

NYC STEM STUDY TOUR

Creating Opportunities Through Career and Technical Education: A Case Study of Brooklyn STEAM Center

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The Brooklyn STEAM Center, located in Building 77 of Brooklyn Navy Yard, exemplifies how strategic partnerships between public education institutions and local industries can enrich and empower young adults. While it may be somewhat difficult to place within the traditional educational landscape, as its model simultaneously falls under traditional high school, extracurricular enrichment, career and technical education (CTE), and college preparation, the Brooklyn STEAM Center is without a doubt an innovative institution that serves its community's needs. We briefly describe here, based on our visit to Brooklyn STEAM Center during the Spring 2024 study tour, some of the key components that make Brooklyn STEAM Center work, and how their students benefit from its unique programming.

To apply to Brooklyn STEAM Center, a student must be a rising eleventh-grade student at one of the eight nearby partner public schools. Furthermore, they must be in good academic standing and have completed accelerated coursework in their ninth- and tenth-grade years. In their application to Brooklyn STEAM Center, students rank their preference for all six programs and receive admission offers based on the strength of their application and program availability. Once accepted into a program, during eleventh and twelfth grade, students attend their home institutions for half the day for traditional academic coursework and attend Brooklyn STEAM Center for the other half for CTE coursework. Many local public high schools were initially considered and evaluated under various criteria such as demographics and socioeconomic status. Ultimately, eight high schools with large, underserved populations that

highlight the diverse, multicultural Brooklyn community were chosen. As Brooklyn STEAM Center continues to grow (during our visit, they were renovating more floors in its building to accommodate continued expansion), it continues to seek new partnerships with nearby institutions.

The Center offers six CTE pathways in culinary arts, construction, cybersecurity, engineering, media, and full-stack (website) development. Each demonstrates the interdisciplinary nature of industry professions and gives students early exposure to their potential careers. What makes the Brooklyn STEAM Center unique is that it is not just a CTE institution that graduates students directly into the workforce. At the Brooklyn STEAM Center, they believe that academic rigor and vocational skills are not separate education tracks that students must choose from; in fact, close to 99% of the center's graduates move on to attend post-secondary education institutions, in both two-year and four-year programs, or even beyond. As repeatedly emphasized during our visit, there simply does not need to be a distinction between academic and vocational training – both can be obtained concurrently at Brooklyn STEAM Center. The programming at the Center provides students with certifications and vocational training. However, the true focus is on providing students with engaging, project-based learning that develops problem-solving skills in a real-life context. That is, the program helps students obtain as many useful skills and experiences as possible to prepare them for the future.

During our tour, we had the opportunity to visit and talk to students in the cybersecurity and full-stack

development course. The cybersecurity program provides students with the skills in both (ethical) hacking and defending against hackers. As cybercrime becomes ever prevalent in the increasingly online world we live in, with a record 12.5 billion dollars of losses to Internet crime in 2023 (Federal Bureau of Investigation, 2023 p. 7), it was no wonder that the cybersecurity programs were in high demand and had the most competitive admissions out of the six offered programs. Students begin this program by building their own computers and assembling all the hardware components such as the CPU, RAM, and hard drive into their appropriate positions. This provides the opportunity for students to gain hands-on experience in handling computer hardware and perhaps increases the amount of personal investment and attachment to the program. As students continue to work through the Cybersecurity program, students develop both theoretical and practical skills in hacking, understanding where system vulnerabilities can occur and how to defend them against exploits. On the industry level, there is considerable demand for expertise in what is typically referred to as “white-hat” hacking (as opposed to “black-hat”), a type of ethical hacking where (under the owner’s consent) the hacker attempts to pre-emptively hack systems and find their vulnerabilities, so that defenses may be developed against actual malicious attacks down the line. In the Cybersecurity program at Brooklyn STEAM Center, tasks and assignments are initially scaffolded. However, as students progress, the difficulty increases, and solutions become increasingly sophisticated, just as they would in the real world. In their final assessment, students are tasked with a long-term project that requires them to hack a series of successively difficult problems, while fully documenting their thinking processes and techniques used. Students work in pairs, but are otherwise completely on their own, with only their experience and knowledge to guide them.

In the full-stack development class, students were working on websites they devised, designed, and created from scratch. During class time, the instructor walked around and provided assistance as students worked, but the main learning activities we observed were very much student-driven. Students shared ideas and worked through problems together and on boards on walls, which provided us with artifacts of their brainstorming and designing process. Even when learning practical and technical skills, their education felt personalized. Some students’ websites sought solutions to inconveniences and problems they noticed in their everyday lives. Other students created programs based

on their interests and hobbies. An example of a final project a student team shared with us was a food-reviewing mobile app that assigned scores to reviewers based on whether their views agreed with overall consensus. That is, if your reviews strongly reflect what most people thought, your “rank” would increase, and your ratings would carry more weight on the app. They even showed us a prototype installed on their phones with functional user interfaces. It was clear that students felt a great sense of ownership and investment in their work and ideas. This was a common thread throughout our conversations with students.

While speaking with the students at Brooklyn STEAM Center, what also stood out to us was how concrete the students’ goals were. As students happily shared their plans with us, they were particularly candid about what requirements they needed, such as coursework in majors they hoped to study, potential difficulties they might face, and what anxieties they have for the future. In general, it seemed that the students appreciated the job-preparedness, the training, and certifications brought. Nevertheless, many wanted to continue their studies to learn more about computer science or data science, and to eventually obtain a bachelor’s degree. To this end, Brooklyn STEAM Center also works actively with the City University of New York (CUNY) to align its curriculum and ensure that students who wish to attend college after high school have a smooth transition. CUNY representatives also participate in events that allow students to learn more about the college and build connections between the institutions.

When discussing future colleges they would like to attend, many mentioned schools in the CUNY or State University of New York (SUNY) systems, citing the affordable cost of attendance, location, and, most importantly, the availability of programs that they wanted to pursue. According to a report by the Brookings Institute, “six of CUNY’s senior colleges and six community colleges [rank] among the top 10 four-year and two-year colleges nationwide with the greatest success in lifting low-income students into the middle class. Three other CUNY senior colleges were ranked in the top 25” (City University of New York, 2020). At Brooklyn STEAM Center, it was clear that students also understood the great value of these nearby higher learning institutions and the socioeconomic potential they represented. Perhaps these types of understanding were what attracted them to Brooklyn STEAM Center, and students seemed to be appreciative of the opportunities made available to them through this program.

As an innovative CTE provider, Brooklyn STEAM Center also aims to provide robust industry opportunities. Work-based learning is a key component of the Center’s programming, and students are heavily incentivized to find work placements relevant to their program (although this is not required). The strategic location of Brooklyn STEAM Center and its partnerships with local industries allow the center to offer its students many opportunities for paid internships and work experience. Currently, Brooklyn STEAM Center partners with over 40 industries and has provided students with over 35,000 hours of work-based learning experience, with more than \$500,000 paid out in student earnings. Furthermore, the center hosts events to help students showcase their projects and network with industry professionals. Students are also encouraged to personally reach out to potential employers to practice their networking and negotiating skills. On multiple occasions, students have been able to secure paid positions without any assistance. The Brooklyn STEAM Center then provides the necessary legal documentation, contract drafting, as well as general oversight to ensure that the student employment process occurs without issue. Through these various initiatives, students can increase their employable skills beyond what is learned in the classroom, improving their social and economic potential before even graduating high school.

The Brooklyn STEAM Center helps underrepresented and underserved communities access opportunities that help them gain valuable experience and expertise. Through practical and rewarding work-based learning opportunities, they challenge stigmas associated with CTE programs and showcase the impacts of high-quality experience-driven learning. Brooklyn STEAM Center also supports young adults in college preparation. It reimagines education as preparation for the future, where academic learning and career preparation do not have to be mutually exclusive. While the Brooklyn STEAM Center is relatively new to the STEM education landscape, it is an inspirational model that provides access to invaluable experiences and aims to support the diverse needs of the New York City community.

References

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