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VIRTUAL REALITY FOR EXTENSION EDUCATION AND LEARNER ENGAGEMENT

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ABSTRACT

Virtual reality (VR) is an emerging technology that is used to transport, expose, and educate viewers about a variety of topics through visual and audio-based immersive experiences. VR provides Extension educators with the opportunity to circumvent costly field trips for farm demonstrations. The eFields VR experience was implemented at county and state fairs in Ohio during the summer of 2019. Evaluation was conducted through a pre-test, post-test questionnaire. VR is a viable technique for Extension educators to connect with diverse audiences. Findings support that this kind of program can be replicated through Extension programs nationwide.

INTRODUCTION

Technology and online media are components of the average American's life. In 2016, Americans were consuming entertainment media (viewing television, the Internet, mobile apps, etc.) for 10 hours and 39 minutes per day (Koblin, 2016). Therefore, the average American was consuming 306,315.3 hours of entertainment programming in their lifetime (44.3 percent of the average life expectancy calculated at 78.8 years; Stein, 2016). Internet content is expected to consist of 82 percent of video traffic by 2020, which will also significantly increase the time spent by Americans consuming entertainment yearly (Cisco Visual Networking Index, 2016). Because of these statistics, it is realistic to expect Americans to be able to learn through digital entertainment and media.

Virtual reality (VR) is an immersive technology that can transport viewers to remote locations, utilizing 360° video and virtual reality headsets. It is estimated there are nearly 171 million VR users worldwide as of 2018 (Liu, 2019). However, VR is a large field with multiple sub-categories, which can include gaming and 360° video. 360° video is essentially a spherical video file. When played with the use of a streaming platform, like YouTube or a VR headset, the video will provide the viewer with an immersive experience.

The two main components of VR media are 360° videos and augmented reality (AR). VR videos are able to provide viewers with an interactive view of the scene, with no obstructions. AR is where the viewer has a live view of what is around them, but has additional computer-generated (CG) graphics or audio incorporated over the live view. While VR is an advanced communication strategy, the future of VR technology is already available and is gaining popularity with educational institutions through the implementation of virtual field trips. Examples of VR experiences include the National Geographic YouTube Channel, NASA VR videos in the International Space Station, and the New York Times Daily 360. This technology is congruent with the strategies outlined by agricultural communication researchers to provide audiences with transparent communication messages for the highest impact (Johnson, 2016).

Videos and VR are impacted by several theoretical components, including cultivation theory, entertainment-education, and transportation theory, to work collaboratively with viewer's perceptions of agricultural concepts. Cultivation theory is a medium that shapes the public's perspective of social reality. With increased exposure to specific stimuli over periods of time, viewers begin to see the information presented in entertainment as accurate representations of society. Used frequently in television studies, cultivation theory is used to evaluate the effects of television viewing on the viewer's perception and values (Werner & Tankard, 2001). For instance, individuals who watch law enforcement-based entertainment, are more likely to believe that the crime rates are higher in the United States than what the crime rates actually are (Werner & Tankard, 2001).

Entertainment-education (E-E) has been used to incorporate educational components into entertaining pieces since the 1960s. E-E "is the process of purposely designing and implementing a media message to both entertain and educate, in order to increase knowledge about an issue, create favorable attitudes, and change overt behavior" (Singhal & Rogers, 1999, p. 229). While many examples of E-E are interwoven into complex story lines in films and television shows, such as *Parenthood*, *Meet the Browns*, *Contagion*, and *I Am Legend*, Extension educators can create short, compelling pieces that can also accomplish similar goals.

Transportation is the process of becoming absorbed into the story. When individuals are more cognitively engaged with processing narratives of stories, they are more likely to experience greater effects of transportation (Bilandzic & Busselle, 2008). Transportation is also a feeling of being connected with the media presented, for instance feeling as though the viewer is included in the story line on a more personal level.

VR videos are an attractive tool for educating youth about agriculture because they allow students to have an immersive experience that may not be possible otherwise. Field trips to farms do not allow students to experience the breadth of production agriculture since many farm activities cannot be conducted when students are on site due to concerns like safety, biosecurity concerns, and the seasonality of farm tasks. VR videos can bring experiences to youth without risk

to their safety and can provide a more complete view of production agriculture by providing information about activities that occur over weeks and months of time.

PURPOSE AND OBJECTIVES

The purpose of this study was to determine the viability of VR programming for agriculture education at public venues. The objectives of this study were to:

Objective 1: Determine if VR is a viable resource for educating the public on agriculture topics.

Objective 2: Have a better understanding on the appropriateness of VR technologies for various participants.

METHODS

VR VIDEO CREATION AND PRESENTATION

A VR experience featuring planting corn was filmed and edited by Ohio State University Extension educators during the spring of 2019. The video was produced using a GoPro Fusion Camera, GoPro Fusion Studio software, and Adobe Premiere Pro. The VR experience was a ride-along on a research planter, planting a test plot in the spring of 2019. Participants were shown a series of segments highlighting the tractor, cab and monitors, and several locations on the planter. In addition to the visual components, there was an accompanying narration by three Extension educators explaining the process of planting, the importance of technology in agriculture, and how innovations support efforts for water quality.

The transcript of the video was:

Speaker 1: “Farmers today have access to a lot of technology that can be used in their operations to improve their decision making.”

“Modern planters have the ability to collect data about machine performance and field and soil conditions as they travel across the field.”

Speaker 2: “The planter is measuring soil temperature, organic matter, and row cleanliness. All of these can impact the germination of the seed and the growth of the plant.”

“The planter also tracks the space between each seed and how deep they are planted. If the planter is not preforming nearly perfectly, the farmer can make adjustments right away.”

Speaker 3: “The planter can also apply the fertilizer the plant needs into the soil next to the plant. Reducing the risk of that fertilizer running off the field. This is just one way farmers are working to improve water quality.”

“The eFields On-Farm Research Program allows farmers to conduct research in partnership with Ohio State University Extension that informs their decisions to help make their farms more profitable and sustainable.”

The video had a total runtime of two minutes and 44 seconds. The video was shown to participants using an Oculus Go headset, which provided the ability to view all angles of the film as well as 360° audio. The video is available to viewing via: https://youtu.be/kw_y3Q7QlxE. Participants were asked to sit on a stool for the duration of the VR experience. The VR experience display and two participants are shown in Figure 1.

Figure 1. Participants in the eFields VR Experience at the Ohio State Fair.

DATA COLLECTION AND INSTRUMENTATION

Data collection was conducted by a third-party partner assisting with the overall Ohio State Fair Living and Land building displays. The data that was relevant to this research paper was part of a larger evaluation of the Land and Living Exhibit, which comprised of multiple stations based around agriculture education in the overarching categories of food, technology, environment, animals, and horticulture. Data collection utilized a mixed methods approach that included a quantative pre-test, post-test questionnaire as well as qualitative interviews with exhibit attendees to analyze participant experience and depth of impact.

There were 385 individuals who completed the pre-questionnaire, 206 participants completed the post-questionnaire, and 105 exhibit participants participated in the qualitative interviews. Additional qualitative data was collected at the two county fairs by recording real-time responses of participants.

Quantative questions that were relevant to this specific portion of the technology zone were 5-point Likert Scale questions. These questions included:

- The exhibit was appealing and engaging
- The people working the exhibits were informative and helpful
- Information in the exhibit was easy to understand
- Farmers care about the health and safety of their animals

- Farmers use technology to sustain the environment for future generations
- Genetic modification is an important tool farmers use to produce crops
- There are many food/agriculture careers in agriculture
- Farmers prioritize protecting water quality

Additionally, farmers were asked how many zones they visited. In the qualitative interviews, open-ended questions were asked specific to the zones visited, which included: What did you learn? What was your favorite part of that zone?

POPULATION

The participants in the VR trials were attendees to the Ohio State Fair and two Ohio county fairs. All of these fairs were open to the public. The attendance of the Ohio State Fair Living and Land building, was estimated at over 140,000 people. The eFields VR Planter experience was part of the Living and Land building, which consisted of four zones that educated participants on food, technology, environment, and animals. The eFields VR Planter experience was part of the technology zone. Participants in all three trials varied in ages, but were primarily youth participants.

While it is estimated that the attendance of individuals who walked through the Living and Land building at the Ohio State Fair was over 140,000 people; more than 2,400 actually participated in the eFields VR Planter experience at the Ohio State Fair. The individuals who did not participate in the VR experience were also exposed to the same content because a video of the same material was also playing on a television screen that was visible to those passing by.

RESULTS

In the pre-questionnaire, participants indicated an already positive perception toward agriculture technology. The pre-questionnaire response to this question was 4.4 on a 5-point Likert scale. In the zone-specific post-test for the technology zone, there was a slight increase of trustworthiness after being exposed to the exhibit materials to 4.6 on a 5-point Likert scale.

FINDINGS OF OBJECTIVE 1: DETERMINE IF VR IS A VIABLE RESOURCE FOR EDUCATING THE PUBLIC ON AGRICULTURE TOPICS.

The VR experience was part of the Technology Zone in the Living and Land Exhibit at the Ohio State Fair. Additional portions of the Technology Zone featured a tractor driving simulator, video of drone flight, and a drone flying experience. From the respondents of the questionnaire, no concerns were reported about the Technology Zone as a whole.

Statements specific to the eFields VR Planter experience included:

“We liked the technology area best.”

“I loved the virtual reality glasses that took me on tours of the soybean fields.”

“Look, I’m driving the tractor!”

“This is so cool, it is like I am actually there.”

“I want to ride the tractor!”

“I liked the virtual reality, but I can’t say that I really took away any specific messages.”

“This was very educational. I learned about technology used on the farm and how it helps farmers.”

“Can I watch this again? I want to see the tractor again.”

The overall reactions to the experience were positive. Respondents strongly agreed that the experience was appealing and engaging. Youth participants were enthusiastic about the tractor ride along experience, which was featured in three of the scenes in the VR video.

FINDINGS OF OBJECTIVE 2: HAVE A BETTER UNDERSTANDING OF THE APPROPRIATENESS OF VR TECHNOLOGIES FOR VARIOUS DEMOGRAPHICS.

VR headsets are best used for children and adults age 5 and older. While younger children enjoy the process of VR, some are not able to support the weight of the headset on their own to enjoy the full VR experience. Based on the participant patterns at the Ohio State Fair and the county fairs where the eFields VR Planter experience was shown, youth were more likely to try the headset before an adult. In many cases, adult participants were persuaded to try the VR experience by the child they accompanied.

Participation at the Ohio State Fair was evenly distributed among male and female participants. However, at the county fairs there was a higher percentage of female participation.

DISCUSSION

VR is a viable form of agricultural education for Extension programming. By incorporating advanced technologies, like VR, into Extension programming, educators are able transport participants to remote fields without physically moving an inch. This modern method of communication strategies allows the

producer and consumer to form connections without costly field trips or biosecurity concerns.

The eFields VR experience at the Ohio State Fair provided an opportunity to gauge participant feedback in real-time for a better understanding of the impacts VR could have on extension programming. Participants were enthusiastic about their experience viewing the eFields VR video. Youth, in particular elementary aged children, were enthralled with the experience. Many of the younger children would watch the film multiple times so they would be able to experience the feeling of driving the tractor several times. While the most enthusiastic responses came from younger children, participants of all ages enjoyed the experience, and many found it to be interesting and educational.

Due to the popularity of the VR experience, future VR projects are planned to educate consumers on agricultural practices and producers on safety procedures. VR has many applicable uses for Extension educators, and the cost of technology has become more affordable in recent years.

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