Impact of a STEM Mobile Laboratory Initiative on K-12 Students in High Needs Schools

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Abstract— It is well known that exposure of young students to authentic STEM experiences can lead to lifelong learning and exploration. One University and one Science Museum located in the northeastern United States have collaborated to develop and implement a mobile STEM laboratory on a 35-foot New Flyer Bus (Model D35LF) with a capacity for 23 individuals per lesson and named it *STEM On Wheels*. The goal of this project was to bring technical STEM lessons and hands-on experiences to urban high-needs K-12 schools. During the first year pilot (2018-19), the team developed K-12 STEM content lessons that were NGSS aligned and enriched with hands-on activities. The *STEM On Wheels* bus traveled to local urban K-12 schools where they immersed students in exciting and interactive activities using technology typically not available in most classrooms. Area schools viewed the *STEM on Wheels* project as a vital partner in their quest to actively engage their K-12 students through hands-on learning. Participating students from all grade levels were positively impacted as they were actively engaged and often inquired about the next STEM bus visit to their school. This case study presents data collected during the initial pilot year of the project.

Keywords—STEM teaching, mobile laboratories, STEM equity, STEM exposure

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I. Introduction

Equity suggests that all children receive the same privileges and experiences, regardless of their zip code. Equity in STEM (Science, Technology, Engineering and Math) education is front and center in education today [1]. The 21st Century has birthed a technological age like nothing ever seen before. Likewise, careers in STEM continue to grow around the globe and today's global population is dependent upon technology (e.g. owning a cell phone). With technology use on the rise, the need for skilled STEM professionals likewise also increases. However, the number of students in the United States entering STEM fields lags behind other developed countries [1]. With budget cuts limiting STEM resources to many area schools, the *STEM on Wheels* collaborative project brings university expertise and STEM technologies back to schools to engage K-12 students through hands-on learning, bring science back to life, and nurture STEM growth and future STEM interests.

This study proposed one strategy to level the playing field and strive to provide equity in STEM education in a northeastern urban school district by bringing high quality STEM lessons and related hands-on activities directly to children in high needs schools. Mobile laboratories help to provide engaging hands-on STEM lessons for K-12 students that would otherwise be unattainable. This unique exposure for students can help fill the gaps and increase equity in STEM education for all students [2].

A. Study Purpose

One northeastern university and local Science Museum have collaborated to develop and implement a mobile STEM laboratory. Awarded grants enabled the retrofitting of a city bus into a mobile STEM laboratory. The purpose of this project was to bring technical STEM lessons and activities that are aligned to the Next Generation Science Standards (NGSS) to local high-needs K-12 schools. A team of professionals from multiple disciplines (education, engineering, math, and computer science) worked on this initiative during the STEM on Wheels mobile laboratory pilot year in 2018-2019. In addition to the professional team, the STEM on Wheels program became an ideal mechanism for the university's National Academy of Engineering (NAE) Grand Challenges Scholars Program to provide outreach, serve as role models and increase their own STEM literacy and communication skills.

This proposed K-12 STEM mobile laboratory project studied the impact of engaging NGSS aligned STEM lessons on both K-12 students and their teachers in high needs schools. The research questions were as follows:

Q1) What is the impact of providing engaging NGSS aligned STEM (Science, Technology, Engineering, and Math) lessons within a mobile laboratory for students in grades K-12 in high needs schools on their knowledge, skills, and dispositions of STEM content and disciplines?

Q2) What is the impact of providing engaging NGSS aligned lessons within a mobile STEM laboratory (Science, Technology, Engineering, and Math) for students in grades K-12 in high needs schools on their teachers' knowledge, skills, dispositions and self-efficacy towards the implementation of STEM content and disciplines within their own classrooms?

II. Review of the Literature

A. The Need for STEM Professionals

STEM job growth is on the increase in the United States (US), opening up more opportunities for higher wage earning jobs in a market where other jobs can be limited [3]. Today's global society is more technological savvy than ever before, creating a dependency on electronic gadgets and devices with unique programing that are developed by computer scientists, engineers, and technicians, just to name a few. In the future, STEM jobs will continue to increase in number to meet the demand, dependencies, and competitiveness of the global society [4]. However, the United States is yielding a limited number of high school graduates entering into STEM disciplines and career pathways [5, 6]. This lack of interest creates a gap in the supply and demand chain. While American teens are interested in their technology and devices which are the output of STEM jobs, they tend to be less interested in moving forward into STEM careers [1]. With STEM jobs increasing in the coming years, and the limited number of our youth pursuing STEM disciplines, we face a shortage of STEM professionals in our country, in which continued growth is expected in the years to come [7, 8].

Bybee [9] states that there is a continued need for diversity of individuals to enter STEM careers and remain there. The best way to encourage diversity within the STEM workforce is through K-12 education and reaching minority children through engagement in active learning, problem solving, and challenges that will result in stronger STEM knowledge base.

B. Early Exposure

As a nation, one goal is to increase STEM interest in our youth through providing more engaging hands-on science lessons and experiences within the K-12 curriculum. The Next Generation Science Standards (NGSS) released in 2013 include a broader scope of STEM content through the inclusion of K-12 engineering education. The NGSS emphasize scientific inquiry, engineering design, and require K-12 students to have the ability to link broad concepts across the various scientific disciplines in STEM [10]. By exposing children to STEM disciplines during the early years through hands-on, interactive, and problem-solving activities, research indicates that children's interest in STEM career fields' increases, which establishes an educational pathway for their future [11, 12]. Student interest, motivation and engagement in learning science has been linked to both achievement and the intention to pursue coursework or careers in STEM after high school [13, 14]. The engineering design process engages students in authentic real world problems where they collaborate with peers to conceptualize, design, and build real solutions to real problems [15]. Through this highly engaging instructional approach, students are intrinsically motivated as they experience personal success in STEM content and experiences. In order for these unique engaging learning experiences to occur for all students, K-12 teachers at all levels need professional development, curricular support, and resources [16].

C. Lack of Teacher Training in STEM

According to Proudfoot & Kebritchi [17], "Among the challenges of fully teaching STEM are limitations in teacher education, efficacy, and skill in STEM topics" (p. 20). Oftentimes in schools, an attempt to focus on STEM can lead to actually 'siloing' science and math as separate entities. Teacher preparation, until most recently, did not include the integrated subjects of STEM, which was not only true at the 7-12 grade levels, but especially true at the elementary and early childhood levels. The lack of effective teacher training for STEM content and the

NGSS negatively impacts K-12 students as they lack positive engaging hands-on experiences in STEM education that is very motivational. Prepare and Inspire [1] states that “we must inspire all students to learn STEM and, in the process, motivate them to pursue STEM careers.” There is a direct link between teachers’ self-efficacy in their ability to plan and facilitate integrated STEM curricula with their students and improved student learning in science and math [18].

D. Mobile Laboratories Bring Equity

Engaging and positive STEM learning experiences have the potential to improve student attitudes, interests, and achievement towards STEM [17]. Many underserved schools lack the resources needed to provide high-quality, hands-on science and STEM education. Mobile labs are increasingly used as a valuable tool to supplement traditional classroom science lessons and increase equity of access to authentic laboratory experiences and equipment [13]. Connor et al. [19] stated that through mobile hands-on pedagogy, students become more comfortable and familiar with experimental practices which could enhance interest and learning for all students in STEM disciplines. Research shows that student active engagement with authentic science tools effectively helps students to learn and retain science knowledge [2].

Mobile laboratories have the ability to deliver and supply K-12 schools with technological tools and STEM resources that they would not otherwise have access to for their students. In addition, facilitators who are knowledgeable in STEM content and pedagogy deliver the instruction within the mobile lab with K-12 students and thus also positively impact the teachers’ knowledge and skills. One common theme for all mobile laboratories is the goal of improving equity of access to engaging, high-quality STEM education for all students [2]. The mobile laboratory provides students with a unique STEM experiences that is authentic and which fully immerses them in learning like a scientist or engineer. These positive experiences in the laboratory have the potential to significantly impact students’ interest in pursuing STEM careers when they get older [20].

E. Theoretical Perspective

Students benefit from an instructional approach grounded in the experientialism learning theory. A hands-on experience in the mobile STEM lab provides students with an active way to experience science, technology, engineering, and mathematics (STEM). Kolb’s [21] experiential learning theory is a constructivist perspective on learning through experiences and reflecting on those experiences to construct knowledge [22]. The STEM lessons provided within the mobile laboratory for this project are all hands-on, incorporate student collaborations, and problem-based in nature. The K-12 students engage in a variety of forms of active engagement through authentic settings drawing on their own (or collective) deductive reasoning as they work through particular STEM lessons presented. The learners are always at the very center of the learning experience.

Additional theories engaged in this study are the sociocultural theory and the constructivist approach to learning by Vygotsky [23], as well as the social learning theory presented by Albert Bandura [24]. Constructivist theory focuses on providing learning experiences through authentic problems that reflect their environment which allows for taking ownership of the task at hand [25]. A key component of Vygotsky’s sociocultural theory involves the learner gaining understanding through interaction with others and their environment. Through social interaction and reflection, students are able to develop cognition. Problem-based learning embodies principles of constructivism through engagement in experiences that present the learner with a problem to be solved, thus engaging students in critical thinking processes.

III. Methodology

The STEM on Wheels mobile laboratory visited three targeted high-needs schools within the same urban school district where a team of university engineering students (4) and university faculty (5) led students in grades K-12 in engaging NGSS aligned STEM lessons. The STEM lessons followed the new NGSS (Next Generation Science Standards) with a focus on STEM technology that students would not otherwise receive exposure. The lessons had a multi-focus of technology, engineering, and earth and space science. The grade levels targeted during this initial pilot year were grades 4, 6, and 9-12. The STEM lessons were designed by the university faculty members, and facilitated for K-12 students by undergraduate students funded by a grant.

A. Participants

The three schools that received the *STEM on Wheels* experience during the pilot year were all part of the same local urban school district. Two schools were grades PK – 8 and one school was grades 9-12. These schools were located in an urban center with approximately 150,000 people. The median household income for this urban center in 2016 was around $42,000 per year, which is well below the state average [26]. Ethnicities of the city population included 39% Hispanic, 32% African American, 2% Asian, and 23% Caucasian. The crime index for this city is 400.5, which is almost double the US average. The difficult issues surrounding this city (crime, poverty, unemployment, etc.) are similar to challenges in other urban centers around the United States. During the STEM on Wheels pilot year, an estimated 390 students, 15 teachers, and 3 school administrators participated in the program receiving exposure to STEM content and careers within the mobile laboratory.

B. The Study

The university Institutional Review Board (IRB) approved research study began with the first school visit by the *STEM on Wheels* bus in early November, 2018 and ended with the conclusion of the university academic year in mid-May, 2019. Each targeted school and grade level received 2-3 weekly visits on Fridays of each week. During this pilot year, one grade level team was invited to participate in the STEM lessons provided on-board the STEM mobile laboratory per visit. A related classroom lesson was also provided simultaneously as grade level classes were divided into two smaller groups for the instructional time due to limited space on the STEM bus. The classes rotated after receiving a 30-40 minute lesson, participating in both lesson settings each day.

C. Curriculum Design

The *STEM on Wheels* curriculum was designed by the team consisting of university faculty from the School of Education, School of Engineering, and staff from the Science Museum. In all STEM lessons, students worked in small groups of 2-3 to collaborate and explore. STEM lessons for grades four and six consisted of learning to code a small robot called DASH to complete specified tasks. DASH is a stack of three spheres that rolls around on level surfaces. Both the head and body are covered in lights and it can also see, hear and speak in limited ways. The purpose of these lessons on coding DASH allowed students the opportunity to benefit from "real-world" technology. This physical toy allows children to connect with mental models of what coding is all about, as well as learn specific coding languages so that they are prepared for further study if they wish when they grow older. Robots like DASH show kids that coding isn't just about pushing pixels behind a screen, but is used to control physical systems such as a home's heating system or even space rockets! Students also experiment with cipher codes and learn about how encrypted codes are used in society to secure private information (such as banking information).

A second lesson topic for this age group (grades 4 & 6) consisted of 3D printing with a connection to space science and its valuable use on the International Space Station (ISS). Students are given the challenge of designing a multi-function tool for use in space by astronauts on the ISS. This tool must meet specifications and constraints and will be 3D printed. Students learn basic concepts related to materials design and 3D printing, as well as simple tools that would be useful in space in a microgravity environment. Students are introduced to *Tinkercad©* software and allowed to experiment to create a 3D multifunctional design tool that could be used in space. Tinkercad is a simplistic online 3D CAD software created for beginners with the capability of connecting to a 3D printer. Two designs from each class are selected and printed for the class to keep.

The *STEM on Wheels* curriculum for high school students included lessons on mechatronics, remote sensing and satellite tracking. Mechatronics is a combination of mechanical, electrical, and computer engineering. In the mechatronics lessons, high school students are introduced to circuits using *Arduino®* kits involving bead boards. First, students build a mechanism that produces varying red-green-blue LED light. Students program their mechanism for light brightness and the ability to flicker, and change colors. Students also use Arduino kits using a servo motor to make something move. Controlling servo motors is one of the most important functions in the field of robotics, and it opens up many possibilities for projects that let the Arduino control the physical world. Students experiment with rotation, range, and speed of their servo motor. Additional lessons involve introducing students to thermal imaging, Kubtec's x-ray technology, and higher level robotics.

D. Data Collection

Data collection for this case study involved voluntary post electronic surveys of the teachers regarding their knowledge, skills, dispositions, and self-efficacy for STEM implementation. The survey consisted of a 5-point Likert scale questioning the participants' knowledge and dispositions regarding STEM. The electronic survey was administered through an email providing a link to LiveText for teachers on their laptop computers. Voluntary teacher interviews and/or focus groups throughout the project were also conducted upon the conclusion of the STEM Bus visit. The interviews were recorded and transcribed using member checks for accuracy. Teachers' responses were then coded for themes.

Data collection initially involved identical pre and post electronic surveys of the K-12 students regarding their knowledge, skills, and dispositions for STEM content and disciplines. These surveys also consisted of a 5-piont Likert scale questioning the students' knowledge and dispositions regarding STEM. The electronic survey was administered by providing a link to a software system called LiveText for students to answer on their iPads. However, finding it difficult to obtain two administrations of the survey (pre and post), the switch was made to only a student post survey regarding their experience on the STEM bus. The surveys' face value was established by experts and the surveys were pilot tested on a subset of participants to establish validity.

Field observations were documented on the reactions of both the teachers' and the students' response to the STEM lessons implemented through the *STEM on Wheels* program. The researcher served as a participant observer during the lessons. DeWalt et al in [27] define participant observer as a researcher who is physically present and involved with the daily activities, rituals, and routines of the group culture. The researcher in this study was an active part of the STEM lessons through regular involvement and instruction.

IV. Results

Results from this case study regarding the *STEM ON WHEELS* mobile laboratory pilot year indicated that the K-12 students were indeed exposed to technology, STEM concepts, and problem-based learning activities that increased their knowledge, skills, and dispositions regarding STEM disciplines. Initially, a pre and post student survey was implemented that provided some key insight on the impact of the STEM bus program on K-12 students, albeit on a small scale, which led to the decision to only collect a post survey from students to make it more convenient for the teachers.

A. Survey Data

For this pilot study survey data, teachers found it challenging to get the students to complete both the pre and post surveys, so after two school visits, we revised the survey to only one post survey regarding students' experience on the STEM bus. The descriptive statistics from these survey results provided valuable results that we show herein to address research question one. Question 1 asked, "I have a good understanding of what STEM is". On the pre-survey, only 10% of students (N=59) responded in the combined areas of level 4 (Very) and level 5 (extremely), however, on the post survey (N=27), the percentage of students responding in the two highest combined levels markedly increased to 52% percent.

Question 2 stated, "I have enjoyed the STEM lessons in my classroom". On the pre-survey, 29% percent of students responded positively in the combined top two levels, which increased to 67% on the post survey indicating that students enjoyed the lessons on board the STEM bus.

A third question that is worth highlighting from the first student survey is Question 7 which stated, "I definitely want to pursue a career in a STEM field when I get older". On the pre-survey, 79% of students chose the two lowest ratings of level 1 (Not at all) or level 2 (A little), however, on the post survey, the value for students opposing STEM careers was reduced to 48% indicating that some of these students felt more positively about STEM content and careers as a result of their experience with the STEM bus.

After the initial student survey, a second post only survey was implemented. This survey had 12 questions and utilized a five point Likert scale rating the impact of the STEM on Wheels program impact on students' STEM knowledge and dispositions. This survey received the same validation process as the first. Results from this post survey are displayed in Table 1 and Figure 1.

Descriptive Statistics N=124	**1. Not at All**	**2. A Little**	**3. Somewhat**	**4. Very**	**5. Extremely**
1. My visit to the STEM Bus was enjoyable.	4%	14%	17%	34%	31%
2. My visit to the STEM Bus introduced me to new concepts in STEM (Science, Technology, Engineering, and Math).	9%	8%	25%	39%	19%
4. I enjoy learning new things in science when we do hands-on activities.	8%	16%	19%	21%	36%
9. I enjoy working with technology and computers.	17%	14%	15%	16%	38%
11. I feel like I would be successful if I decided to pursue a career in a STEM field.	22%	24%	23%	14%	18%
12. I definitely want to pursue a career in a STEM field when I get older.	33%	22%	23%	14%	9%

Table 1. Select student STEM post survey results

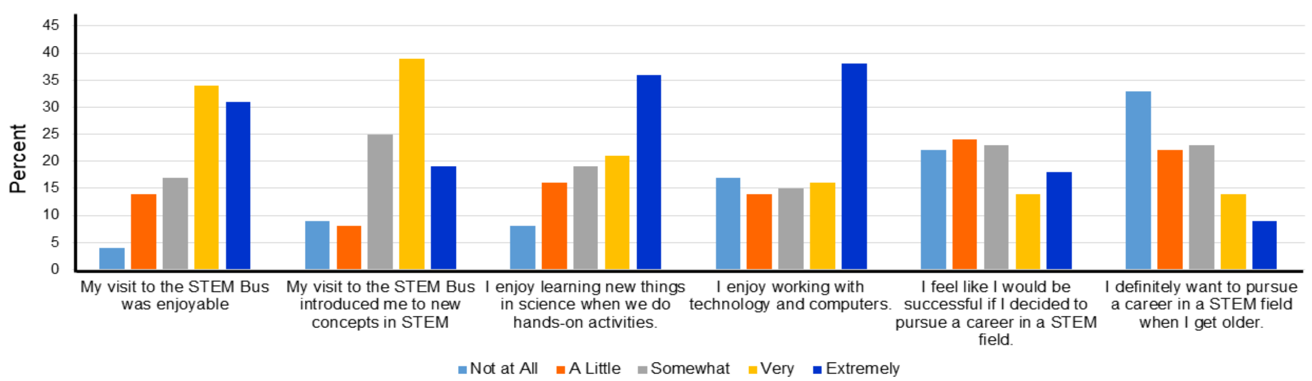

Figure 1. Select student STEM post survey results

A few of the questions from the student post only survey warrant highlighting as displayed above. The focus of these questions reveal the positive impact that the *STEM on Wheels* experience had on student participants. The data reveal that the students enjoyed their time on the STEM bus as 65% gave ratings of either level 4 (Very) or level 5 (Extremely) for question one. Students also stated they learned some new information about STEM as 58% gave positive ratings in the highest two categories. Even though students had an enjoyable experience with the STEM bus, question 12 still reveals a reluctance to envision a career in a STEM field as 55% of students gave ratings in the bottom two categories of one (Not at all) and two (A little). Question 11 revealed students lack of self-efficacy when it comes to STEM content as only 32% of students rated their foreseeable future success in STEM in the highest two categories.

Additional data was collected regarding the teachers' STEM knowledge and dispositions from two sources, electronic post surveys and post interviews or focus group in order to address research question two. Selected highlighted teacher responses are shown in Table 2 and Figure 2.

Descriptive Statistics ***N=8***	**1. Not at All**	**2. A Little**	**3. Somewhat**	**4. Very**	**5. Extremely**
4. I think engineering instruction would take time away from the core academic content that I am required to teach.	50%	50%	0	0	0
6. I would like to teach more STEM lessons.	0	13%	0	50%	38%
8. I think that it is important to expose my students to STEM.	0	0	0	63%	38%
9. I am confident in my ability to incorporate STEM activities for my students.	25%	13%	38%	25%	0
10. I am confident in my knowledge level of STEM content and disciplines to implement instruction with my students.	13%	50%	0	38%	0
18. I have received adequate training/professional development on how to implement STEM instruction with my students.	50%	50%	0	0	0
20. I believe that STEM instruction is important and necessary for my students in order to promote future STEM careers.	0	0	25%	13%	63%

Table 2. Select teacher post survey results

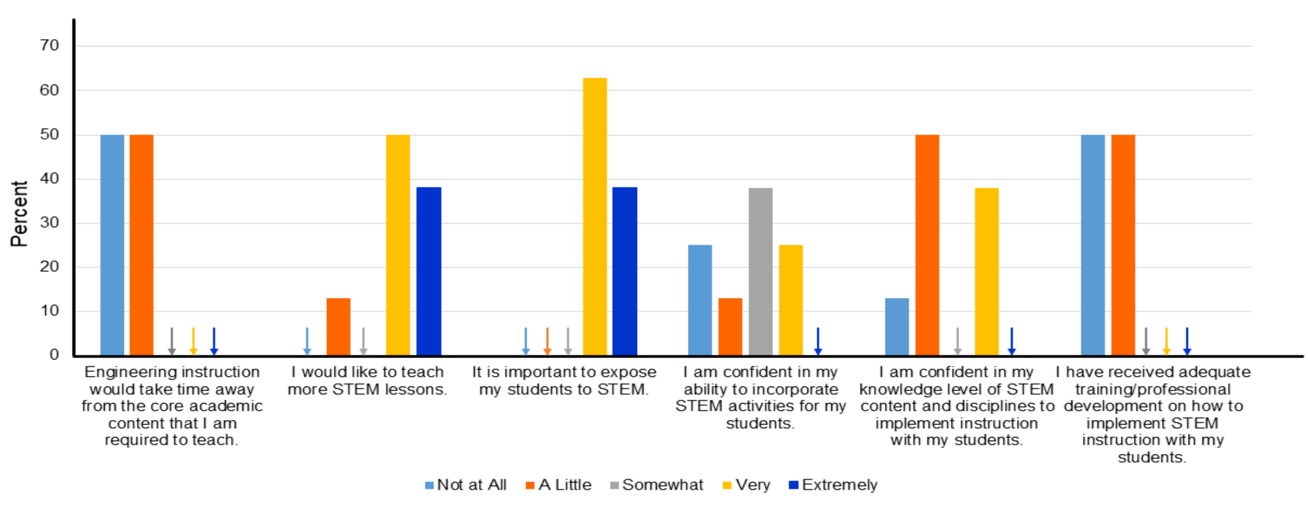

Figure 2. Select teacher STEM post survey results

It is interesting to note in the teacher responses on the post survey that 100% of the teachers believed that instruction in engineering would not take away from the core content that they were required to teach as ratings for question one were split between the two lowest levels of one (not at all) and two (a little). This indicates that the teachers are aware of the value of teaching engineering skills as they are now a key part of the NGSS. Responses to question eight confirm this as 100% of teachers rated the importance of exposing their students to STEM activities within the two highest levels 4 and 5. Question nine asked teachers to rate their confidence levels on their ability to incorporate STEM activities for their students, which is where their ratings were spread across the levels demonstrating a gap in self-efficacy in teaching STEM. The survey data also reveals that the teachers were in agreement in response to question 18 stating that they feel they have not received adequate training or professional development on how to implement STEM instruction effectively. Finally, teachers were in agreement with question 20 where the responses demonstrate their belief that quality STEM instruction is necessary in order to promote future STEM career choices for their students with 73% assigning the highest two levels.

B. Teacher Interview/Focus Group Data

Of the fifteen teachers involved in the program, two teachers agreed to personal interviews and two additional teachers participated in a focus group with the researcher for a total of four. Their responses to the questionnaire protocol were coded for common themes. Themes that resulted from question 3) "Describe how you feel the impact of the STEM on Wheels program had on your students' feelings towards STEM" were that students were excited and engaged. They stated that the program had a positive impact on students and inspired them, increasing their interest in STEM. Themes from question 5) "What do you feel was the most valuable aspect for your students regarding the STEM on Wheels program?" resulted in responses that students were able to experience STEM in a tangible way, it was hands-on, and provided a new window of curiosity. Several teachers also remarked about how they noticed their students with exceptionalities (special education) were totally engaged and focused during the STEM lessons. Finally, teachers' responses to question 12) Do you foresee any challenges for your students with regards to learning STEM concepts because of their urban setting?" stated that they have a lack of background knowledge and exposure due to their setting creating gaps in their STEM content knowledge. One teacher stated that, "I think they may have a lack of exposure because of their setting, but not because of their abilities," indicating a belief in students' hidden potential.

C. Field Observation Data

Field observations revealed that the K-12 students were engaged, excited, and challenged by the STEM activities they received. For all activities, students worked in groups of 2-3 where they consistently demonstrated their ability to collaborate and problem solve. The students demonstrated varying levels of background knowledge in STEM during group discussions with the vast majority lacking scientific knowledge, but yet communicating surface level knowledge. Many of the students demonstrated the ability to recall STEM content knowledge which was learned during the lesson at the lesson's conclusion, as well as a week later. Students with exceptionalities, or learning disabilities, amazed both facilitators and classroom teachers with their abilities to fully engage in the STEM lessons and experience success, attributed to the fact that it was hands-on. Observations of the teachers revealed mixed results where some were fully engaged in the STEM lessons with their students while others were somewhat reluctant to engage and were content to simply observe.

V. Conclusions and Educational Implications

Currently, the United States is experiencing a shortage of high school graduates entering into STEM disciplines and career pathways [28]. This is truly 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 [29]. With STEM jobs increasing in the coming years, and the limited number of youth pursuing STEM disciplines, we face a shortage of STEM professionals in our country, which is only expected to escalate [8]. In light of these statistics, the importance of providing early exposure for K-12 students is of national urgency, particularly in high-needs schools where engaging STEM experiences are often lacking.

The Goals of this project were to provide engaging hands-on and NGSS aligned STEM lessons for K-12 grade students in an urban high needs school district providing rich experiences in STEM that they would not otherwise receive. The students were consistently and actively engaged in the STEM lessons across all grade levels receiving services. The data revealed that the *STEM on Wheels* bus visits did have a positive impact on students' knowledge and dispositions regarding STEM as evidenced by the descriptive statistics in response to research question one. There was not enough evidence to support that the STEM bus experience motivated large numbers of students' interests in STEM career fields as a result.

In response to research question two, many of the teachers also indicated expansion of their own STEM learning and documented positive dispositions towards STEM as a result of their participation as evidenced by the electronic survey. The vast majority of teachers, even at the high school level, feel unprepared to effectively implement the new science and engineering concepts presented in the NGSS [30, 31]. A secondary goal of the STEM bus project was to provide STEM support and resources for teachers in high-needs schools. Partnering with these teachers to provide exposure to engaging STEM curricula resulted in positively impacting these students in regards to their STEM knowledge and dispositions as demonstrated by this study.

VI. Delimitations and Limitations

While this study of the *STEM on Wheels* program was very valuable in analyzing the impact of engaging STEM experiences on K-12 students, there are several delimitations and limitations to the study to be considered. First, a delimitation to mention is the small number of schools involved, thus limiting the number of students receiving exposure. The researchers placed a focus on multiple exposures for a few schools versus numerous single exposures for a large number of schools. Most mobile laboratories consist of a one and done STEM lesson experience. The researchers in this study were interested in identifying the impact of multiple STEM lessons on K-12 students in high-needs schools. The majority of students received two different lessons per visit (one in the classroom and one in the bus) with 2-3 consecutive weekly visits for a minimum of four STEM lessons and a maximum of six.

Limitations of this study evolved due to the nature of working in high-needs schools as cooperation from parents and teachers was inconsistent. The researchers struggled to collect parental letters of consent for students to participate in the research study. In addition, occasionally there were teachers who did not follow through with the collection of the survey data or participate in the requested interview/focus group conducted by the researchers. These inconsistencies impacted the ability to collect consistent data from these schools. That being said, the purpose of the *STEM on Wheels* program was achieved and the STEM lessons were offered to all students whether they returned parental letters granting consent for the research or not. The purpose was providing equitable STEM education for all students.

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