

**Wiring Real-World Connections: Integrating STEM Concepts  
into Agricultural Mechanics through Trailer Circuit Instruction**

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### **Introduction**

Science, technology, engineering, and mathematics (STEM) concepts are often naturally embedded within school-based agricultural education (SBAE) instruction (Eck et al., 2023). Specifically, Agriculture, Food, and Natural Resources (AFNR) areas, such as biotechnology, plant science, animal science, and agricultural mechanics, have been identified as contexts in which STEM concepts are formally taught in SBAE classrooms (Swafford, 2017). Agricultural mechanics, in particular, offers students rich opportunities to apply academic concepts to real-world problems (Parr et al., 2006; Wells & Parr, 2011; Young et al., 2009). Its diverse content allows teachers to meaningfully connect many STEM concepts to agricultural instruction (Wells et al., 2021).

While agriculture teachers recognize the importance of integrating STEM into their instruction (Smith et al., 2015), many report low confidence in teaching these concepts. Stubbs and Myers (2015) emphasized that teachers with more STEM-focused professional development (PD) feel better prepared to teach these concepts. As such, targeted agricultural mechanics PD may strengthen teachers' abilities to embed STEM concepts within their curricula.

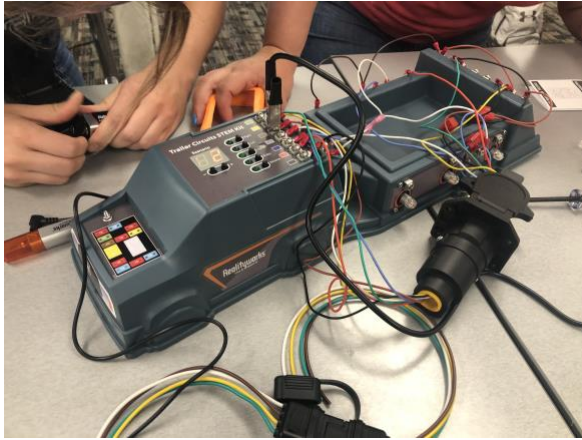
### **How it Works**

In the 2025 summer session, we engaged 20 Illinois agriculture teachers in a multi-day agricultural mechanics PD summer workshop focused on integrating STEM concepts into existing curricula. A central activity of our PD involved showcasing the RealityWorks<sup>®</sup> Trailer Circuits STEM Kit, designed to “transform the mystery of electricity into a concrete set of skills through the real-world context of wiring a trailer” (RealityWorks, 2025, para. 1). The trucks they worked on mimic actual rigs with working brakes and lights, without the need of a full-size vehicle and trailer in the laboratory (RealityWorks, 2025). The kit emphasizes safety, preventing dangerous short circuits or electrical damage from occurring in the event of wiring mistakes (RealityWorks, 2025).

During our PD session, our participants were placed into small groups and guided through a demonstration of the kit. They applied embedded STEM principles, including basic concepts of DC electricity, circuit types, wiring skills, multimeter use, and troubleshooting during the hands-on activity. Each of our assigned groups was then challenged to wire and connect a 7-way round harness on their trailer within 60 minutes (see Figure 1). Our session concluded with a reflective discussion on how this activity could be integrated into their programs to enhance student learning in electrical systems within the Power, Structural, and Technical Systems pathway. Due to time constraints in our workshop, the half-day PD session focused on the actual wiring of trailer circuits and on developing troubleshooting skills.

### **Figure 1**

*Agriculture teachers are completing the trailer wiring activity during a PD session.*



### **Results to Date**

Participant engagement remained high throughout the activity. During the reflection time, our participants noted the kit's potential to enhance students' problem-solving and critical thinking skills without requiring a full-sized trailer in their facilities. Workshop evaluations confirmed that the kit was among the most popular activities during the week. Following the event, several participants indicated that they had purchased the kit for use in their own agriculture programs.

In addition to the workshop, we have integrated the activity into our AGR 130 Introduction to Agricultural Engineering Technology course at Illinois State University, using it as a laboratory exercise in our electricity unit. Similar to workshop participants, undergraduate students demonstrated strong engagement and expressed high perceived value through both in-class feedback. Several agricultural education students expressed interest in using the kit in their future classrooms, pending funding availability.

### **Future Plans & Advice to Others**

We plan to continue incorporating the kit into our summer agricultural mechanics PD workshops and the AGR 130 Introduction to Agricultural Engineering Technology course at Illinois State University. Based on positive feedback from both our workshop participants and undergraduate students, we intend to increase the time allocated to this activity and explore the kit's curriculum and extension activities in greater depth. We encourage other instructors of agricultural mechanics courses to consider using this activity to engage students and help them apply STEM concepts in real-world agricultural contexts.

### **Costs**

The RealityWorks® RC Trailer Circuits STEM Kit costs \$2,199.00. The kit includes three trailer circuit trucks, each equipped with a wire stripper and crimping tool, a multimeter, an auto light tester, a screwdriver, batteries, 4-way and 7-way connection harnesses, and a storage box. Also included is a spare parts kit with additional wire, terminals, connectors, bulbs, and screws. An additional replacement pack can be purchased for \$219.00. A downloadable curriculum, student workbook, and answer key are also provided. The curriculum provides six to eight hours of instruction, encompassing all presentation slides, student activities, and assessments. It does include a one-year limited warranty.

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