Computing Education for School Children

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Outline

• Why it matters
• Lack of CS teachers
• Three approaches
  – Scratch for middle school (Colleen Lewis, HMC)
  – Explore CS for high school (Jane Margolis, UCLA)
  – Code.org for K-12 (Hadi Partovi, code.org)
• Closing thoughts
• Discussion
Why it matters

• Equitable access to careers
• Meeting current and long term demand for CS
• Diverse perspectives produce better and more ideas
Lack of CS teachers in the US

- NYC licensed science teachers in 2016:
  - Biology 1587 17%
  - Chemistry 568 6%
  - Computer Tech 23 0%
  - Earth Science 405 4%
  - General Science 1267 14%
  - Mathematics 4993 55%
  - Physics 246 3%
Scratch for middle school (Colleen Lewis, HMC)

Curriculum Development Supported by

atdp

NSF

LOCKHEED MARTIN
Programming in Scratch on EdX & YouTube

- 70+ videos 1-3 minutes
- 30+ hours of curriculum
- Designed for advanced middle-school students
- Emphasis on “Iteration”
- **Enrollment in EdX 2015:** 29K (Feb), 33K (May)

Links:
- edx.org Search for: Programming in Scratch
- youtube.com/user/ColleenMLewis/
Exploring Computer Science
(Jane Margolis, UCLA, supported by NSF)

• UCLA – Los Angeles School District collaboration
• Increase access to CS for females, students of color
• Year-long intro CS high school course covering:
  – HCI, problem-solving, web design, programming, robotics, computing, data-analysis
Making it happen

• Curriculum development
• Teacher professional development
• Working with school leaders
• Learning community among teachers
• Student assessment
• Policy
## ECS students in Los Angeles

<table>
<thead>
<tr>
<th>Year</th>
<th>TOTAL</th>
<th>FEMALE</th>
<th>LATINO/A</th>
<th>BLACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2011</td>
<td>1,377</td>
<td>564 (41.0%)</td>
<td>971 (70.5%)</td>
<td>133 (9.7%)</td>
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<tr>
<td>2011-2012</td>
<td>2,136</td>
<td>923 (43.2%)</td>
<td>1,649 (77.2%)</td>
<td>200 (9.4%)</td>
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<tr>
<td>2012-2013</td>
<td>1,927</td>
<td>877 (45.5%)</td>
<td>1,566 (81.3%)</td>
<td>126 (6.5%)</td>
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<tr>
<td>2013-2014</td>
<td>2,365</td>
<td>1,084 (45.8%)</td>
<td>1,705 (72.1%)</td>
<td>255 (10.7%)</td>
</tr>
<tr>
<td>2014-2015</td>
<td>2,390</td>
<td>1,005 (42.1%)</td>
<td>1,762 (73.3%)</td>
<td>209 (9%)</td>
</tr>
</tbody>
</table>
Findings in 2014-15 for ECS students

• Self-assessment of proficiency in ECS topics significantly increased, especially in programming and robotics

• Gains especially pronounced for female students

• Change from fixed mindset to growth through practice
Expansion

ECS is currently in the 7 largest school districts in the United States, with many additional sites nationwide.
Code.org
(Hadi and Ali Partovi)

• Non-profit launched in 2013
• Every child should have access to a quality CS education, not just a lucky few
• Has many partners (e.g. ACM) and builds on decades of work by others
Code.org efforts

- Annual hour of code (over 225M students so far)
- Video endorsements by tech celebrities
- Contracts with school districts to train teachers
- Working with states to give science credit for CS
- Many online CS courses on website
Closing thoughts

• Computer scientists can and should play a key role in developing curriculum and training teachers.

• Should share knowledge broadly across countries
Discussion