RanchCraft: Leveraging an Online Gaming Environment for Skill Development in Agricultural Education

Bailey Brashears
Natural Resource Management
M.S. 2125
Texas Tech University
806-742-2841
bailey.brashears@ttu.edu

Lauren Underwood
Agricultural Education and Communications
M.S. 2131
Texas Tech University
806-742-2816
lauren.underwood@ttu.edu

M. Todd Brashears
Agricultural Education and Communications
M.S. 2131
Texas Tech University
806-742-2816
todd.brashears@ttu.edu

Clint Rusk
Natural Resource Management
Texas Tech University
M.S. 2125
806-742-2841
clrusk@ttu.edu

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Introduction

The effects of the COVID-19 pandemic were both immediate and lasting at all levels of agricultural education in the United States (U.S.). McKim, Sorensen & Burrows (2021) determined that Instructional Quality, Student Motivation, and Technology/Internet were three of eight thematic challenge areas identified by agricultural teachers as they dealt with the lingering impacts of the pandemic. According to the National Center for Education Statistics (2022), during spring 2020, 77% of public schools moved students to online education systems, and 84% of college students across the nation received all or some of their courses online. Experiences from this time continue to influence students and their preferred delivery of educational materials to this day. A study by Child et. al (2023) indicated that up to 65% of current college students wanted at least some aspects of their learning environment to remain online, even without the constraints of the pandemic. Colleges of Agriculture face additional pressures. While this new focus on distance education presents new opportunities for advancing education in agriculture, the number of young people entering agricultural fields is in continuous decline (United States Senate Special Committee on Aging, 2025). At the same time, the USDA reports U.S. farms and ranches are shrinking in both size and number, reducing opportunities for hands-on learning (Lacy, 2025).

The novelty aspect of providing unique and engaging content has been documented, including Miguel-Alonso et. al (2023), who found increased engagement, satisfaction, and knowledge gain for students participating in a virtual reality educational program. The desire for online course content by students, coupled with the positive effects of such content, presents the opportunity to bridge the gap using an online environment already known by many college students. This project has responded to that challenge by creating a virtual ranch using Minecraft Educational Edition, providing college students with an online format to learn and practice an unlimited number of skills related to ranch management.

How it Works

This study utilizes Minecraft Education Edition as a platform for building and distributing virtual agriculture-related labs, simulating real-world fieldwork and teaching principles of wildlife management. Within the Minecraft environment, a single contiguous ranch was constructed. Custom wildlife and livestock were programmed, building on existing resources while adding more realistic behaviors and interactions.

Within the ranch space, individual lesson plans were then designed as self-contained virtual labs. The features of the game's Education Edition allow for the creation of lessons with non-player characters (NPCs) providing instruction to guide students through the space while engaging with educational experiences throughout the ranch. The first lab used northern

bobwhite quail to illustrate a lesson on wildlife survey methods. This project is a proof-of-concept and pilot test for the virtual agriculture lab framework, and future labs on a variety of topics are in development.

Result to Date

This pilot study sought to determine the usability, engagement, and learning outcomes of virtual agriculture-related labs, simulating real-world fieldwork and teaching principles of wildlife management. Additionally, possible gender differences in learning were considered as previous research has found men and women engage with different aspects of video games, which may influence learning in this context (Greenberg et al, 2008).

Twenty undergraduate students (9 female, 11 male) majoring in agriculture were recruited from the [University] as participants. Students completed a 30-minute lesson covering strategies for estimating the population of quail on a ranch. Following the lab, the students were given a content quiz and interviewed about their experience with the lab.

The mean score for the post-learning quiz was 6.55 out of 10 (SD = 1.47). The two questions with the lowest accuracy involved over- and underestimation of the quail population. This indicated a need to append the lab content to directly address risks associated with the survey methods. Correlational analysis found no significant relationship between major and score ($r(18) = 0.147$, $p = .535$) or assessment of usefulness ($r(18) = 0.122$, $p = .609$), indicating students from a variety of backgrounds found it to be an effective learning tool. Additionally, no significant correlation was found between gender and score ($r(17) = 0.250$, $p = .301$) or usefulness ($r(17) = -0.291$, $p = .227$), indicating gender was not related to learning outcomes.

Thematic analysis of the interviews determined students found the lab engaging, fun, and immersive, regardless of past Minecraft use. Students gained practical knowledge of quail survey methods; those with previous experience noted that while not fully replicating fieldwork, the lab could realistically simulate elements and convey concepts effectively. Students expressed enthusiasm for the platform and suggested further agricultural topics to explore.

Conclusions/Implications/Recommendations

Critical feedback from students included difficulty navigating the virtual ranch, indicating a need for clear navigation instructions around the environment that will be implemented in future work. Additionally, students who lacked experience with video games struggled initially; future versions of this work will consider a short introduction to the controls and technical aspects of Minecraft prior to the virtual lab. Overall, this study found the Minecraft Education platform has potential for agricultural education, with a high degree of engagement and positive learning outcomes for higher education students of various agricultural backgrounds.

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