

# Computer Science For All

New York City's Historic Expansion of  
Computer Science Education for All Students

November 2015



A partnership between

The City of New York /  
NYC Department of Education

&

CSNYC - New York City Foundation  
for Computer Science Education

# AGENDA

01

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WHY  
COMPUTER SCIENCE  
EDUCATION

02

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COMPUTER SCIENCE  
EDUCATION  
IN NYC

03

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CS4All  
10 YEAR  
EXPANSION PLAN

04

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\$81 MILLION PUBLIC  
/ PRIVATE  
PARTNERSHIP

Questions

# Why Computer Science Education

## *An economic imperative:*

- The number of CS jobs is growing at 2x the national average; will outpace all other STEM-related industries
- By 2020, there will be 1.4 million new CS jobs nationally, and only 400,000 CS students = a shortfall of 1 million
- CS is prevalent in many industries including finance, health, and education, which increasingly rely on software to manage, organize, display, and synthesize data
- There's an increased need for technically-proficient workers at all levels across nearly every sector

# Why Computer Science Education

## *A social imperative:*

- CS represents a new literacy that promotes:
  - ◆ Understanding of the design and functionalities of technologies we interact with daily
  - ◆ Ability to communicate, collaborate, and build relationships
  - ◆ Critical thinking, creativity, and problem-solving skills
  
- Through CS, NYC's 1.1 million public school students will:
  - ◆ Be prepared for higher education and pathways to careers in technology and related fields
  - ◆ Gain skills to help them compete and thrive in the global marketplace

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# CS Education in NYC Public Schools

*Only 1 in 10 high schools in the United States offers computer science.*

*In New York City:*

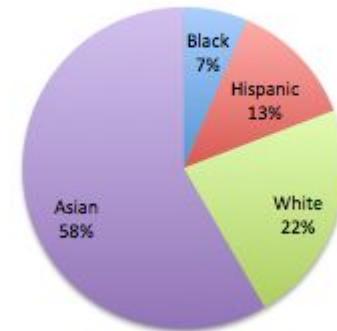
- Fewer than 5% of 1.1 million public school students currently have an ***opportunity*** to learn CS
- Few teachers are currently equipped to teach CS, and a pipeline of future teachers must be built

# CS Education in NYC Public Schools

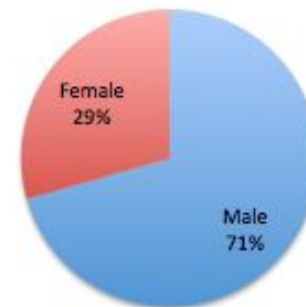
## *A history of inequitable access:*

- In 2014, only 738 students in NYC public schools took the AP Computer Science exam; 63% passed
- Students who take AP Computer Science do not reflect the diversity of the city and public school system
- Nearly 50% of test takers are from just three schools: Stuyvesant, Bronx Science and Brooklyn Tech

**AP Test Takers by Race**



**AP Test Takers by Gender**





A large, diverse crowd of students, likely in a classroom or assembly, with many of their hands raised in the air. The students are of various ethnicities and are looking towards the camera with expressions of interest and engagement. The background is slightly blurred, emphasizing the students in the foreground.

The City of New York and CSNYC have formed a partnership to provide a computer science education to every student in the public school system

This initiative will take 10 years and cost \$81 million

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# CS4All 10-Year Expansion Plan

- By 2025, all NYC public school students will take one unit of CS at each school level: elementary, middle and high school
- The centerpiece of the effort is to train 4,775 public school teachers to bring CS to the city's 1.1 million students, reaching more than 240,000 students annually by 2025
- Each teacher will receive 30 -100 hours of professional development in each year of participation depending on school level and program

# CS4All 10-Year Expansion Plan

## *Computer Science For All will:*

- Be the largest effort to expand CS education in the country, providing every student with multiple opportunities to encounter CS in the curriculum
- Create equitable access to technology education and careers, significantly increasing the number and diversity of tech talent entering the workforce
- The initiative will train an increasing number of teachers each year, slowly scaling up to reach 4,775 teachers at 1,700 schools.

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# \$81M Public-Private Partnership

- \$41 million from the City of New York
- \$40 million in private funding, led by CSNYC and founding sponsor Robin Hood Foundation
- Additional lead partners can help launch CS4All via:
  - ◆ Financial support, either one-time or spread out over multiple years of the initiative
  - ◆ Support internships and other work-based learning opportunities for students
- Initiative announced in September 2015 by Mayor de Blasio, CSNYC, Robin Hood, and AOL Charitable Foundation

# A Leveraged Investment in Education

- 1.1 million students will learn CS in elementary, middle and high school, at a rate of 245,000 students *per year* by 2025
- The \$81 million investment in CS4All will redirect publicly funded teacher salaries to CS education; by Year 10, more than \$250 million per year will be spent by the City on CS education
- The rollout of CS curriculum in every school complements the city's \$750 million investment in network infrastructure and devices for students

# Evaluation and Metrics

- \$5 million of the CS4All budget will support a rigorous evaluation including:
  - ◆ Implementation metrics
  - ◆ Teaching outcomes
  - ◆ Learning outcomes
- Research will be conducted on teaching practices, assessment tools and model comparison for integrating CS within schools



# Governance and Advisory

- An oversight committee will govern key financial and strategic decisions
  - ◆ Lead private partners including CSNYC, Robin Hood Foundation
  - ◆ City government leadership from the Mayor's Office and Department of Education
  - ◆ Fund for Public Schools as fiscal agent and primary coordinator of public-private fundraising
  
- Advisory committee(s) will provide educational and technical direction to the initiative
  - ◆ Education and research
  - ◆ Industry professionals

# Postsecondary Engagement

- CS departments can partner with Education departments to create CS Ed majors or minors
  - ◆ Connect schools of education with computer science departments in order to create a multidisciplinary pathway that provides teachers with flexible, foundational computer science knowledge, and coursework focused specifically on teaching in a CS classroom.
- Partner with CS4All programs to provide teacher professional development.
  - ◆ Offer space to programs
  - ◆ Funding for food or snacks

# Postsecondary Engagement

- Consider interdisciplinary research teams focused on studying computer science education.
  - ◆ CSNYC can provide guidance or facilitation for interdisciplinary workshops to help form teams of researchers, identify relevant funding streams, and connect with appropriate organizations for letters of commitment for access to schools, students, or data.
- Work with CSNYC and the DOE to update the technology courses for pre-service elementary and secondary teachers to reflect problem based learning and opportunities for students to problem solve with technology.

# Postsecondary Engagement

- Connect with High Schools and high school students to provide clear pathways for students to enter computer science degree programs.
- Encourage faculty and pre-service teachers interested in CS to join the CSNYC Education Meetup group and participate as a member of the community.
- Connect CS faculty, students, and alumni with volunteer opportunities through organizations such as TEALS, ScriptEd, iMentor, and NPower.

# A Tale of Two CUNYs: Queens College

- All preservice Math Education students already take two CS courses as a part of their degree
  - ◆ QC updated those two CS classes to better reflect the courses teachers at HS implement
  - ◆ QC partnered with CSNYC to offer a Bootstrap workshop to preservice math educators in January 2015
  
- QC worked with CSNYC to propose a 5th year masters program in CS Education that combines graduate coursework in CS with methods classes
  
- QC CS department is preparing an articulation agreement with AFSE to help communicate a clear pathway from HS to College

# A Tale of Two CUNYs: Lehman

- Lehman's School of Education and CS department collaborated to make something new:
  - ◆ proposed a certificate program in CS Education
  - ◆ submitted a proposal to the state to ask for a license extension for already certified teachers
- Lehman has opened its campus to neighboring schools, and has hosted BASE in their data lab to enrich the 9th grade curriculum.

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APPENDIX



# Teacher Certification

- CS4All will increase the number of CS-trained teachers to 4,775 and address certification barriers to sustain and grow a qualified teaching force
- Currently, there is no *suitable* state-recognized teacher certification in the area of CS
- This plan will address the dearth of CS teachers in NYC by maximizing flexible training options for teachers, while tackling the larger certification challenges
  - ◆ Short-term strategy: teacher training
  - ◆ Long-term strategy: teacher certification and university-based programs

# Rollout and Expansion Strategy

Grade Level	Strategy
Elementary	<ul style="list-style-type: none"><li>● Design and launch an elementary school CS pilot (Years 1-4)<ul style="list-style-type: none"><li>○ Will reach 90 schools over four years</li><li>○ Will inform the scaling up of elementary school CS programs and PD across the system</li></ul></li><li>● Develop CS Blueprint for elementary school that aligns with what entering middle school students need to know and be able to do (Years 2-4)</li><li>● Expand CS to all elementary schools, based on pilot learnings (Years 5+)</li></ul>
Middle	<ul style="list-style-type: none"><li>● Develop CS Blueprint for middle and high school grades (Years 1-3)</li><li>● Scale CS to all middle and high schools across three tiers (Years 1+):</li><li>● Full 3- or 4-year course sequence modeled on SEP (80 schools)</li></ul>
High	<ul style="list-style-type: none"><li>● Single CS courses (e.g., stand-alone SEP, AP courses)</li><li>● CS units embedded in other courses (e.g., modular components of SEP, Bootstrap, ScriptEd, etc.)</li></ul>

# CS4All Press

Click on links below:

[Message from the Mayor + Video](#)

[New York Times article on the initiative](#)

[An Open Letter from the Nation's Tech and Business Leaders](#)

[Why computer science? The Story behind the city's flashiest new education initiative](#)

[Fred Wilson and Mayor de Blasio talk about CS4All on CNBC](#)

[Public + Private Sector Reactions to Announcement](#)

[Fred Wilson's blog post on CS4All](#)