Dancing With the Ducks

University of New Mexico

SMILab, UNM SOE

Appendix

Overview

Traditional education takes place within a secluded building. Therefore, education modules should incorporate research applicable to 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 that help their developing minds and bodies. 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 displacement of the X/Y/Z axes of any object over time. For example, a LEWIS-1 sensor could calculate the displacement and stability of a bridge as cars pass by. While this experiment could be redone, it is not safe for young children. Therefore, we will have the students perform movements on a bridge with no traffic. To make this more interesting, the students will be divided into groups and they will perform dance moves. The displacement of the bridge will be measured by LEWIS sensors and the data will be compared to find out which group has the most harmonious dance moves.

Activity Table

Location	UNM Campus
Duration	2 days from 9:00am-12:00am
Number of students	15-25
Number of educators (UNM mentors, volunteers)	4-7
Stakeholders' involvement	UNM
Preplanning required (Y/N)	Y

Objective

Getting students interested in STEM careers and innovative technology (sensors), by demonstrating potential applications in a fun and interactive way. Sensors can be lackluster, so it is our objective to keep students engaged throughout the field trip. Ideally, students will see a broader view of STEM applications and gain insight into basic engineering.

Timeline

Day 1

Task	Time
Introduction to Smart Sensors/uses of sensors	9:00-9:30
Building LEWIS sensor	9:30-10:30
Small experiments with LEWIS	10:30 – 11:30
Q&A	11:30-12:00

Day 2

Task	Time
Introduction to different Ballet Dances	9:00-9:30
Teaching line dance/analyzing data	9:30-11:30
Answering questions	11:30-12:00

Procedure

During the first day, students will be introduced to LEWIS sensors. They will learn about the components and how they work together. A live demonstration will be given where the students will see how movement affects the graph and test it for themselves. Mentors for this class should have a basic understanding of engineering and should attend 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.

On the second day, mentors will prepare the bridge for the experiment by taping the LEWIS's to a bridge and connecting them to a laptop (image 1). The students will then arrive and be separated into two groups. These two groups will be in competition with one another to measure dance harmony and rhythm. Before the students measure their dance moves, an instructor will show each group how to perform a sauté jump. This ballet move will then be performed by each group as an instructor claps their hands to a synchronized beat (figure3). After this, data will be analyzed between groups and the best dancers will be determined.

Figure 1. Position of the children, sensor, and Chromebook to get accurate measurements for the experiment.

Materials

- 5- 7 LEWIS for each group
- 5-7 USB adapter
- 5-7 Chromebook
- 2 Hotspots for computer

LEWIS checklist

- Introduce LEWIS1 with demonstration
- Build LEWIS1 with groups
- LEWIS can Plot data
- Regroup and analyze the graphs

Overall Check List

- Attending an educational module and building LEWIS sensors
- Discussion about railways, bridges, and sensor applications
- lunch
- Going to Duck Pond bridge for demonstrations/competition
- Fun activities when children are done
- Taking students back to get picked up

Contact Information

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

Contact information:

Website:	https://smartrailroads.org/
Tramway website:	https://sandiapeak.com/
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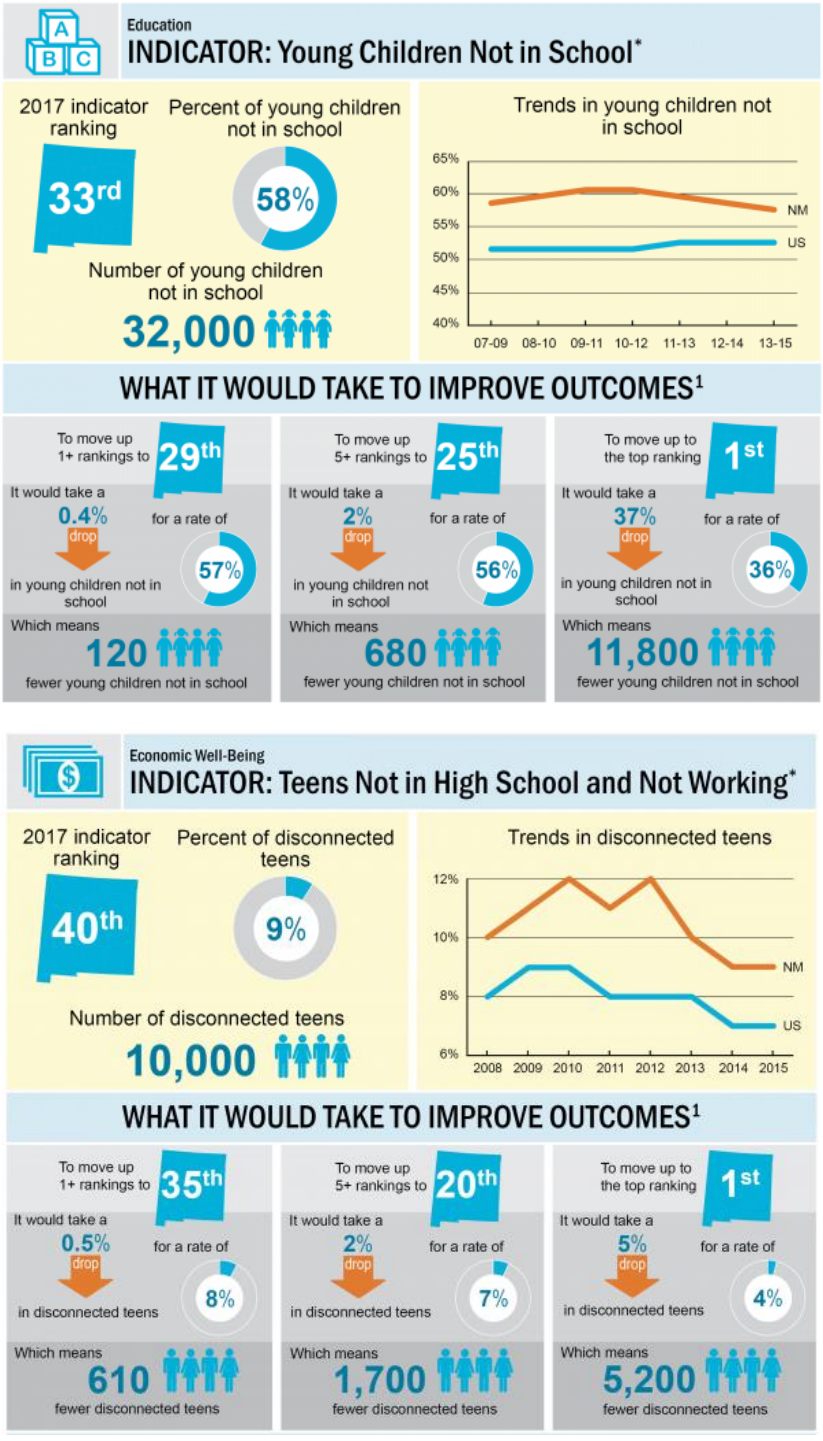
SMILabs:	http://smilab.unm.edu/
UNM School of Engineering:	https://engineering.unm.edu/

References



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