



Building a Better Pathway

Fostering Community-Based Solutions to Advance STEM Equity for Children and Youth

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Introduction

“Coming from humble beginnings in an immigrant family, I really see the stereotypes when it comes to defining who we are as a people or even our work habits... And here at TxT we get rid of those prejudices and discrimination and we’re seen for who we are and the potential we have to build these tech companies.”

ANTHONY Ramirez is a sixteen-year-old young man who participated in a leadership program sponsored by Teens Exploring Technology (TxT). TxT uses technology as a tool for promoting positive youth development and leadership, and ultimately paving the pathway to higher education and careers in Science, Technology Engineering, Math (STEM). At a recent competition, Anthony’s team’s automated attendance invention was the winning invention with a \$4,000 prize.

Promoting and enabling a successful pathway to higher education and careers in STEM for students has never been more vital to the future of California and the nation. And as U.S. demographics are changing, specific attention to the needs of students of color is necessary to ensure the STEM workforce reflects the diversity of the state’s population. However, students of color in low-income neighborhoods face challenges to accessing classes



and training that will help them gain a foothold in technology or a science-related career.

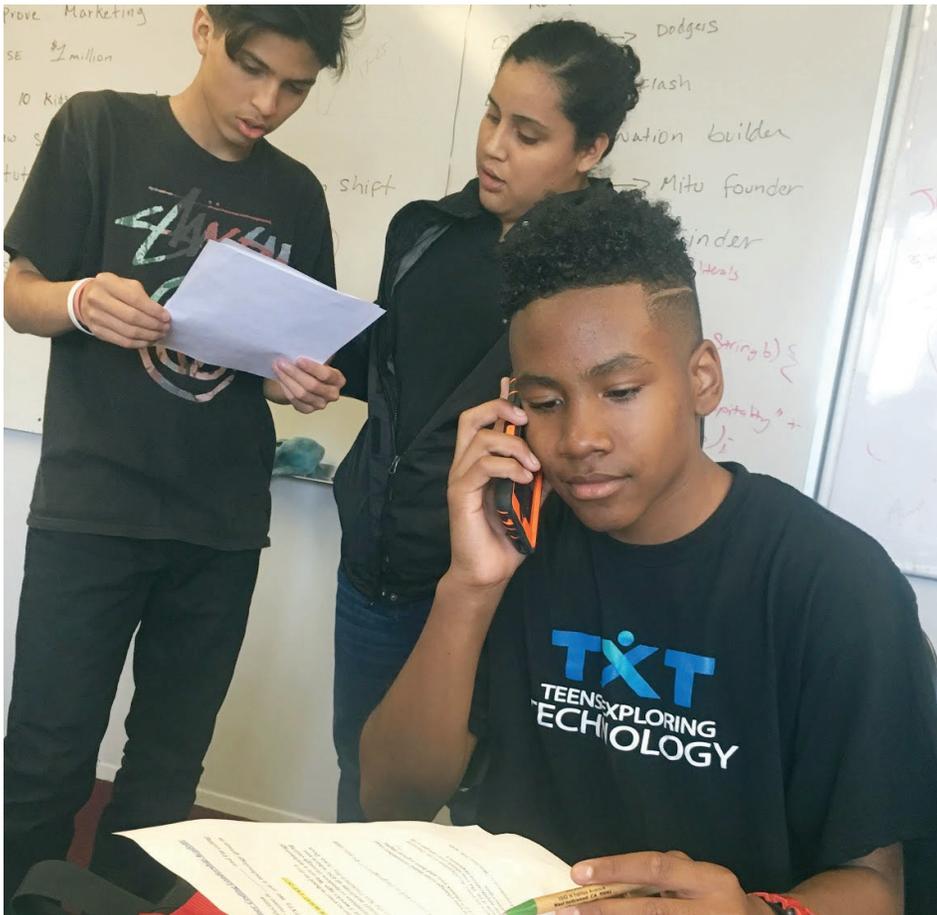
This brief examines some of the challenges faced by low-income students of color, as well as the innovative solutions that communities are creating to address this need. Using feedback from participants in Teens Exploring Technology’s programs, the brief explores how community-based efforts can play a role in bridging the digital divide, by helping youth gain much-needed skills while also helping them envision a pathway to a STEM career.

Why STEM Matters

As STEM-related occupations are expected to grow exponentially in the coming years, guiding students of color towards STEM careers is critical

to individual and national economic prosperity for two primary reasons. First, a STEM career has been shown to significantly reduce earnings inequality between youth of color and their white peers. Studies have shown that STEM employment provides a considerable increase in earnings among Blacks, Latinos, and other ethnic groups, boosting their earnings by as much as \$22,500 per year.¹ For Latinos who earn a college degree or higher and gain employment in a high-paying occupation, such as a STEM job, the earnings gap between them and white peers with the same educational attainment level all but vanishes.² Careers in STEM fields also offer access to stable, higher paying jobs, and will increasingly do so in the future.

Second, expanding diversity within STEM fields has become a workforce necessity for the U.S. The Bureau of Labor Statistics predicts an additional



1 million STEM jobs by the year 2022.³ Computer-related occupations are expected to increase by 12.5 percent during that time; because of its large employment size, this growth is expected to result in nearly half a million new jobs, far more than any other STEM group.⁴ Yet the demand for STEM workers is expected to outpace STEM college degree production. To keep pace with this demand, the U.S. must increase the number of students who receive undergraduate STEM degrees by about 34% annually over current rates.⁵ However, there is a disproportionately low number of African Americans, Latinos, Native Americans, and Pacific Islanders who currently participate in technology or scientific careers. As a whole, these groups represented approximately 30% of the U.S. population in 2010, yet they accounted for only 13.3% of employed scientists and engineers.⁶ African Americans constitute 9% of

degree recipients across all fields, but are awarded only 3.8% of all computer science bachelor's degrees.⁷ In a similar vein, Latinos accounted for 16% of the U.S. population in 2010, yet only earned 8 percent of all certificates and degrees awarded in the STEM fields during that time.⁸ The stakes for bridging economic inequalities across diverse populations will only become more urgent as many job markets become more dependent on new technology, and as our nation grows increasingly diverse. Fostering careers in STEM for youth of color is integral to addressing this divide.

STEM Challenges in Schools

Despite the growing awareness of the importance of encouraging and educating youth of color as early as possible for a STEM career, students of color still encounter substantial difficulties in tapping into STEM

opportunities at school. A National Survey of Science and Mathematics Education conducted in 2012 found stark disparities in terms of teaching experience and curriculum for certain student populations:

- ▶ Schools with the highest proportions of students from low-income households are also more likely to have science and mathematics teachers with less than two years of experience, when compared to other schools.
- ▶ Only two-thirds of schools with the highest percentages of African-American and Latino students offered chemistry. In contrast, 78 percent of schools with the lowest percentages of African American and Latinos in 2014 offered chemistry. For Algebra II, the percentages were 74 percent and 83 percent, respectively.⁹

In addition to the limited availability of STEM-related content and expertise, students of color are also less likely to be prepared for a STEM education. African-Americans, Latinos and American Indians/Alaska Natives face gaps in science and math achievement as early as the fourth grade. Thirty percent of African-Americans, Latinos and American Indians/Native Alaskans in the fourth grade tested below the basic proficiency in math, compared with 8 percent of Asian-American/Pacific Islander and 9 percent of Caucasian fourth-graders.¹⁰ This opportunity gap in STEM education is likely to widen unless organizations develop pathways for more underrepresented youth to succeed in STEM careers.

Technology advocates and policymakers have been working to address these issues in different ways. For instance, in California, legislators have introduced bills that would create a STEM professional teaching pathway; reduce community college

costs for students enrolling in STEM classes; and even establish a STEM state school for L.A. County.¹¹ And while these solutions have the potential to strengthen the STEM pathway, it is important to examine innovative solutions that are being created right in children's own communities.

Community-Based Solutions: The TxT Experience

Teens Exploring Technology Academy (TxT) is a South Los Angeles-based organization whose mission is to transform boys of color from low income neighborhoods into technology leaders who give back to their communities. The program leverages the coding experience to aid young men of color between the 7th and 11th grade in learning the process of taking an idea from concept to market. It also provides participants training opportunities for leadership skills and professional development. The Academy serves as the home of TxT's Summer Coding Academy, a 15-week program where boys, working with TxT staff, build apps that address problems within their community.

The Children's Partnership conducted a survey of TxT Coding Academy graduates in Fall 2017 to identify the challenges facing youth in pursuing a technology-related career. Based on respondents' answers and comments, a number of themes emerged:

- ▶ Of the 26 TxT graduates who participated in the survey, more than half had taken 3 or more STEM education classes at their school. Nevertheless, a large majority (65%) emphasized that the availability of STEM classes in their schools are still limited, posing a major obstacle in pursuing a technology-related career. "Since being introduced to STEM I have had trouble keeping



up with my more well-off peers," observed one participant. "My classmates share experiences about being introduced to STEM and technology at a very young age, and I often find myself struggling to keep up with them and the skills that they possess, due to the early exposure they had."

- ▶ Other students pointed to the need to improve the quality of STEM education in schools. Some mentioned that computer science classes did little in the way of prepping students for technology-related careers. "In my school, we have access to technology, but we are limited in how to use them," one student commented. "We do not learn about programming, we just use them for writing essays and completing assignments for classes."
- ▶ Approximately 39% of the respondents also noted that the cost of technology training opportunities would also impede progress for youth interested in pursuing a technology-related career. Noted one

survey participant: "Technology is too expensive for poor schools and families."

- ▶ Interestingly, only 13% of respondents thought that a lack of access to either computers at home or at school presented a major challenge to pursuing a technology/science-related career, and even fewer (4%) cited limited broadband access as an issue.

According to Oscar Menjivar, the Executive Director of TxT, the experience of TxT recognizes the challenges that students of color face in their communities and offers a "leadership development" program within the technology learning space.¹² Though the availability of classes is limited and the quality and cost of education and training must be improved in their respective communities, community programs like TxT provide students exposure to STEM fields and mentorship opportunities.

Building a Better STEM Experience

Community-based initiatives like TxT are a key element in a broader network of supports that, if properly designed and implemented, can nurture STEM



learning opportunities for all children. Research has shown that participation in community-based initiatives are most impactful when students “...engage in authentic experiences embedded in rich social and intellectual contexts, participate in an immersive climate of positive thinking around potential, capacity, and confidence in STEM, and build social capital.”¹³ Community-based initiatives are most effective when students participate in the learning process in a meaningful manner.

It is important to note that there are other key players in creating a broader network of supports to expose children to STEM learning opportunities. In 2015, the Obama Administration recognized the importance of these networks by hosting the first convening of the STEM Learning Ecosystems Initiative, which was designed to “bring STEM to life for young people in real-world, high-quality and engaging ways.”¹⁴ A broader network of supports includes resources for families to help them engage their children’s interest in STEM opportunities; pre-K-12 schools that provide interactive and engaging instruction in STEM fields; STEM-rich institutions such as science museums; businesses that lend their expertise and philanthropic support; colleges, universities and trade schools that

offer STEM programs, resources and training; and out-of-school programs that provide high-quality learning opportunities that emphasize real-world applications.¹⁵ Such ecosystems create connected learning opportunities for students throughout their community, both within and outside of school.

Recommendations and Conclusion

Programs like TxT underscore the critical role locally grown initiatives play in building a stronger STEM Pathway. The Children’s Partnership offers three recommendations for local, state and federal policymakers to consider in improving STEM education for children of color:

- ▶ Support community-based solutions. The success of nonprofit initiatives such as TxT demonstrate how locally grown out-of-school programs play a major role, not just in getting students of color interested in a STEM career, as well as providing them with the necessary skills in coding and programming. In low-income neighborhoods where schools often do not provide an adequate STEM education, these out-of-school programs become even more crucial. STEM funders

must recognize the important role these community-based efforts play, and ensure ongoing support as more students start to depend on these programs for the training and education they need.

- ▶ Foster STEM ecosystems at the local level. To be truly effective, STEM activities must be developed, coordinated and implemented where children live and study. Although coordination at the state and county levels is important, local planning facilitates the identification of the opportunities and partners within a community, as well the unique challenges that students in the neighborhood may face— such as lack of regular transportation, limited bandwidth access, or inadequate STEM education at the local high school. These “neighborhood STEM ecosystems” must link to larger ecosystems to leverage other resources that may not be available in a given community, such as science museums or philanthropic organizations.
- ▶ Engage youth in STEM planning and implementation. Students of color in low-income communities face unique challenges that must be taken into consideration in creating a STEM ecosystem that works. Their participation in all aspects of STEM pathway building—as planners, peer tutors, or mentors-- is crucial.

As our economy becomes increasingly global, and as racial and ethnic disparities persist, educators and policymakers must identify and prioritize solutions that increase the number of underrepresented racial and ethnic minority students who join the STEM workforce. New policies that seek to create solutions at the macro level are important; but equally vital is the ongoing support for innovative programs and networks that are already considering the unique needs of a local community.

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The Children’s Partnership is a non-profit, advocacy organization that works to improve the lives of children where they live, learn, and play. Since 1993 we have worked to advance the health and wellbeing of underserved children in California and in the country, through meaningful community partnerships, forward thinking research, and community-informed policy.

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