The TEACH Trailer:
A Mobile Model for Agricultural Education, Research, and Outreach

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Introduction

Technological innovations like precision agriculture, unmanned aerial systems (UAS), and artificial intelligence are increasingly integrated into agricultural systems, transforming management practices and creating new workforce needs (Lowenberg-DeBoer & Erickson, 2019; Wolfert et al., 2017). As these technologies advance, educational programs must equip students and agricultural stakeholders with the necessary technical knowledge and practical skills to use them effectively (National Research Council, 2009). However, access to advanced agricultural technology education remains limited for many rural schools, Extension clients, and agricultural communities due to high equipment costs, geographic barriers, limited broadband, and inequalities in educational resources (Federal Communications Commission, 2024; USDA, 2023). Land-grant universities must adopt innovative educational methods to expand experiential learning and promote interdisciplinary collaboration across agriculture, engineering, technology, and education (APLU, 2021; Kolb, 1984). Mobile learning labs offer a scalable solution by delivering advanced technologies, research-based instruction, and hands-on experiences directly to learners, regardless of location, thus enhancing the outreach mission of land-grant institutions. The following section describes how the Technology Education and Agricultural Collaboration (TEACH) Trailer was designed to fulfill this educational mission. Rather than functioning as a simple equipment transport unit, the trailer serves as a purpose-built mobile laboratory that supports instruction, outreach, research, and stakeholder engagement across diverse learning environments.

How it works

The physical design of the TEACH Trailer supports multiple instructional formats while allowing advanced agricultural technologies to be transported and demonstrated in diverse learning environments. Built on a 26-foot bumper-pull marketing trailer, the passenger side folds down into an elevated presentation deck with railings, allowing audiences to either participate in demonstrations from the platform or move through the trailer as an interactive learning space. Visitors enter through the rear, engage with multiple hands-on technology stations, and exit onto the presentation deck, creating a natural flow that accommodates both guided instruction and self-paced exploration. Bringing advanced agricultural technologies directly to stakeholders, the trailer has been deployed to school-based agricultural education (SBAE) programs, Agricultural Research Centers, Extension offices, commodity meetings, and community events.

The trailer houses portable 3D printers, CNC fabrication equipment, unmanned aerial systems, renewable energy demonstrations, and precision agriculture technologies that support practical agricultural applications. Faculty from multiple departments use the platform for instruction, outreach, recruitment, research demonstrations, and stakeholder engagement, while undergraduate and graduate students assist with programming and event delivery. To ensure consistent operation, all users complete a standardized training program that includes trailer setup, equipment use, presentation technologies, and verification of safe trailer towing. This shared operational model has allowed the trailer to function as college-wide infrastructure rather than a department-specific resource.

Results to date

Since its deployment, the TEACH Trailer has evolved well beyond its original purpose as a recruitment tool and now serves as a statewide engagement platform. During the 2025–2026 program year, the trailer traveled 2,831 miles and engaged nearly 4,000 participants across 20 events representing every region of Montana. The initiative has strengthened collaboration among faculty across multiple College of Agriculture departments, increasing research visibility through field demonstrations and stakeholder engagement while providing undergraduate and graduate students with meaningful experiential learning through event delivery and communicating research to diverse audiences. Collectively, these outcomes demonstrate that a mobile agricultural technology laboratory can effectively extend teaching, research, and outreach beyond campus. The trailer has expanded access to emerging technologies while supporting recruitment, workforce development, Extension programming, applied research dissemination, and interdisciplinary collaboration through a single shared platform.

Plans/Advice to others

Future efforts will focus on expanding interdisciplinary collaborations across the college while increasing engagement with Agricultural Research Centers, SBAE programs, Extension offices, and university partners throughout the state. Planned enhancements include additional portable fabrication equipment, expanded precision agriculture demonstrations, improved connectivity for field-based instruction, and increased opportunities for undergraduate and graduate student leadership. The trailer's demonstrated impact has also positioned it as competitive infrastructure for external grant proposals, where it serves as both a shared project resource and an institutional in-kind contribution.

For institutions considering a similar initiative, the greatest recommendation is to begin with clearly defined educational objectives rather than an equipment list. Shared ownership across departments, intentional student involvement, and programming driven by stakeholder needs have been central to the trailer's success. Long-term sustainability will require modest personnel support, such as a graduate assistant or part-time coordinator, together with industry partnerships and external funding to support continued statewide outreach.

Costs/Resources Needed

The initial platform required an investment of approximately $35,000, followed by a $15,000 internal equipment grant to outfit the trailer with technologies aligned with our College’s priorities in precision agriculture and agricultural technology. Equipment included portable 3D printers, CNC fabrication equipment, unmanned aerial systems, and renewable energy demonstrations that supported hands-on learning across diverse audiences. Annual operating costs average approximately $8,000 for travel, maintenance, and consumable materials. To date, all funding supporting the trailer has come from internal investments, allowing the initiative to serve as a proof of concept before pursuing external funding. Over its first year and a half of operation, nearly $100,000 has been secured through internal grants and strategic investments to expand equipment and programming.

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