Cultivating STEM Career Interest in the Middle School Science Room Setting

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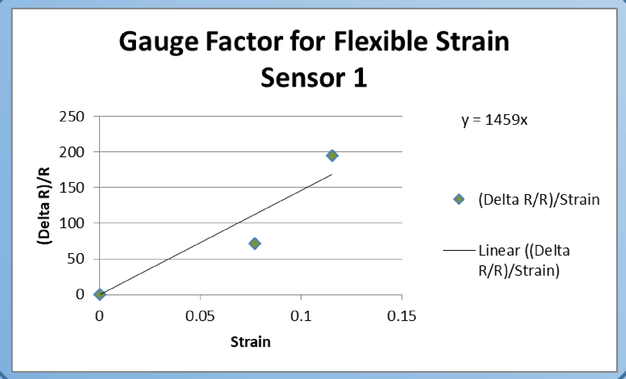
Summary

- American graduation rates in STEM are not keeping up with career demands
- Women and minorities are underrepresented in STEM fields
- Objective: to increase student interest in STEM careers, especially in females and minorities
- RET (Research Experience for Teachers) program lab experiences enriched science and computer technology background
- Relevant lab experiences were modified for middle school classroom use
- Student interest in STEM careers will be measured through pre and post surveys



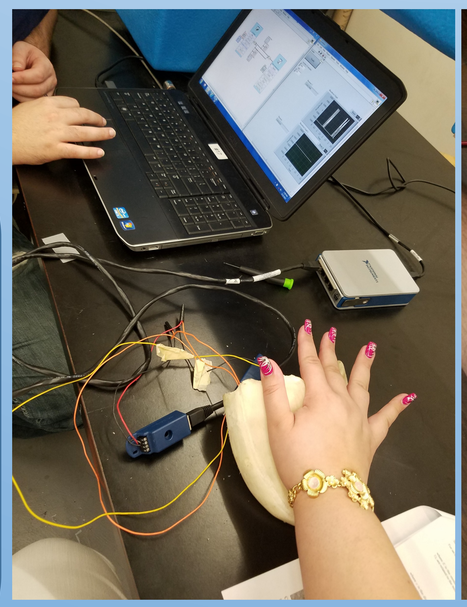
Research Activities

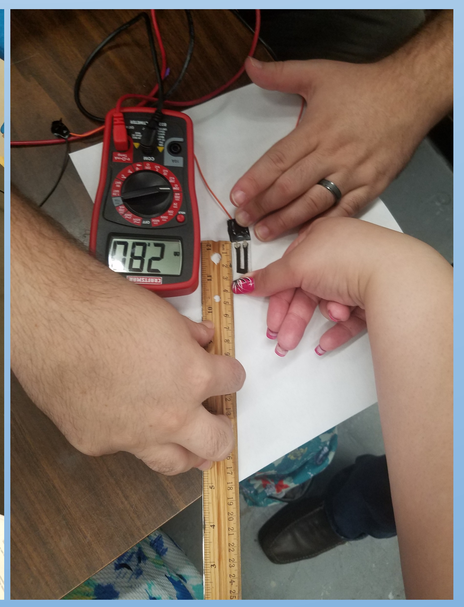
- Created carbon nanotube ink
- Designed and printed carbon nanotube strain sensors on a 3D printer
- Measured gauge factor of c. nanotube strain sensors
- Mixed a polyurethane foam and used it to adhere strain sensors (encased in silicone) to a phantom lung
- Aspirated a phantom lung and collected data with carbon nanotube strain sensors
- Learned binary and hexadecimal, and how to convert
- Created a Java web server
- Designed and created a website, hosted it on a Java webserver

Lesson Plan

- Over a 10 day period, students and the teacher will do the following:
- Take a survey about their knowledge and interest in STEM careers
- Learn about Ohm's Law, including the various calculations
- Build series circuits
- Parallel circuits
- Introduce carbon nanotubes and some modern research
- Calculate the change in resistance in carbon nanotube strain sensors under strain
- After learning HTML, build a website "study guide" about their learning experience
- Assess learning aligned with the Sunshine State Standards
- Re-take the survey about their knowledge and interest in STEM careers

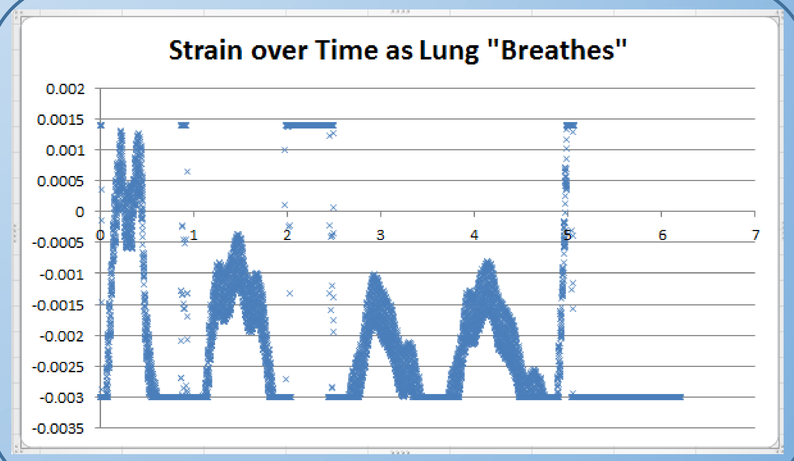
Research Activity Photos





Lessons Learned and Assumptions

- The value of carbon nanotubes in modern engineering
- The ease and excitement of coding, especially related to websites and Android phones
- C++ and Java programing
- Academic research methodology



Implementation Strategy

- 5E model labs
- Cooperative Learning
- Inquiry Learning
- Fill in the blank notes
- Hands-on learning experiences
- Direct instruction

Acknowledgments

RET Site: COMET Program, College of Engineering and Computer Science, University of Central Florida. This content was developed under National Science Foundation grant EEC-1611019.

Special thanks to Dr. Jihua Gou, Dr. Damla Turgut, Xin Wang, Eric Cheng, Max Parker, Salih Bacanli, and Dr. Hyoung "Joe" Cho.