



## The Flying Railroad of Albuquerque

University of New Mexico,  
SMI Labs, UNMCOE



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## Overview

Because it takes place within a secluded building, traditional education results in little hands-on learning in the real world. To mitigate this effect, education modules should incorporate research applicable STEM activities. Therefore, the pedagogy in these activities should utilize the students gross and fine motor skills. This will allow children to use a multitude of learning mechanisms. Although the integration of complex STEM ideas can be difficult, a cost effective, simple device can make incorporating STEM in education attainable. One device that fits these parameters is the Low-cost Efficient Wireless Intelligent Sensor (LEWIS). LEWIS sensors do the same calculations as any other state of the art sensor, but with a fraction of the cost. LEWIS sensors can be easily made and disposed of as needed, making them an excellent education option. This is vital as students tend to use their creative skills for destructive means. In this education module, we will be focusing on using a LEWIS-1 sensor in the state of New Mexico (NM). It is also particularly fitting since New Mexico notoriously struggles with academic excellence at the K-8 level (figure 1), and at the 9-12 level (figure 2) of education. While the LEWIS project is based out of University of New Mexico's Civil Engineering Lab in collaboration with SMI Labs, these modules are applicable to any school system that has the required prerequisites (materials, etc.).

## Introduction

LEWIS sensors have a multitude of engineering applications, however, for this module, LEWIS-1 sensors will be used in a civil engineering setting. LEWIS-1 sensors calculate the acceleration of the X/Y/Z axes of any object over time. For example, a LEWIS-1 sensor could calculate the acceleration of an airplane's takeoff, ride, and landing. Although the applications of a LEWIS sensor are numerous. It is easiest to demonstrate LEWIS capabilities on a tram due to the abundance and affordability of this mode of transportation. This module will help guide educators through the creation and use of a sensor while on a tram.

## Objective

Getting students interested in sensors/sensor technology by demonstrating potential applications of the technology in a fun and interactive way. Sensors can be lackluster, and so it is our objective to keep children engaged throughout the field trip. Ideally, students will see a broader view of STEM applications and pursue a career in STEM.

## Timeline

**Table 1. Activity Chart.**

Location	UNM/ Sandia Peak Tramway
Duration	1 day – 9:00-3:00
Number of students	25
Number of educators (UNM mentors, volunteers)	10
Stakeholders involvement	Sandia Peak Tramway
Budget	\$ 1000
Preplanning required (Y/N)	Y

## Materials

- 4-5 hotspots
- 5-10 LEWIS 1 packets
- 5-10 Laptops with USB adapter
- Instructions for LEWIS fabrication and software installation
- Rail-Runner ticket for each student

## Procedure

First, students will be introduced to LEWIS1. They'll learn about the parts and how they work together. A live demonstration will be given where they'll get to see how movement affects the graph and test it for themselves. Mentors for this class should have a basic understanding of engineering and have attended a previous LEWIS training or be trained by someone who has. After being introduced to the equipment, the children will start to build the LEWIS's with the instructions provided. Instructors will supervise to ensure that the students are fabricating the LEWIS's properly. After the LEWIS's are created, students will then graph the Rail-Runner ride using a LEWIS sensor and a laptop.

- Introduce LEWIS1 with demonstration
- Build LEWIS1 with groups
- Plotting data
- Regroup and analyze the graphs

## Contact Information

If you are interested in one of the most diverse, collaborative, and inspiring programs to help build up the future of the young generation and encourage them to be railroaders of the future, please contact us!

### Contact information:

Website: <https://smartrailroads.org/>

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UNM Website: <https://www.unm.edu/>

UNM College of Engineering: <https://engineering.unm.edu/>

## References

table1

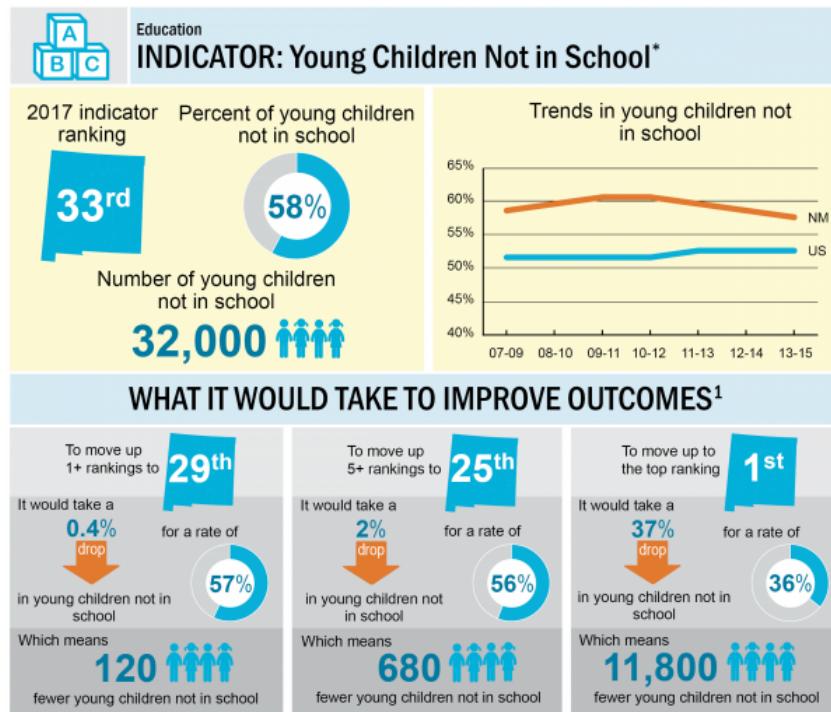
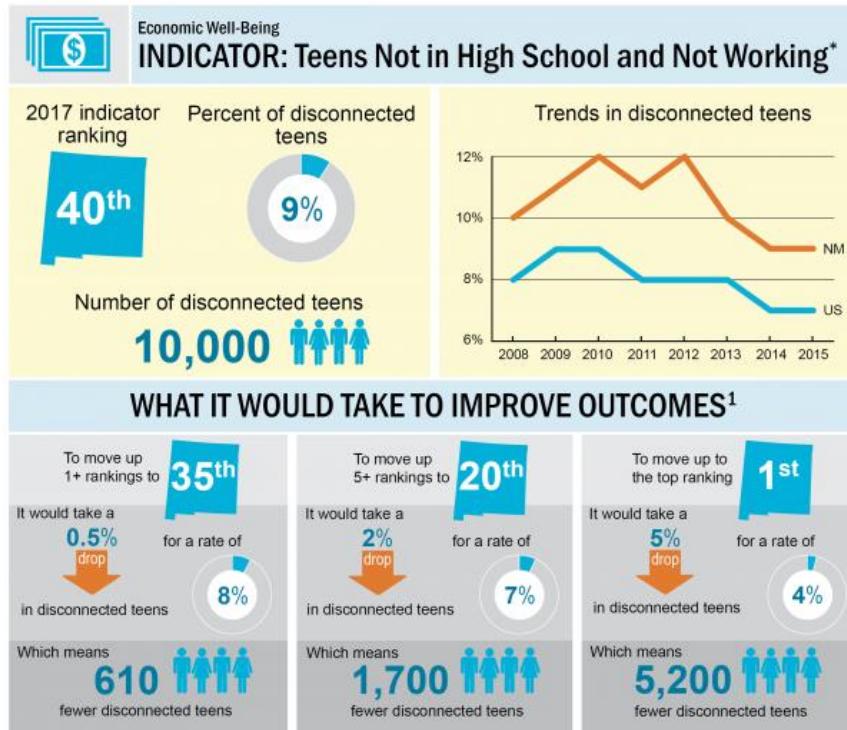


Table 2



New Mexico Voices for Children. (2020, February 14). Retrieved August 5, 2022, from <https://www.nmvoices.org/>