreed they had greater confidence relevant to teaching with VR after AMA (M = 4.48, SD = 0.44) compared to before the program (M = 2.99, SD = 0.66). This 1.39 change in confidence was statistically significant (t[26] =9.28, $p < .01$) with a medium effect size (d = .78).

Discussion & Recommendations

The findings from this research indicate that AMA successfully improved respondents' self-efficacy to use VR as a teaching tool. Respondents' pretest results showcased generally low levels of self-efficacy in teaching with VR, creating lesson plans using VR content, or creating their own virtual field trips (Bandura, 1977). This finding was consistent with past research (Pulley et al., 2024; Wells & Miller, 2020) and further illustrates the need for this type of training. Teacher educators should consider these findings when developing similar VR PD programs in the future and recognize that training should go beyond simply how to use the technology. Teachers also need to develop self-efficacy skills related to finding and adapting existing VR resources, as well as strategies for successfully teaching with VR. Future research should explore the long-term impact of the AMA on teachers' self-efficacy related to teaching with VR after teachers have had the opportunity to implement the teaching tool for themselves. Additionally, replicating the pre-test questions with a larger sample of SBAE teachers across different states can provide a generalizable understanding of teachers' current self-efficacy related to teaching with VR. The findings would support the development of tailored PD to enhance SBAE through VR.

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