

# The UB-Discovery STEM on Wheels Project

## (Science, Technology, Engineering, & Mathematics)



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**ABSTRACT:** Bridgeport Public Schools (BPS) in Connecticut serve 21,260 students from 39 minority groups in low performing schools. BPS have limited funds for curriculum improvements and resources necessary to address STEM achievement gaps. Thus, the University of Bridgeport (UB) has partnered with the Discovery Museum and Planetarium (DMP) to purchase and retrofit a bus that will bring STEM education and precious resources to high-needs K-12 schools in the community that are lagging behind. A city bus is transformed into a mobile classroom and laboratory and UB-DMP offer the required technical, logistical, and science literacy and pedagogy expertise that is essential in reaching targeted students. UB-DMP collectively brings space and astronomy themes (rocketry, satellites, mission control, high altitude ballooning, remote sensing, citizen science) as well as robotics, 3D printing, virtual reality, and renewable energy programming to students of all ages. In sum, STEM on Wheels: 1) offers STEM experiences to schools lacking resources, 2) provides K-12 students with hands-on, STEM-focused skills aligned with the Next Generation Science Standards (NGSS), and 3) trains UB engineering, science, and math students in effective teaching practices that communicate the excitement of STEM activities. *This project is sponsored in part by the CHEFA Client Grant Program, The Greater Bridgeport Transit Authority, 21 Century Fox and NASA CT Space Grant Consortium.*

### GOAL:

The goals of this project are to provide engaging hands-on and Next Generation Science Standards (NGSS) aligned lessons for K-12 students in an urban high needs district. The University of Bridgeport (UB) researchers, in collaboration with the Bridgeport Discovery Museum and Planetarium (DMP) designed the Science, Technology, Engineering, and Math (STEM) lessons which are conducted in and around the STEM on Wheels mobile laboratory. Instruction is provided by UB undergraduate students, UB faculty, and DMP staff.

### RESEARCH QUESTIONS:

- 1) What will the result of providing engaging NGSS aligned lessons within a mobile STEM laboratory for **students** in grades K-12 in high needs schools have on their content knowledge and dispositions towards STEM content and disciplines?
- 2) What will the result of providing engaging NGSS aligned lessons within a mobile STEM laboratory for students in grades K-12 in high needs schools have on their **teachers'** knowledge and skills of STEM content and their **teachers'** dispositions and self-efficacy towards the implementation of STEM content and disciplines within their own classrooms?

### METHODOLOGY:

The STEM on Wheels mobile laboratory is currently visiting targeted Bridgeport high-needs schools where a team of UB engineering students, UB faculty, and DMP STEM-trained staff are leading students in grades K-12 in engaging NGSS aligned STEM lessons. Three schools and four different grade levels are targeted during this pilot year (2018-19), so students receive three to four lessons.

The STEM activities follow the new Next Generation Science Standards (NGSS) and incorporate the Engineering Design Model. The lessons will focus on technology, engineering, and earth and space science.

#### Data Collection:

The data collection involves post- surveys of the teachers regarding their knowledge, skills, dispositions, and self-efficacy regarding STEM implementation. Teacher interviews and/or focus groups throughout the project will also be conducted. Interviews will be recorded and transcribed for accuracy, and utilizing member checks for reliability.

The data collection also involves post surveys of the K-12 students regarding their knowledge, skills, and dispositions regarding STEM content and disciplines.

Field observations will be recorded on the reactions of both the teachers' and the students' response to the STEM lessons implemented. The researcher will serve as a participant observer during the lessons.

### TEAM MEMBERS:

#### University of Bridgeport:

##### UB School of Education:

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##### UB School of Engineering:

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##### UB Office of Sponsored Research and Programs:

Julie Demers, Christine Hempowicz

##### The Discovery Museum, Inc.:

John Chamberlain, Sarah Tropp-Pacelli

### LITERATURE:

Currently, the United States is experiencing a lack of high school graduates entering into STEM disciplines and career pathways (Rice, et al., 2013). This is alarming for our country since STEM job growth is on the increase in America, opening up more opportunities for higher wage earning jobs in a market where other jobs can be limited (Milgram, 2011). Taking into consideration the lack of American students pursuing STEM disciplines, educators need to become more creative in the recruitment processes. Simply reading or hearing about engineering and STEM disciplines is not enough; students must engage in hands-on programs and activities that build their interest and self-efficacy towards STEM (Ralston, Hieb, & Rivoli, 2013).

#### References:

- Milgram, D. (2011). How to recruit women and girls to the science, technology, engineering, and math (STEM) classroom. *Technology & Engineering Teacher*, 71(3), 4-11.
- Ralston, P. S., Hieb, J. L., & Rivoli, G. (2013). Partnerships and experience in building STEM pipelines. *Journal of Professional Issues in Engineering Education & Practice*, 139(2), 156-162.
- Rice, L., Barth, J., Guadagno, R., Smith, G., & McCallum, D. (2013). The role of social support in students' perceived abilities and attitudes toward math and science. *Journal of Youth & Adolescence*, 42(7), 1028-1040.

**DATA COLLECTION IN PROGRESS:** During this pilot year, we have completed 50% of the scheduled 12 classroom visits to 3 different schools. Although we are still in the data gathering phase, we are able to note that for all grade levels from the selected schools, students are receiving their first hands-on experience with robotics, mechatronics, and 3D-printing. The teachers have stated that the hands-on activities in the STEM Bus environment allowed their students to engage in STEM in a tangible way, thus helping them better retain the STEM content.

## UB – Discovery STEM on Wheels



Bridgeport Military Academy (9-12)



Roosevelt Elementary School (K-8)