PROJECT REPORT

National Summer Transportation Institute: Increasing Career Awareness in Civil Engineering for Underserved High School Students

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Abstract

Our nation needs to increase the number of students pursuing degrees in the fields of Science, Technology, Engineering, and Mathematics (STEM) and those leading to transportation-related careers. In order to meet the demand for qualified graduates in transportation, it is necessary to diversify the pool of students entering college with an interest in these fields. The National Summer Transportation Institute (NSTI) is an educational initiative developed by the Federal Highway Administration (FHWA) and Department of Transportation (DOT). The NSTI at City Tech was designed to increase awareness of transportation-related careers among New York City high school students. The structure of City Tech's NSTI includes lectures, field trips, projects, and laboratory activities that promote the growth of each participant and strengthen their academic and social skills. This NSTI program provides a model for broadening participation in STEM and building America's STEM workforce.

Need to Increase Underrepresented Minorities in Civil Engineering

In order to remain competitive in a world of advancing technology, the United States needs to build a workforce with knowledge and skills in the fields of Science, Technology, Engineering, and Mathematics (STEM). According to the U.S. Bureau of Labor Statistics, the projected number of STEM jobs was expected to grow 18.7% during the 2010–2020 period (Fayer, Lacey, & Watson, 2017). As the country's economy and demographics change, it is important to increase the participation of underrepresented minority groups in STEM, including women (Gilliam, Jagoda, Hill, & Bouris, 2016; Briggs, 2016). Given more opportunities to develop their capabilities in STEM, this untapped population can help to fill the critical STEM workforce gap (Science Pioneers, 2017; U.S. Department of Commerce, 2011).

The U.S. Bureau of Labor and Statistics (2020) reports that the employment of civil engineers is projected to grow 6% from 2018 to 2028, an average rate faster than all other occupations. As the current U.S. infrastructure grows obsolete, civil engineers will be needed to manage projects that rebuild, repair, and upgrade bridges, roads, levees, dams, airports, buildings, and other structures. Because of the urgency to increase the civil engineering workforce, the Federal Highway Administration Office of Civil Rights (HCR) encourages academic outreaches to target groups who are underrepresented in the transportation workforce. Females, economically disadvantaged students, and students with disabilities have been identified as underrepresented minorities in STEM (NSTIP, 2012). Based on the 2010 census report, the population of the United States is about 49.2% male and 50.8% female (Howden & Meyer, 2011). But although women make up half of the college student population and the general workforce, they account for only about one fifth of all bachelor's degrees conferred in engineering in 2016 (National Center for Science and Engineering Statistics, 2017; Yoder, 2016) and a quarter of the STEM workforce (Landivar, 2013). The statistics become more dismal for minority women. In 2012, only 3.1% of bachelor's degrees in engineering were awarded to minority women (National Science Board, 2016). Specific to the civil engineering workforce, the Bureau of Labor Statistics in its *Labor Force Statistics from the Current Population Survey* (2016) states that a tenth of the jobs were held by women. Only 3.6% of the civil engineering positions were held by African Americans, 10.4% by Hispanics, and 7.7% by Asian Americans. While the population trends show that minorities will become the majority, the STEM workforce statistics clearly does not proportionally reflect this trend, particularly in civil engineering. Therefore, it is imperative that more programs be developed to promote the awareness of civil engineering occupations and to increase the participation of minorities and women in these fields.

Benefits of Exposure to STEM at the K–12 level

Many studies have shown a correlation between STEM exposure at the K–12 level and a student's interest in pursuing a STEM degree (Chiappinelli et al, 2016; Lomax, 2015; Means, Wang, Young, Peters, & Lynch, 2016; Naizer, Hawthorne, & Henley, 2014.) While the majority of American youth are exposed to STEM content in high school settings, out-of-school programming may be particularly important for sparking an interest in the STEM disciplines (Gilliam et al., 2016). Programs that engage high school students in unique STEM experiences will likely continue to play a profound role in recruiting and retaining bright young minds in the increasingly important STEM fields. Summer camps and experiences are especially important for students in urban and low-income areas, where underfunded science curricula and limited access to role models and mentors in STEM are common (Phelan, Harding, & Harper-Leatherman, 2017). Moreover, post-secondary institutions should prioritize programs that engage underrepresented students in hands-on science experiences during the high school years (Phelan et al., 2017). The American Society of Civil Engineers (ASCE), recognizing the importance of inspiring the next generation of civil engineers, has established a website for precollege outreach, which provides resources including lessons, videos, and activities that promote civil engineering (ASCE, 2020).

The Landscape of Minority High School Students

National trends indicate that high school graduation rates have declined, with African Americans and Hispanic graduation rates being approximately 65% (Heckman & LaFontaine, 2010). Minority students are also far less likely to be college ready. This is particularly the case

in underserved minority high schools, where students are the least prepared (ACT, 2015; Bryant, 2015; Moore et al., 2010). Evidence of poor performance among minority high school students abounds not only in high school graduation rates, but also in SAT scores, Advance Placement courses, and enrollment in advanced mathematics courses (Musoba, 2010; Camara, 2013). These poor academic performances have been attributed to poor academic preparation. The National Assessment of Educational Progress (2015) found that overall only 33% of eighth grade students entering high school were proficient in mathematics. The corresponding percentages for African Americans and Hispanics were 13% and 19%, respectively. Since mathematics is the foundation of engineering degrees, there is an urgent need to strengthen these skills at the high school level.

City Tech's National Summer Transportation Institute

The National Summer Transportation Institute (NSTI) is an educational initiative developed by the Federal Highway Administration (FHWA) and Department of Transportation (DOT). A transportation-focused career awareness program, it is designed to introduce high school students to all modes of transportation-related careers, provide academic enhancement activities, and encourage students to pursue transportation-related courses of study at the college/university level. Moreover, the NSTI focuses on addressing future transportation workforce needs by ensuring that the transportation industry has a well-trained, qualified, and diversified workforce. City Tech was selected for funding by the FHWA and DOT in 2013, 2014, and 2015 to develop a NSTI for underserved urban high school students. A grant is provided to cover all costs related to the program in order to provide the opportunity to participants on a tuition-free basis. New York City is the ideal location, since it has both a diverse population and a complex transportation network. The College's location in downtown Brooklyn, New York, made it easy to recruit underserved high school students. City Tech is the designated senior college of technology within the 24-unit City University of New York, and it is the largest urban public university system in the nation. The college plays an important role nationally in the education of future scientists, engineers, technologists, and mathematicians for New York City (NYC) and the surrounding areas.

The mission of the civil engineering technology department at City Tech is to prepare non-traditional students of diverse backgrounds to successfully enter a wide range of careers through a balance of practical knowledge, theory, and professionalism. The department's mission aligns with the program objectives of the NSTI: to improve STEM skills, to promote awareness among middle and high school students (particularly minority, female, and disadvantaged youth) about transportation careers, and to encourage them to consider transportation-related courses of study in their higher education pursuits.

City Tech's NSTI summer program includes lectures, field trips, projects, and laboratory activities which promote the growth of each participant and strengthen their academic and social skills. The academic component is designed to reinforce the mathematics and science skills of the high school participants, to stimulate their interest in the various modes of transportation, and to expose them to new opportunities. The session topics are transportation related and are taught by certified high school teachers with a STEM background.

The skills enhancement component is critical to the success of the program. The topics covered include critical thinking, problem solving, computer literacy, research, oral and written communication skills, and time management.

The length of the summer program has varied; it was one week long in 2013, two weeks long in 2014, and three weeks long in 2015. The daily program schedule was from 9 a.m. to 4 p.m. and included a lesson, activity, lunchtime speaker, and field trip.

Curriculum Modules

Five curriculum modules were implemented in the NSTI: **(1) Bridges, (2) Land Transportation, (3) Air Transportation, (4) Public Transit and Railroad Transportation, and (5) Water Transportation.** A summary of each module and the course objectives is presented below.

Bridges

This module is designed to introduce participants to different types of bridges, structural forces, and geometry. Participants will be able to differentiate between materials and understand the force systems responsible for the

stability of a bridge. The course objectives are to identify types of bridges, to understand the force distribution within a truss bridge, and to design a structurally sound bridge using principles of compression and tension.

Land transportation

This module introduces the interrelationship of land use and transportation systems. Students will be introduced to concepts of energy, force, motion, speed, velocity, and acceleration. The course objectives are to introduce participants to the process of land use and effective transportation systems, to identify data sources needed to make prudent transportation decisions, and to demonstrate an understanding of land use planning and ways to minimize transportation problems (i.e., congestion, noise, pollution).

Air transportation

This module introduces students to the concepts of flight theories, aircraft performance, flight instruments, gravity, air navigation, and space. Students will be introduced to concepts of force, projectile motion, center of gravity, velocity, and aerodynamics. The course objectives are to introduce participants to flight theories as they relate to airplanes and space and to explore a historic aircraft carrier and space shuttle.

Public transit and railroad transportation

This module describes the history of railroads and public transit. Participants will be able to summarize advantages and disadvantages of public transit systems in use today, in particular in the New York City area. The course objectives are to explore the social history of New York City, subway and station design, transit development, construction, and impact over time.

Water transportation

This module is designed to give participants an opportunity to learn the fundamental regulations and responsibilities of safe water transportation. Students will be introduced to the concepts of buoyancy and density, as well as to the engineering design process. The course objectives are to inform participants of the best water travel practices, and to identify possible threats and solutions to promote safe waterways.

Speakers

Participants were able to interact with professionals in the transportation field. These professionals were invited guest speakers sharing their own academic experiences and challenges with the participants while highlighting their careers and promoting the field of transportation. Speakers were representative of the various fields related to transportation and engineering.

Staff

The program staff consists of a project director, two instructors, and two academic aides. The primary role of the project director is to develop, implement, and direct all phases of the program, schedule, and budget and to supervise the program staff, develop curriculum, and provide laboratory activities and resource materials.

The primary role of the instructors is to provide daily academic instruction, interact with participants and administrative staff, and develop curriculum. The instructors are certified high school teachers, and as such have the training and background required to deliver the STEM-focused lessons and activities.

The academic aides assist the instructors throughout the day, set up laboratory activities, assist with coordination of field trips, and assist with orientation and closing activities. The academic aides are typically graduates of the civil engineering technology associate degree program at City Tech. The academic aides are also recruited from a group of trained peer leaders on campus. As peer leaders the academic aides bring to the program their knowledge of pedagogy and techniques for group facilitation.

Activities

The curriculum is reinforced with projects and laboratory activities. Participants are engaged in the engineering design process through hands-on activities and computer simulation applications. Computer-based activities include simulating bridge building and city planning. Hands-on activities include building a model bridge, solar car, boat, and rocket. The activities were preceded by a lesson or guest speaker introducing the relevant topics and careers in transportation. Participants worked both independently and collaboratively to complete the projects in preparation for testing and display.

Field Trips

Several field trips were organized during the NSTI. The participants had the opportunity to visit the Intrepid Sea, Air, and Space Museum, the NYC Transit Museum, the Brooklyn Navy Yard, and the U.S. Coast Guard Command Center, as well as John F. Kennedy International Airport. Each trip included a customized tour for the group aligned with the program focus of transportation and engineering.

FIGURE 1. Week 1 Sample Schedule

Week 1

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 AM	9:00-10:30 Orientation & Administrative Activities	9:00-12:00 Lesson on Solar Energy - Introduce scientific concepts of solar energy and physics concepts such as force, motion, speed, velocity, and acceleration. Solar Car Design Project	9:00-12:00 Lesson on Bridge Design- Introduce scientific concepts of engineering, structural forces, and geometry Bridge Design Project West Point Bridge Designer	9:00-12:00 Lesson on Rocket Design- Introduce scientific concepts of force, projectile motion, center of gravity, initial velocity, aerodynamics, and introductory rocketry. Rocket Design Project	9:00- 3:00 Field Trip US Coast Guard Command Center Topics: Careers at the Coast Guard, Deep Sea Freight transportation, Deep Sea passenger transportation, Inter-Coastal Waterway
10:00 AM					
11:00 AM	10:30-12:00 Team Building Activity : Mousetrap Car				
12:00 PM	12:00-1:00 Lunch Presentation Topic: Civil Engineering and Transportation	12:00-1:00 Lunch Presentation: The Engineering Design Process	12:00-1:00 Lunch Presentation Topic: Transportation Planning	12:00-4:00 Field Trip Intrepid Sea, Space and Air Museum Topics: Gravity, Air Navigation, Space	
1:00 PM	1:00-2:00 SIMCITY Simulation , Introduction to Projects	1:00-2:00 College Skills	1:00-4:00 Project Model Bridge Building		
2:00 PM	2:00-4:00 Project Mass Transit Design - SIMCITY	2:00-4:00 Field Trip NYC Transit Museum Topics: Public Transit/RR Transportation			
3:00 PM					3:00-4:00 Waveglider Design Project
4:00 PM	Dismissal	Dismissal	Dismissal	Dismissal	Dismissal

FIGURE 2. Week 2 Sample Schedule

Week 2

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 AM	9:00-10:00 Library/Career Research	9:00-12:00 DOT Site Visit: K-Bridge Phase 2	9:00-10:00 Department of Buildings Safety Lecture	8:00-2:00 Field trip JFK Tour Topics: Aircraft Performance, Flight Theories, Flight Instruments Arrive at Federal Circle at 9:30 AM	9:00-11:00 Project Completion
10:00 AM	10:00-12:00 Maglev Vehicels		10:00-12:00 Airplane Project		
11:00 AM					11:00-12:00 Lunch Presentation Topic: Strategies for Success in STEM
12:00 PM	12:00- 1:00 Lunch Presentation Topic: DASNY	Lunch Presentation Topic: NYSDOT Highway Project	3:00-4:00 Guest Speaker: Waterfront Design		12:00-2:00 Poster Preparation
1:00 PM	1:00-4:00 Field Trip : NY Waterway Ferry Ride	1:00-2:00 Lesson on Energy: Converting potential energy into kinetic energy.	1:00-4:00 Field Trip Brooklyn Navy Yard Topics: Deep Sea Transportation, Inter-Coastal Waterway, History of Navy yard Tour begins at 1:30. 2 hours customized Sustainable Architecture and Industry Tour		
2:00 PM		2:00-4:00 Project Boat Design		2:00-4:00 College/Career Advisement	2:00-4:00 Closing Program: Poster Presentation, Awards, Evaluations
3:00 PM					
4:00 PM	Dismissal	Dismissal	Dismissal	Dismissal	Dismissal

Sample schedules are included as Figures 1 and 2.

Student Eligibility, Recruitment and Selection

At the time of participation, applicants must be a rising ninth, tenth, eleventh, or twelfth grader, qualify for enrollment in algebra, and hold a minimum cumulative GPA of 2.0 on a 4.0 scale. Graduates of the NSTI program are not eligible to repeat the program. The students are primarily recruited from City Poly High School and STEP-UP, a program of the McSilver Institute for Poverty Policy and Research. City Poly High School opened in September 2009 as one of four state-approved career and technical education (CTE) demonstration sites in New York City. The New York State Department of Education (NYSED) indicates that the 2015–2016 student demographics for City Poly were as follows: 75% black, 16% Hispanic, 4% Asian, 3% White, and 2% Other. In addition, 76% of the student population were economically disadvantaged (NYSED 2016). STEP-UP is a program designed by African-American and Latino adolescents (14 to 17 years of age) experiencing significant academic, social, and emotional issues for teens in similar circumstances. The STEP-UP participants were from Central Park East (CPE) High School. The NYSED has supplied the following demographics for CPE students in 2015–2016: 24% Black, 62% Hispanic, 8% Asian, 4% White, and 1% Other. Eighty-nine percent of the student population are economically disadvantaged (NYSED, 2016). These demographics are representative of underserved high school students.

Applicants submit a complete application with one letter of recommendation from a teacher or guidance counselor and a statement regarding their reasons for wanting to participate in the program and how the NSTI can assist in meeting their academic and career goals. The program director selects a cohort of 20 students, and a select number of applicants may be placed on a waiting list.

Methodology

Participants

A total of 41 high school students participated in the NSTI from years 2013-2015. There were 12 participants in 2013, which was a one-week program, 15 in 2014, which was a two-week program, and 14 in 2015, which was a three-week program. There were at total of 24 (58.5%) males and 17 (41.5%) females. Among the 41 high school students, 22 (53.7%) identified themselves as African American (non-Hispanic), eight (19.5%) as Hispanic, nine (22.0%) as Asian/Pacific Islander, two (4.9%) as Caucasian, and one failed to respond. The average age of the participants was 15.7 years. The average New York State Regent Mathematics and Science scores of the participants were 82.9 and 80.0, respectively.

Data analysis

On the last day of the NSTI, the high school students were asked to respond to statements regarding four areas: (1) speakers, (2) staff, (3) activities, and (4) field trips.

TABLE 1. Means and Standard Deviations for Students Satisfaction Survey Responses by Year

Statements	2013 N=12 Mean(SD)	2014 N=15 Mean(SD)	2015 N=14 Mean(SD)	Total N=41 Mean(SD)
Speakers				
Speakers were well organized.	3.3 (0.5)	3.9 (0.3)	3.4 (0.5)	3.6 (0.5)
I was academically challenged by the activities the Speakers provided.	2.8 (1.1)	3.9 (0.3)	3.4 (0.7)	3.4 (0.9)
Speakers responded well to the questions posed to them.	3.6 (0.5)	3.9 (0.3)	3.9 (0.3)	3.8 (0.4)
Staff				
The Staff was very interested in my career awareness.	3.2 (0.8)	3.8 (0.4)	3.8 (0.4)	3.6 (0.6)
The Staff was very helpful when I had problems.	3.6 (0.5)	3.7 (0.5)	3.7 (0.5)	3.7 (0.5)
The Staff encouraged participants to strive for excellence in all their academic pursuits.	3.5 (0.9)	3.8 (0.4)	3.8 (0.4)	3.7 (0.6)
The Staff was always available when I had a question or needed assistance.	3.5 (0.5)	3.9 (0.4)	3.7 (0.5)	3.7 (0.5)
The Staff was very friendly at all times.	3.4 (0.5)	4.0 (0.0)	3.7 (0.5)	3.7 (0.5)
The Staff was very knowledgeable about transportation-related careers.	3.8 (0.4)	3.9 (0.4)	3.9 (0.4)	3.9 (0.4)
The Staff was very enthusiastic about transportation-related careers.	3.6 (0.5)	3.9 (0.4)	3.8 (0.4)	3.8 (0.4)
Activities				
Project activities helped me understand transportation careers better than before.	3.8 (0.5)	3.9 (0.4)	3.9 (0.4)	3.8 (0.4)
Generally, adequate time was allotted for project activities.	3.0 (1.0)	3.9 (0.4)	3.4 (0.8)	3.4 (0.8)
Generally, adequate time was allotted for audience participation.	3.3 (0.5)	3.8 (0.4)	3.7 (0.5)	3.6 (0.5)
Project activities gave me some practical experience related to transportation.	3.3 (0.7)	3.9 (0.3)	3.9 (0.3)	3.8 (0.5)
Project activities often included competition between groups.	2.7 (1.3)	3.7 (0.6)	3.8 (0.4)	3.4 (1.0)
Field Trips				
Field trips were informative.	3.6 (0.5)	4.0 (0.0)	3.6 (0.5)	3.8 (0.4)
Concepts from the field trips were related to the field of transportation.	3.8 (0.4)	4.0 (0.0)	3.9 (0.3)	3.9 (0.3)
Field trip activities helped me understand transportation careers better than before.	3.6 (0.7)	3.9 (0.3)	4.0 (0.0)	3.9 (0.4)
Adequate time was allotted for project activities.	3.3 (1.0)	3.9 (0.4)	3.6 (0.9)	3.6 (0.8)
Adequate time was allotted for questions.	3.6 (0.5)	3.9 (0.4)	3.6 (0.9)	3.7 (0.6)
Transportation to and from the site was comfortable, safe and clean.	2.6 (1.1)	3.7 (0.5)	3.8 (0.4)	3.4 (0.9)
The number of field trips was appropriate.	3.6 (0.5)	3.9 (0.3)	3.9 (0.4)	3.8 (0.4)

TABLE 2. One-Way ANOVA Results

Statements	One-Way ANOVA
Speakers	
Speakers were well organized.	F(2,38) = 7.90, p<0.05
I was academically challenged by the activities the Speakers provided.	F(2,38) = 8.61, p<0.05
Speakers responded well to the questions posed to them.	F(2,38) = 4.08, p<0.05
Staff	
The Staff was very interested in my career awareness.	F(2,38) = 5.10, p<0.05
Activities	
Generally, adequate time was allotted for project activities.	F(2,38) = 4.26, p<0.05
Generally, adequate time was allotted for audience participation.	F(2,37) = 3.63, p<0.05
Project activities gave me some practical experience related to transportation.	F(2,38) = 4.93, p<0.05
Project activities often included competition between groups.	F(2,38) = 3.96, p<0.05
Field Trips	
Field trips were informative.	F(2,36) = 4.16, p<0.05
Transportation to and from the site was comfortable, safe and clean.	F(2,36) = 9.92, p<0.05
The number of field trips was appropriate.	F(2,36) = 3.38, p<0.05

A Likert scale with 1 indicating "strongly disagree" and 4 indicating "strongly agree" was used. Table 1 is a summary of the responses by year and collectively over the three years.

A one-way analysis of variance (ANOVA) was used to determine whether the mean responses were statistically significant among the years. Table 2 lists the responses that showed statistically significant differences. A Tukey test was used to follow up to determine the mean differences between each year. Overall the responses of the participants in 2014 and 2015 were most strongly positive to the statements that the speakers were well organized, the students were academically challenged by the speakers, the speakers responded well to the questions posed to them, and the staff was very interested in the students' career awareness. The activities and the field trips statements were also evaluated more positively by the 2014 and 2015 groups than the 2013 group.

Some of the high school students' reflections regarding the NSTI:

The U.S. Coast Guard trip was fun. It made me consider joining! (2013 participant)

John F. Kennedy Airport trip was a very new experience. The tour showed me there [were] more [jobs] in air transportation. (2013 participant)

I was very interested in Intelligent Transportation Systems; there were more things about information and technology and how it is used in transportation. (2013 participant)

In this first week, I have already learned a lot about a diverse range of topics from bridges, trains and kites. My favorite experience in the program so far has been making a kite constructed of string, straws and tissue paper, with my partner. I really enjoyed building a workable kite from few materials and being able to test the invention later. I had never really built something from nothing. The project also forced me to work with and depend on my partner. It was fun to collaborate and we were really proud with the end product. (2015 participant)

Conclusion

The results of the study showed high school students participating in the NSTI responded positively to the program. The participants felt academically challenged by the speakers, and they felt strongly that the speakers were able to address their questions and concerns. Students benefit from role models in STEM and can expand their interest in STEM by exposure to informal

STEM-related learning opportunities (Weber, 2011). Hands-on activities can stimulate interest in STEM and help students gain confidence in their ability to approach STEM activities (Colvin, Lyden, & León de la Barra, 2013; Ziaeefard, Miller, Rastgaar, & Mahmoudian, 2017). The students also found the field trips very informative. Many underserved students do not have the opportunity to be exposed to various careers, and field trips allow them to connect the importance of civil engineering to the real world.

This study also found that the length of the summer program made a difference in the participants' responses. The participants responded more positively to the speakers, staff, activities, and field trips when the program was either two or three weeks long. Better feedback responses came from the participants in the two-week program.

Lessons Learned

The NSTI offers an opportunity for students to be exposed to civil engineering and transportation fields while reinforcing their math and science skills. The most significant challenge of the program is recruitment, since the average high school student may not recognize the value of a STEM summer program. Several outreach efforts to advisors, parents, and counselors were made to encourage participation. The three-week program provided the students with one high school elective credit; however, it was difficult for students to commit for a three-week period because many of them had summer jobs. For two consecutive years, the program offered participants a stipend which helped offset the costs of participation. In 2015 the guidelines removed the allowable costs of stipends making recruitment more challenging. Students from these underrepresented populations residing in the five boroughs typically have to work during the summer to cover their expenses and assist their families. Participation in the NSTI offers a wonderful opportunity; however, it means the students have no income for the duration of their participation, and they have the added the cost of transportation. This study reinforces that stipends will allow for greater diversity in participation.

Epilogue

City Tech was selected to host the NSTI in July 2020; however, due to the COVID-19 pandemic the program was offered in a virtual platform. The curriculum remained the same, participants were expected to be available Monday–Friday from 9 a.m.–4 p.m. during the two-week period. Lessons and guest lectures were delivered via Zoom. Field Trips were delivered as virtual reality field trips using available technology. Students were provided a supply kit to complete projects individually and participated remotely in software simulations. In order to ensure that all eligible applicants could participate in the program, students were provided the opportunity to obtain a loaner Chromebook for the duration of the program. In addition, a stipend was provided to each participant to offset the loss of income they might incur by participating in the program. The program was a success and students were able to benefit from the experience in an alternate format.

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This project report is dedicated in loving memory of Janet Liou-Mark, a role model and a champion for all who were fortunate enough to know her.

About the Authors

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Janet Liou-Mark is a professor of mathematics at City Tech, and she holds a PhD in Mathematics Education. Her research focuses on developing and evaluating programs that help women and underrepresented minority and first-generation college students to remain in school and successfully graduate with STEM degrees. She is the interim director of Faculty Commons.

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