TECHAPPRENTICE

A 10-YEAR RETROSPECTIVE
2006 TO 2016

BOSTON Public Schools Focus on Children

SIM BOSTON | WHERE IT LEADERS CONNECT

National Center of Excellence BATEC Computing and Information Technologies

PIC

WHAT IS TECH APPRENTICE?

Tech Apprentice is a six to eight week, paid summer internship program for Boston public high school students who express a desire to learn and experience more information technology through a professional experience at a sponsoring company. As part of the Mayor's Summer Jobs Program, Tech Apprentice has facilitated more than 1,000 paid IT-related internships for Boston public high school students at a variety of companies in the Boston area. The Boston Private Industry Council (PIC) organizes these experiences for youth at a range of employer sites and connects with IT professionals in partnership with SIM Boston's outreach efforts.

ORIGIN OF TECH APPRENTICE

Tech Apprentice was launched during the summer of 2005 as a collaborative effort involving the PIC, BATEC (Broadening Advanced Technological Education Connections) and Tech Boston, a BPS district-wide initiative to increase access to technology courses by developing student interest and technical skills in afterschool settings. The plan was to design specific internships for BPS students enrolled in technology courses and participating in Tech Boston activities. With support from partners, PIC career specialists would identify students with the appropriate skills and match them with employers offering "Tech Apprenticeships".

The Tech Apprentice internship program has grown from 27 students in the summer of 2005 to roughly 90-120 students each summer from 2014 to 2017. Although the Tech Boston initiative ended several years ago, the PIC, BATEC, and BPS have sustained summer internship opportunities for tech-savvy students.

HOW DOES A STUDENT BECOME A TECH APPRENTICE?

Students apply and compete for Tech Apprentice positions at various companies. PIC staff conduct job readiness workshops and pre-screen candidates to guide them toward opportunities appropriate for their skill levels. While many Tech Apprentices are enrolled in technology courses at their high schools, other students acquire tech skills on their own or through extracurricular programs. Once on the job, Tech Apprentices apply their skills in a variety of ways—from network support and data cleanup to coding or engaging with complex design programs or managing multimedia operations.

10-YEAR STUDY

This study profiles the 734 students who participated in a Tech Apprentice internship between Summer 2006 and Summer 2016 and reports on their subsequent education and employment choices. This information was compiled from data accessed through the National Student Clearinghouse, as well as interviews, a survey of former Tech Apprentices, and self-reported data on LinkedIn.

METHODOLOGY

ALUMNI SURVEY

734 students
510 students had active email addresses and received a survey
122 students responded, a 24% response rate, representing 16% of the 734 students
Survey asked:
- College enrollment
- Postsecondary credentials earned
- Rate the impact of the Tech Apprentice internship on their education and career
- Employment – job title – industry of employer

INTERVIEWS

16 students participated in a group or one-on-one interview in August 2017 where they were asked about their Tech Apprentice experiences and how they affected their education and career choices.

NATIONAL STUDENT CLEARINGHOUSE

Students from the BPS Classes of 2007 to 2015 were matched with National Student Clearinghouse enrollment records to determine if they enrolled in college.

SELF-REPORTED DATA VIA LINKEDIN

Students from the Boston Public Schools Classes of 2006, 2011, 2012, and 2013 were researched via LinkedIn to see if they self-reported college completion and the industry of their most recent employer. These classes were selected because their graduation and degree information were not in the National Student Clearinghouse data.

DATA SOURCES

Boston PIC Tech Apprentice program data
Self-reported information through the Tech Apprentice alumni survey, interviews, and LinkedIn
*National Student Clearinghouse*

INTERNSHIPS

Tech Apprentices have summer jobs in tech companies or performing a tech-related role. This report focuses on the 734 students who were placed in 958 summer internships between Summer 2006 and Summer 2016.

78% of students were placed in one internship, and 22% of students were placed in two or more.

# of summer placements	# of students	%
One	573	78.1%
Two	133	18.1%
Three	26	3.5%
Four	2	0.3%

Source: Boston PIC Tech Apprentice program data

Industries of summer internships (n=958)

Source: Boston PIC Tech Apprentice program data
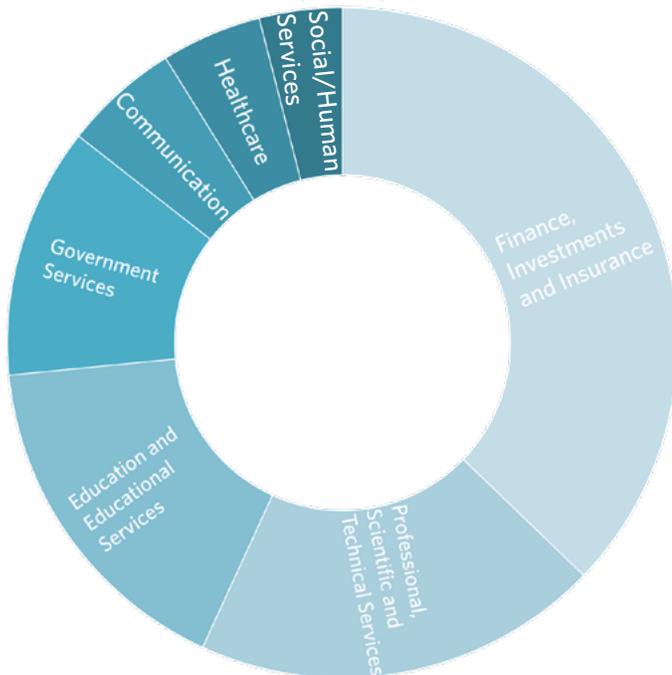
32% of internships were in the finance, investments, and insurance industry, and 17% were in the professional, scientific, and technical services industry.
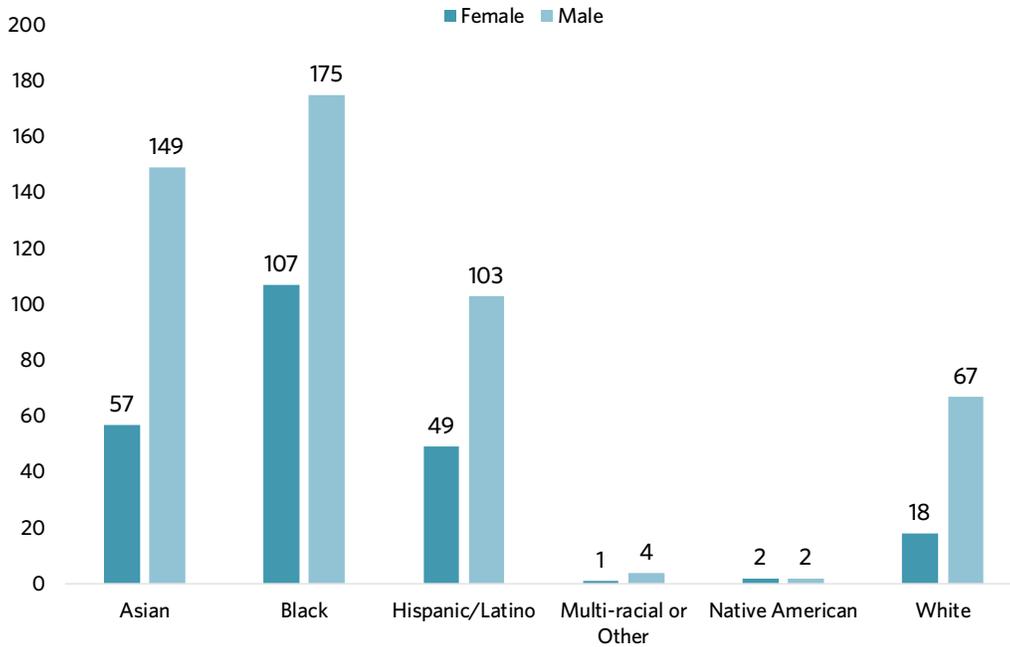
Employers with 15 or more cumulative student placements, 2006 to 2016			
State Street	164	Boston Public Library	20
TechBoston (cyber security training; CBO placements)	68	Boston Public Schools	19
Blue Cross Blue Shield of Massachusetts	47	Red Sox	18
Boston College	32	Partners HealthCare	18
New England Sports Network (NESN)	28	Harvard University	17
Vertex	26	Federal Reserve Bank of Boston	16
Fidelity Investments	23	University of Massachusetts Boston	15
John Hancock Financial Services	23		

Source: Boston PIC Tech Apprentice program data

STUDENT DEMOGRAPHICS

Gender and race/ethnic group of Tech Apprentices, 2006 to 2016 (n=734)

Female   Male

	Female	Male
Asian	57	149
Black	107	175
Hispanic/Latino	49	103
Multi-racial or Other	1	4
Native American	2	2
White	18	67

Source: Boston PIC Tech Apprentice program data

68% *are male and* **32%** *are female.*

38% are Black
21% are Hispanic/Latino
28% are Asian
11% are White

45% of students attended an exam school. 55% of students attended a non-exam school, with the top non-exam schools being TechBoston Academy, Madison Park High School, Charlestown High School, and East Boston High School. For comparison, approximately 24% of the BPS high school population is enrolled in exam schools.
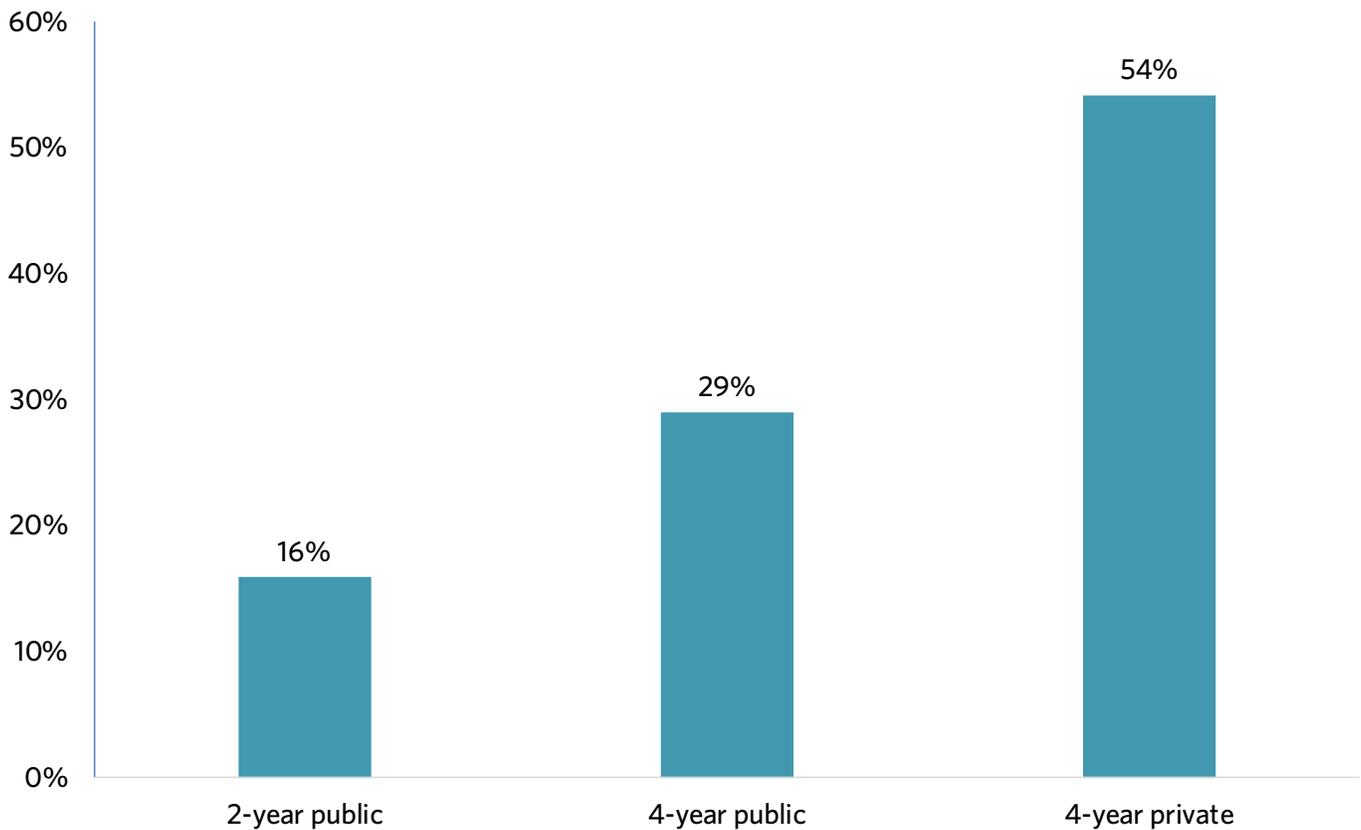
High School	Students
Boston Latin School	150
TechBoston Academy	109
Boston Latin Academy	92
John D. O'Bryant School of Mathematics & Science	86
Madison Park Technical Vocational High School	46
Charlestown High School	26
East Boston High School	25
Jeremiah E. Burke High School	19
Excel High School	15
Fenway High School	15
Josiah Quincy Upper School	13
Media Communications Technology High School	12
West Roxbury Academy	11
Brighton High School	10
Other Schools	105
Total students	**734**

Source: Boston PIC Tech Apprentice program data

COLLEGE ENROLLMENT

Of the 556 Tech Apprentices from the Boston Public Schools Classes of 2007 through 2015, 85% enrolled in college. Of these students, 83% enrolled in a four-year school. As comparison, the 16-month college enrollment rate of Boston Public School graduates ranged from 64.3% for the Class of 2007 to 71.6% for the Class of 2014.

Type of college where Tech Apprentices enrolled (n=461)

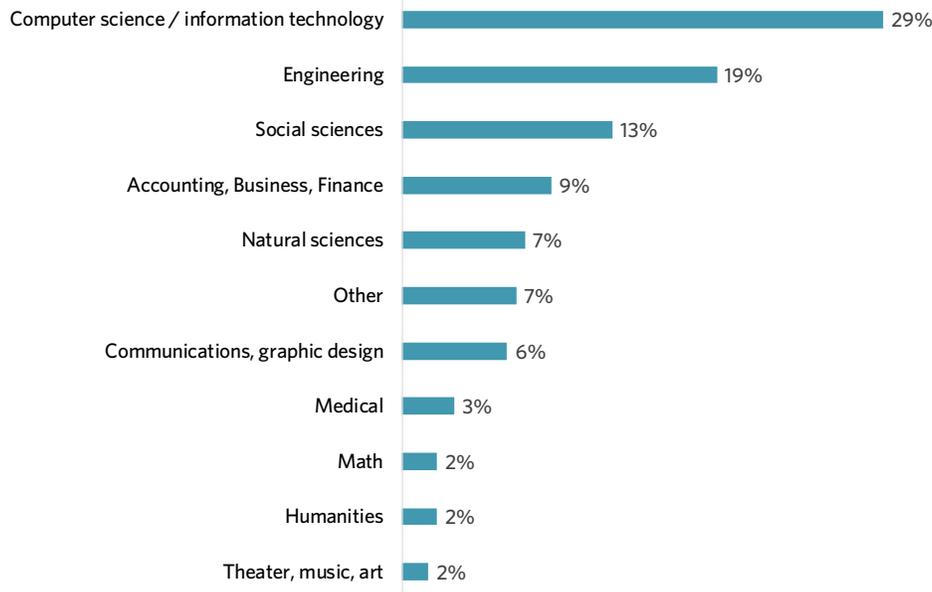| 2-year public	4-year public	4-year private
16%	29%	54%

Source: National Student Clearinghouse
Note: Four students enrolled in either a less-than-two-year private school or a two-year private school, and are not included in this chart. The PIC had National Student Clearinghouse records for the complete BPS Classes of 2007 through 2015 Tech Apprentices, so the college enrollment rate is calculated solely on those years.
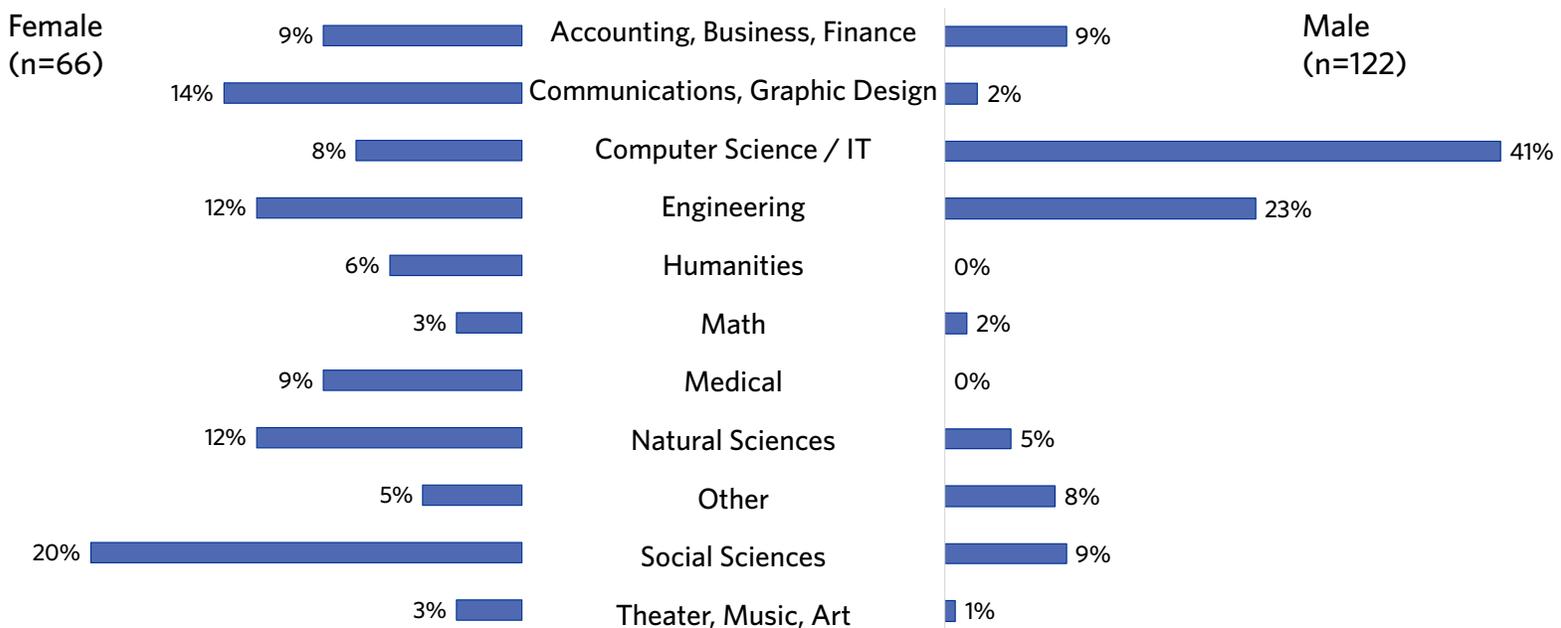
Field of study information for the BPS Class of 2007 through the BPS Class of 2017 was compiled through the PIC alumni survey, LinkedIn research, and National Student Clearinghouse graduation records. Of the 188 students either currently enrolled or who graduated who indicate their field of study, 51% studied computer science, information technology, engineering, or math.

Fields of study in college
(n=188)

Field	%
Computer science / information technology	29%
Engineering	19%
Social sciences	13%
Accounting, Business, Finance	9%
Natural sciences	7%
Other	7%
Communications, graphic design	6%
Medical	3%
Math	2%
Humanities	2%
Theater, music, art	2%

Source: National Student Clearinghouse; Boston PIC Tech Apprentice alumni survey, LinkedIn

Splitting the field of study by gender for these 188 alumni reveals that a far higher share of the males enrolled in computer science, IT, or engineering (64%) compared to females (20%). Higher shares of female alumni enrolled in social sciences (20%), natural sciences (12%), or communications, graphic design, or journalism (14%). This is a small group of alumni, but the skewed fields of study suggest continued tracking of the gender split of student education choices.

| Female (n=66)	Field	Male (n=122)
9%	Accounting, Business, Finance	9%
14%	Communications, Graphic Design	2%
8%	Computer Science / IT	41%
12%	Engineering	23%
6%	Humanities	0%
3%	Math	2%
9%	Medical	0%
12%	Natural Sciences	5%
5%	Other	8%
20%	Social Sciences	9%
3%	Theater, Music, Art	1%

EMPLOYMENT

The PIC Tech Apprentice alumni survey and LinkedIn research identified the industries and job titles of 117 former Tech Apprentices. The alumni represent a range of graduation years, so some are full-time professionals and others are interning or working part-time while enrolled in college. The top industries of employment are health care and social assistance, professional, scientific, and technical services, finance and insurance, and manufacturing. Of the 24 who responded as working in health care, six are in information technology occupations, nine are pharmacy technicians, nurses, or dietary aids, and the rest are graphic designers, youth development specialists, or other titles. Within the professional, scientific, and technical services field, half are in technology occupations, and the others are marketing associates or consultants. Manufacturing is over-represented in the responses compared to Boston's top industries. The occupations include engineers, a GIS intern, a legal intern, and a senior analyst.

Overall, half of this subset of 117 Tech Apprentices are working in the top three industries by total employment in Greater Boston.

Industries where Tech Apprentices work after high school (n=117)
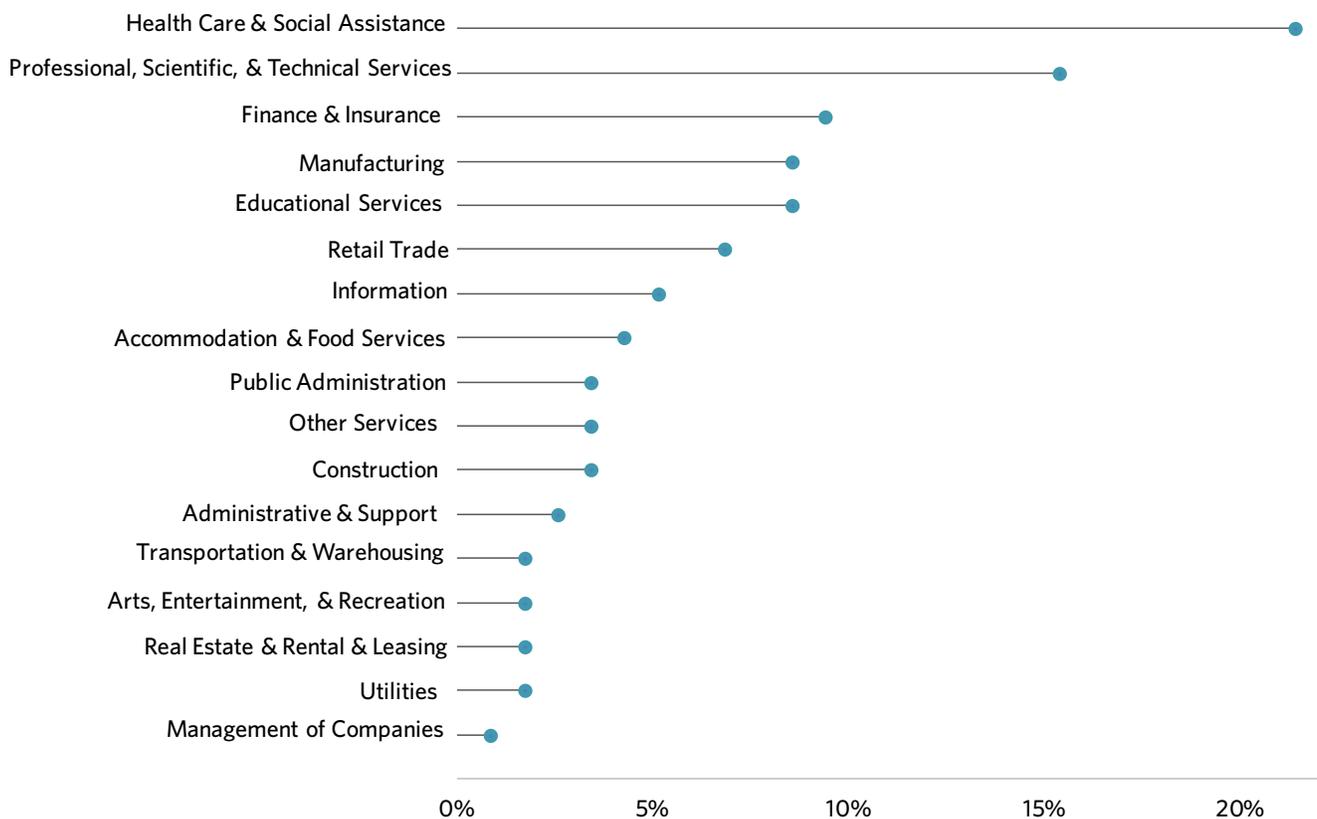
Source: Boston PIC Tech Apprentice alumni survey; LinkedIn

INTERVIEW THEMES

Sixteen alumni were interviewed one-on-one or in small groups. They ranged from current high school and college students to working professionals.

EXPOSURE TO INDUSTRIES AND SKILLS

Many Tech Apprentice alumni felt as though being in a professional office setting gave them an opportunity to learn career-oriented soft skills, including how to:

- Navigate and succeed in a professional setting
- Respectfully interact with coworkers

Alumni spoke about the value of being exposed to the technology industry:

- Exposure to a tech environment, and the associated learning about the different roles one can play within the tech industry, humanized the tech industry for many students
- Exposure allowed students to see themselves working in tech

AREAS FOR IMPROVEMENT

Nearly all alumni advocated for increased outreach to students in computer science classes and schools in general to promote the Tech Apprentice program more broadly.

- A majority of interviewed alumni said that they discovered the program through word of mouth, rather than through formalized channels at their schools or in the community.

Alumni highlighted a disconnect between what programming and software skills are taught in high school and college what is needed in the workplace. A majority of Tech Apprentice alumni stated that most of their technical skills (coding, programming, etc.) were self-learned rather than course-taught.

WHAT CAN MAKE OR BREAK AN EXPERIENCE

Supervisor/mentor relationships: Opinions regarding the impact of mentors/supervisors during their apprenticeships were varied:

- Some students gave examples of their supervisors advising them on college courses and teaching them programming languages that they could use in future employment.
- Some students gave examples of absentee supervisors, or supervisors that had too many additional responsibilities to adequately mentor their apprentices.

Workplaces that are supportive of the students' gender, racial, ethnic, or cultural identities: Many female alumnae, particularly women of color, expressed intimidation at taking computer science/tech-oriented classes and felt discouraged from entering the tech industry.

- As one student took higher and higher level computer science classes at a local private university, she noticed that not only was she among a handful of people of color, but the only woman in most of her classes.
- One alumna said she found it difficult being the only woman of color in her Tech Apprentice internship placement.

Meaningful work is important to the students: Tech Apprentices referenced positive experiences where they had complete ownership over a project that they were able to complete during their internships. Alumni also expressed dissatisfaction from feeling as though their technical skills were not being used to their full capacity. As a result, many Tech Apprentice alumni advocated for more technical-skill based apprenticeships going forward, rather than general internship responsibilities.

LOOKING AHEAD

Based on the PIC alumni survey, interviews, and college enrollment trends, the following are points to consider as Tech Apprentice moves forward.
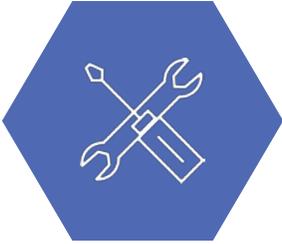
MEANINGFUL EMPLOYMENT

Prepare employers to provide students with opportunities to use their technical skills in the workplace and to have even a small degree of ownership over a project.

OUTREACH

Promote Tech Apprentice earlier in the high school experience so that students might opt into more advanced classes like AP Computer Science, but also do not discourage students from participating if they are not in AP classes. Tech Apprentice experiences can be better segmented so that experiences are developmental and not exclusively for those with the most advanced skills in high school.

ACHIEVING GENDER BALANCE

Recruit women and continue to ensure students' racial and ethnic backgrounds are representative of the school district.
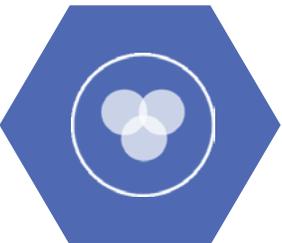
SUPPORT STUDENTS AND PROMOTE DIVERSITY & INCLUSION IN TECH WORKPLACES

Support students in navigating the workplace culture during their internship experiences. Create infrastructure through which Tech Apprentices can reflect on their experiences of workplace culture and create feedback loops to companies so that companies can make changes to be more inclusive and welcoming to people who are currently underrepresented in the industry.
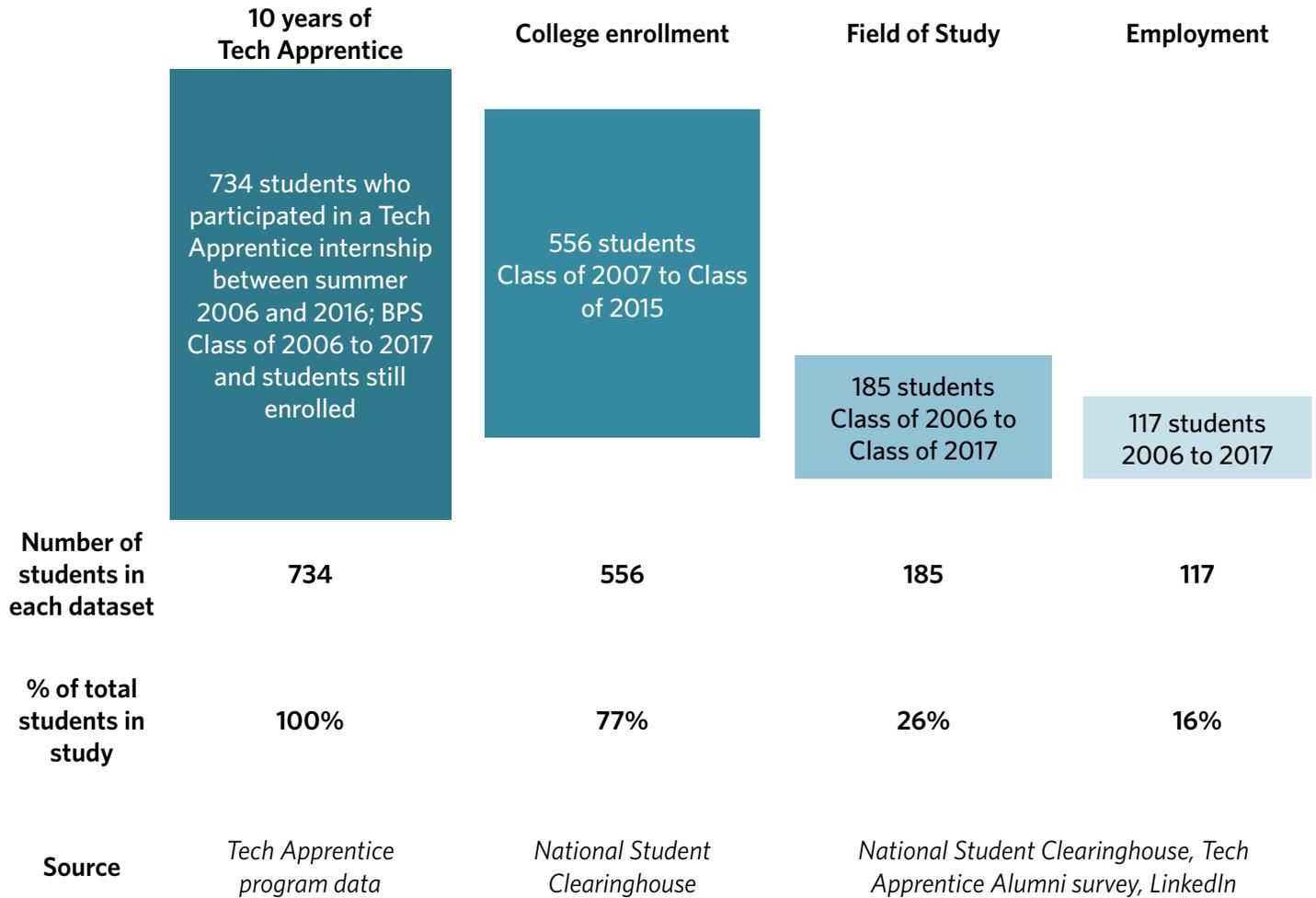
ALUMNI NETWORK

Build and maintain the Tech Apprentice alumni network through which alumni can network and mentor each other as they continue their career journeys.

RETROSPECTIVE STUDY

The Tech Apprentice Retrospective looked at 734 students who participated in a Tech Apprentice internship between summer 2006 and summer 2016. This chart shows the number of students this study was able to collect data on for each section.

	10 years of Tech Apprentice	College enrollment	Field of Study	Employment
	734 students who participated in a Tech Apprentice internship between summer 2006 and 2016; BPS Class of 2006 to 2017 and students still enrolled	556 students Class of 2007 to Class of 2015	185 students Class of 2006 to Class of 2017	117 students 2006 to 2017
Number of students in each dataset	734	556	185	117
% of total students in study	100%	77%	26%	16%
Source	*Tech Apprentice program data*	*National Student Clearinghouse*	*National Student Clearinghouse, Tech Apprentice Alumni survey, LinkedIn*	

ABOUT THE BOSTON PIC

The Boston Private Industry Council (PIC) is the city's Workforce Development Board and school-to-career intermediary. The PIC brings together employers, educators, and workforce organizations, often by industry sector, to help advance the agenda for education and workforce preparation.

ABOUT SIM BOSTON

SIM Boston is a chapter of SIM, an international association of senior IT executives, prominent academicians, selected consultants, and other IT thought leaders. It is the place where IT leaders connect.

ABOUT BATEC

BATEC is the National Center of Excellence for Computing and Information Technologies, headquartered at the University of Massachusetts Boston and sponsored by the National Science Foundation ATE Program. Academic partners are leading edge community colleges in the cities of Boston (Massachusetts), Chicago (Illinois), Springfield (Ohio), Las Vegas (Nevada), San Francisco (California) and Fort Lauderdale (Florida).