Elementary Educators as a Linchpin of STEM Workforce Development

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Background

Elementary educators are a critical conduit for STEM workforce development and are themselves a largely underserved, undervalued part of the STEM workforce. Besides being many students’ first introduction to the content and methods of science, the elementary grades are especially critical for engaging students from groups traditionally underrepresented in STEM. But while elementary teachers are responsible for teaching science curriculum, they are not always interested in or comfortable with science themselves, creating a significant obstacle to their becoming effective teachers of science.

This poster describes a collaboration between the University of Nebraska’s Materials Research Science and Engineering Center (MRSEC) and College of Teaching, Learning, and Teacher Education (TLTE), linking MRSEC research objectives with Lincoln Public Schools’ (LPS) science curriculum to help inspire the next generation of materials scientists. This project contributes to STEM workforce development along three tracks, providing training for undergraduate STEM researchers, preservice elementary science teachers, and students in grades K-6.

Partners

- Nebraska Materials Research Science and Engineering Center
- UNL College of Teaching, Learning, and Teacher Education
- Lincoln Community Learning Centers
- Lincoln Children’s Museum
- Spark Summer Learning program
- Lincoln Public Schools

Objectives

- Develop new educational tools and methods for science teachers to use when discussing nanoscience at the elementary-school level
- Increase competence and confidence of K-6 science teachers in order to boost STEM engagement of students in these grades
- Establish link between Nebraska MRSEC research and Lincoln Public Schools science curriculums

Project Timeline

**Year 1**

TLTE Prof. Krista Adams:
- Developed and administered a survey for MRSEC PIs about their research objectives
- Correlated MRSEC research objectives with Next-Generation Science Standards (NGSS)

**Year 2**

Preservice teachers in Adams’ Elementary Science Methods class:
- Toured selected MRSEC labs to learn about cutting-edge nanoscience research
- Developed nanoscience lesson plans for grades K-6
- Received peer mentoring from MRSEC undergraduates to revise and refine lesson plans
- Implemented lesson plans at Lincoln Community Learning Center afterschool clubs

**Year 3**

- Preservice teachers in Adams’ Elementary Science Methods class developed nanoscience-themed exhibits for new STEAM floor at Lincoln Children’s Museum
- TLTE graduate student Tammera Mittelstet refined selected lesson plans developed in Year 2, creating nanoscience units aligned with NGSS and Disciplinary Core Ideas for particular grade levels
- MRSEC undergraduates implemented nanoscience units at Spark Summer Learning program for K-5 students

**Year 4**

- Adams hosted a workshop for LPS elementary teachers to integrate nanoscience units with the LPS science curriculum
- Participating teachers implemented nanoscience units during weeklong residency at Spark Summer Learning program

**Year 5**

- LPS elementary teachers who participated in Year 4 workshop incorporated nanoscience units in their classroom science curriculum
- Spark Summer Learning students visited selected MRSEC labs

Outcomes

This collaboration among Nebraska MRSEC researchers, TLTE curriculum specialists, and LPS educators has directly impacted STEM workforce development in three ways:

1) by providing specialized training for preservice elementary educators to address nanoscience topics,
2) by creating opportunities for STEM undergraduates to address nanoscience topics,
3) by engaging K-6 students with cutting-edge nanoscience, in both formal and informal contexts.

The partnership with Lincoln Community Learning Centers allowed for targeted programming for elementary and middle schools with a high proportion of low-income and underrepresented minority students.

The project will have longer-term impacts on STEM workforce development through the creation of nanoscience curriculum units for use in grades K-6. In addition, these nanoscience lessons were used to develop a permanent exhibit related to Nebraska MRSEC research objectives on the Lincoln Children’s Museum’s new STEAM floor. Finally, by increasing elementary educators’ competence and confidence in teaching nanoscience concepts, this project will promote STEM workforce development by enhancing teachers’ effectiveness in engaging and developing young students’ interest in STEM fields.