

## **WIP: Mobile STEM Learning Lab Initiative to Expand Engineering Education to Rural Counties**

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### **Abstract**

The Work-in-Progress (WIP) paper discusses an engineering-focused Mobile STEM Learning Lab initiative to expand STEM literacy to rural and underserved counties in northeastern North Carolina. This initiative is important in developing the STEM educational foundation of and for students from Northeastern North Carolina, the most economically distressed region in the State. The project extends laboratory resources and learning activities to the school districts and rural communities using Roadshow-in-a-Box model. This highly interactive format provides students with hands-on inquiry-based activities and rich digital media content to develop awareness and increase interest of STEM related subjects, especially engineering. The initiative, supported through both federal and private partnerships, is expected to serve over 200 schools during the course of three years. The project has potential to improve student exposure and interest in STEM and create a pipeline of college-ready students from underrepresented and disadvantaged backgrounds.

### **Keywords**

K-12 Outreach, STEM Literacy, Roadshow-in-a-Box, Mobile Learning Lab

### **Mobile STEM Learning Lab Initiative**

Science, technology, engineering and mathematics (STEM) education is crucial to the ultimate success of our young people as STEM jobs in the United States are expected to grow nearly twice as fast as other fields by 2020<sup>1</sup>. Unfortunately, there is a shortage of both interested and adequately prepared K-12 students in STEM subjects, especially among minority youth and young women<sup>2</sup>.

The Mobile STEM Learning Lab initiative at Elizabeth City State University (ECSU) is a comprehensive effort to expand STEM education to rural counties in northeastern North Carolina. The region has long suffered the effects of poverty and has lacked the opportunities for most students to encounter the 21<sup>st</sup> century workplace that is readily accessible in more urban areas of the state. However, with recent growth in the aviation, aerospace, and manufacturing industry in the region, there now exists the potential to link K-12 STEM education to these industries. Hands-on learning activities will integrate modern educational technology tools and inquiry-based learning to reinforce science and mathematical concepts required for engineering discipline. Students will learn about potential career opportunities that exist in engineering fields and why background in advanced science and mathematics is crucial to achieve these careers. The initiative will extend laboratory resources beyond the classroom in the form of a travelling demonstration to engage and inspire people to discover STEM careers. Staffed by ECSU faculty,

lab instructor, and undergraduate students, the hands-on activities housed in the mobile learning lab will be designed to engage visitors of all ages. The engineering-focused mobile STEM lab vehicle will be outfitted with wireless Internet access, laptops, large high-definition monitor and audio/video equipment, and house various laboratory experiments to support hands-on STEM learning experience.

The expected outcomes of the Mobile STEM Learning Lab initiative are:

- Increased understanding of STEM content both for students and teachers
- Increased interest in pursuing STEM knowledge, STEM degrees and careers
- Increased community participation in STEM experiences
- Increase in number of historically underserved and underrepresented students selecting a STEM major for post-secondary

The mobile STEM learning lab will be housed in a 40-foot trailer that will host state-of-the-art desktop flight simulators, aircraft design stations, desktop wind tunnel, flow visualization tunnel, weather stations, model rocketry, GPS, computer programming station, 3D printers, sensor data acquisition stations, mini UAVs, mobile robots, solar and wind energy stations, and a set of hands-on science experiments. The engineering-themed mobile STEM learning lab will allow for students and teachers from within the serving school districts to immerse themselves in science, technology, engineering and mathematics activities. This interactive laboratory designed into a Roadshow-in-a-Box format, will provide students with hands-on inquiry-based activities and rich digital media content to develop awareness and inspire interest of STEM related subject matter, especially engineering.

This traveling demonstration (Roadshow-in-a-Box) will complement the outreach program activities that will include a more in-depth program that invites students from the participating county area to the ECSU campus for a one-week camp. The camp focuses on NASA STEM curriculum and hands-on learning modules, as well as guest speakers and field trips in related subject matter.

Undergraduate student interns will be used to help develop and present the message. As their “near peers,” student presenters can connect with school audiences in a special way. Developing and presenting the message serves an important part of the interns’ education as well.

### **Program Implementation and Evaluation**

*Scope and Impact:* The program will serve to carry these STEM areas to all students in the 21 counties surrounding ECSU. This program will be tailored to grade-specific groups of students to ensure appropriate levels of understanding are considered. The program will be structured to demonstrate STEM concepts and build interest in, and tying to, educational opportunities in line with the North Carolina educational standards for Science and Math and Next Generation Science Standards. It will also bring technology to our future workforce, consequently sparking interest in related STEM programs and attract the attention of industry that would build and grow in Northeast North Carolina.

The targeted audiences are:

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1. Elementary Schools
2. Middle Schools
3. High Schools
4. Community (special events)

There are approximately 256 Schools in the ECSU Service area. This program will be designed to reach out to those students of all ages in order to generate interest in staying in school, pursuing college and careers in STEM related fields.

*Program Development:* There are many factors to consider in the development of a mobile learning lab outreach program. The Mobile STEM Learning Lab initiative at ECSU has adopted the Roadshow-in-a-Box model developed by the National Center for Women and Information Technology<sup>3</sup>. This model defines the value of having an outreach program to motivate and recruit students and carries the message of opportunities in specific industries. Using this model as a guide, we have identified six development components that will be used in implementing the Mobile STEM Learning Lab initiative:

1. Controlled Message
2. Support
3. Ongoing School Partnerships
4. Trained Student Presenters
5. Program Activities
6. Evaluation and Tracking

*Scheduling:* The basic premise for the visits is as follows:

1. Notional 4-6 one-hour sessions/school/day (varies depending on school hours and number of students available to attend). Example: 2-3 sessions before lunch and 2-3 sessions after lunch
2. Stay in one school district per day
3. Visit one school district/county/week
4. Total 4 school districts/county/month (Elementary, Middle and High Schools)
5. For long-distance counties, may be optimal to do more than one school districts in a given week

The schedule will include a total of four visits each month during the school year for a total of 36 visits each year. Summer months will be reserved for special community events.

*Program Evaluation:* Evaluation and tracking is an important step for continuous improvement, making it more valuable to all stakeholders involved. The project team has developed a method of collecting audience feedback and reporting progress, success and risk to all stakeholders. Student visitors of the mobile STEM learning lab unit will be asked upon completion of the exhibit to complete a brief demographic/STEM attitudinal survey. This survey will allow us to keep accurate records about visitor traffic, correlations between demographic profiles and attitudes about STEM learning. Visitor traffic, demographic statistics and attitudinal survey results will be compiled and analyzed for inclusion in required periodic project reporting.

## References

- 1 Bureau of Labor Statistics. (2012). Occupational Outlook Handbook, 2012-13 Edition, Projections Overview. Retrieved from <http://www.bls.gov/ooh/about/projections-overview.htm>.
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- 3 NCWIT, *Roadshow-in-a-Box: Capitalizing on Models for Outreach*. Retrieved from <https://www.ncwit.org/resources/roadshow-box-capitalizing-models-outreach>.

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