U.S. CS Education in 2018: How Google Sees the CS Environment

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Agenda

- Why CS education
- History and key players
- Chris’s predictions
- Google’s CS Education efforts in 2018

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“We need more people working on important technological problems... to make people’s lives better”
Larry Page, Google I/O 2013

Why computer science is critical

- Education must include a focus on the future. We need to prepare our students to design and build the tools the rest of the world will use and to solve critical problems
- Computing power and knowledge is foundational to innovation and advancement in all areas of work and life
- Countries around the globe are working to ensure that they are prepared for the new knowledge and innovation-driven economy

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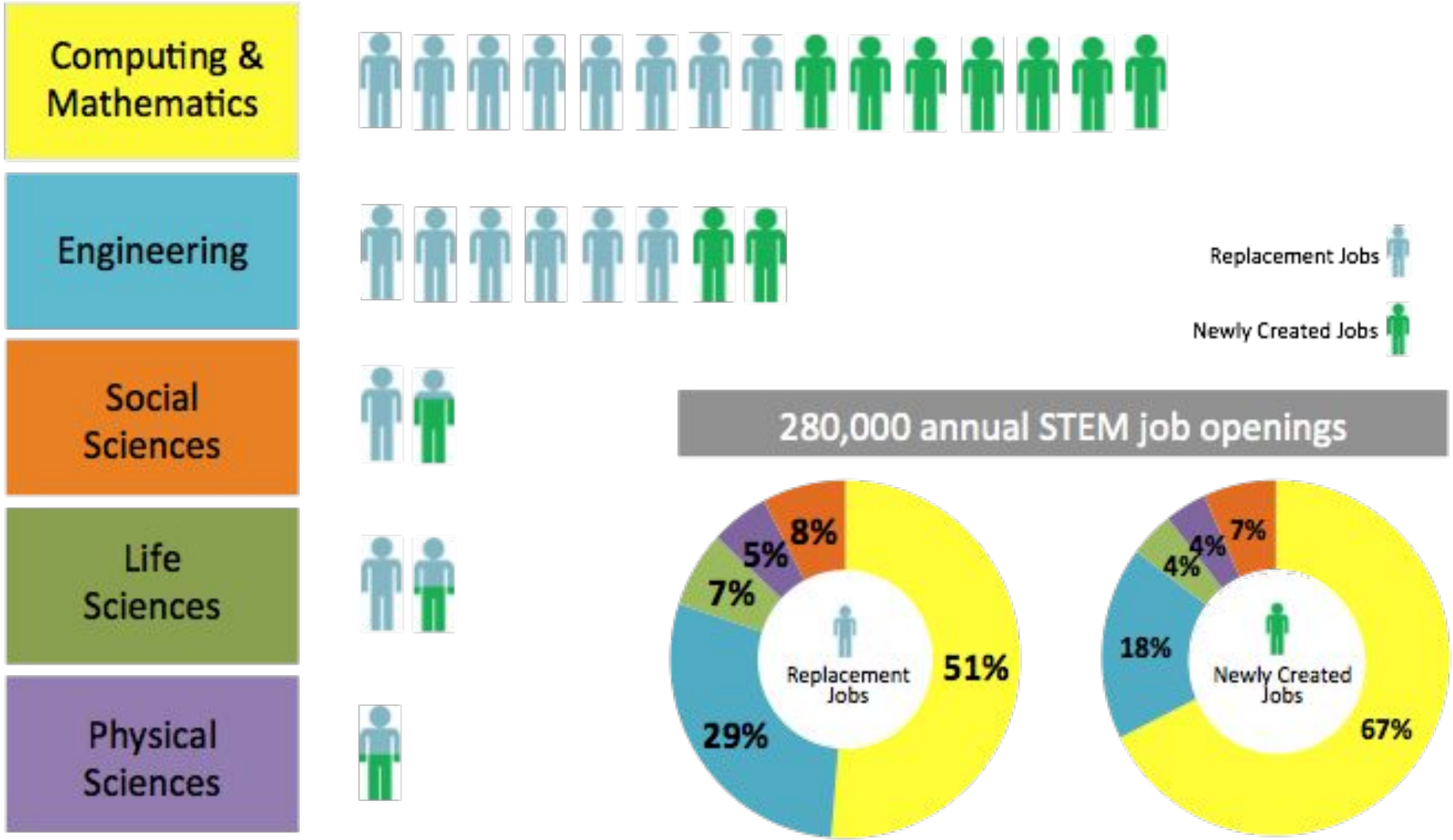
Where the STEM jobs will be (projections 2012-2022)



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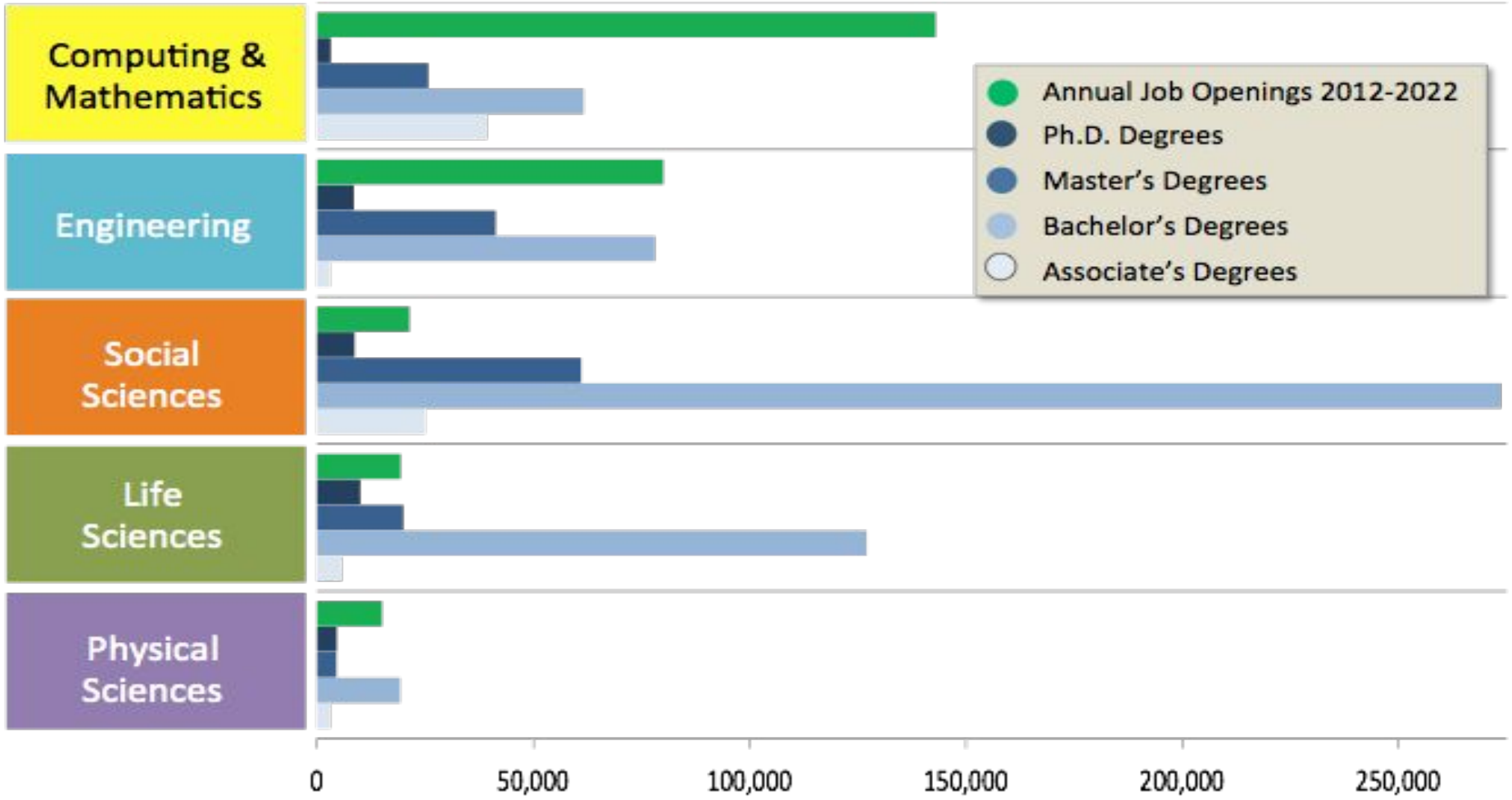
Job openings versus degrees (2012-2022)



Sources: Degree data are calculated from the National Science Foundation (NSF), Science and Engineering Indicators 2014, available at http://www.nsf.gov/statistics/seind14/. Annual jobs data are calculated from the U.S. Bureau of Labor Statistics (BLS), Employment Projections 2012-2022, available at http://www.bls.gov/emp/. STEM is defined here to include non-medical degrees and occupations.

A global focus on future skills

- Computing power and knowledge is foundational to innovation and advancement in all areas of work and life
- All industries/fields need these skills
- Countries around the globe are working to ensure that they are prepared for the new knowledge and innovation-driven economy
- Students need to be prepared to contribute to society in ways that support and improve the general good

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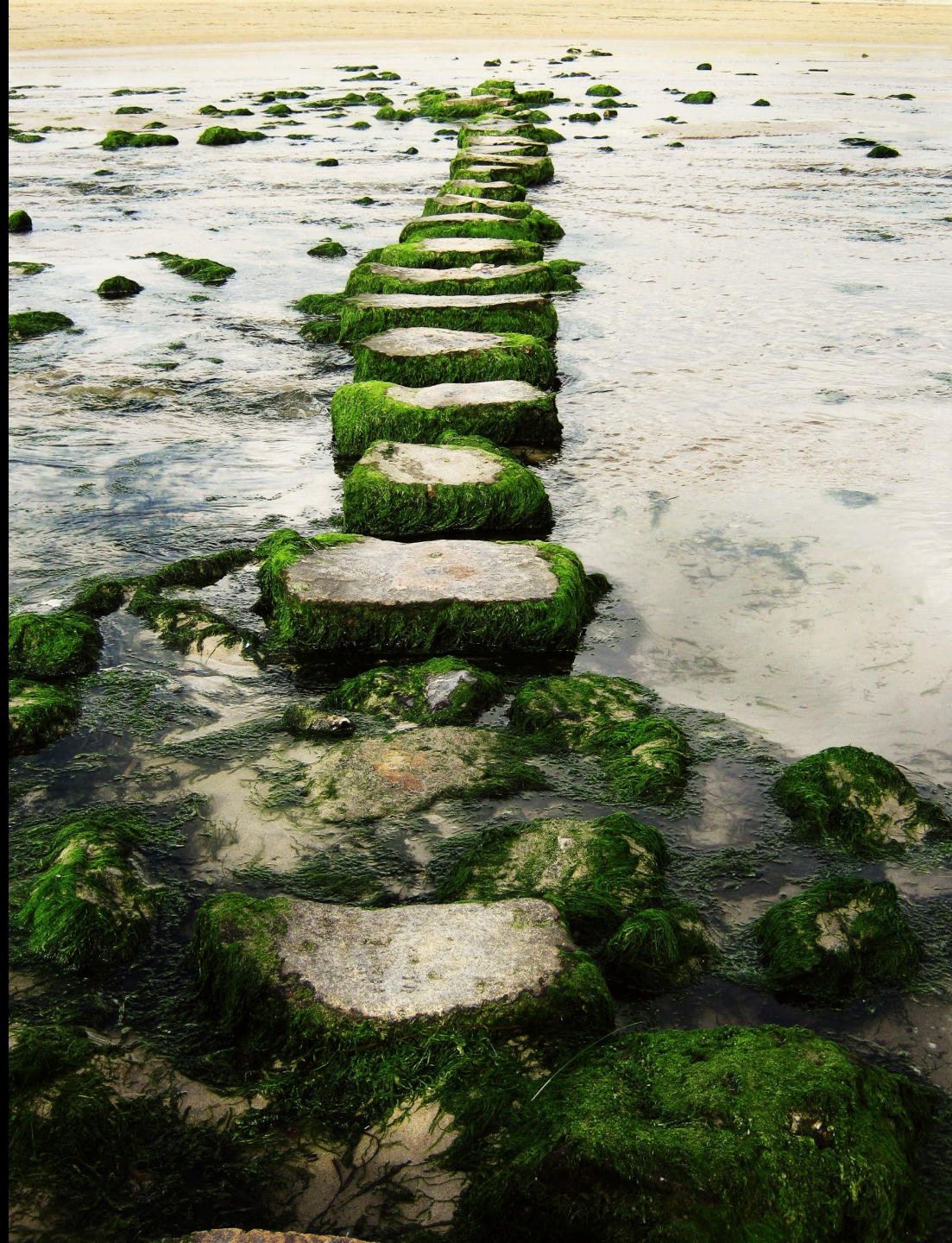
Success is the result of many meaningful steps in the right direction



Quick trip through history

- 1993 ACM publishes the *Model High School Computer Science Curriculum*
- 1998 Alice IDE launched
- 1999 Advanced Placement CS moves from Pascal to C++
- 2000 ACM and ISTE launch first K-12 CS symposium
- 2003 ACM forms K-12 Computer Science Education Task Force, and
- 2003 Advanced Placement CS moves from C++ to Java
- 2003 ACM publishes the *ACM Model Curriculum for K-12 Computer Science* (revised in 2006)
- 2003 Margolis and Fisher publish *Unlocking the Clubhouse*

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Quick trip through history cont...

- 2004 ACM forms the Computer Science Teachers Association
- 2004 CSTA grows CS&IT Symposium into annual conference
- 2006 Scratch IDE released
- 2006 CSTA launches regional chapters in US and Canada (currently >54)
- Margolis' *Stuck in the Shallow End* published
- 2011 ACM and CSTA launch CS EdWeek
- 2011 CSTA publishes the *CSTA K-12 Computer Science Standards*
- 2013 Code.org launches with first Hour of Code
- Code.org and CSTA work to change CS education policy in 25 states

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Issues being addressed

- Better programming tools for younger programmers
- Learning standards
- A new Advanced Placement course that is still rigorous but also more engaging for all students (launching in 2016-17 school year)
- More and better professional development for teachers
- Improved relationships between secondary and post-secondary educators
- Increased focus on diversity issues in computing

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Looking to the future

Chris' predictions

- Continued focus on the development of state-level standards and curricula
- CS will continue to be a high priority but we will start to see some push back
- More efforts will be made to get administrators on board
- Informal CS programs will continue to be needed but the target audience will shift to districts that are less advanced in formal CS education
- Growing realization of how difficult it is to implement a solid and sustainable CS program
- Push for more and better assessments
- More focus but continuing confusion around computational thinking

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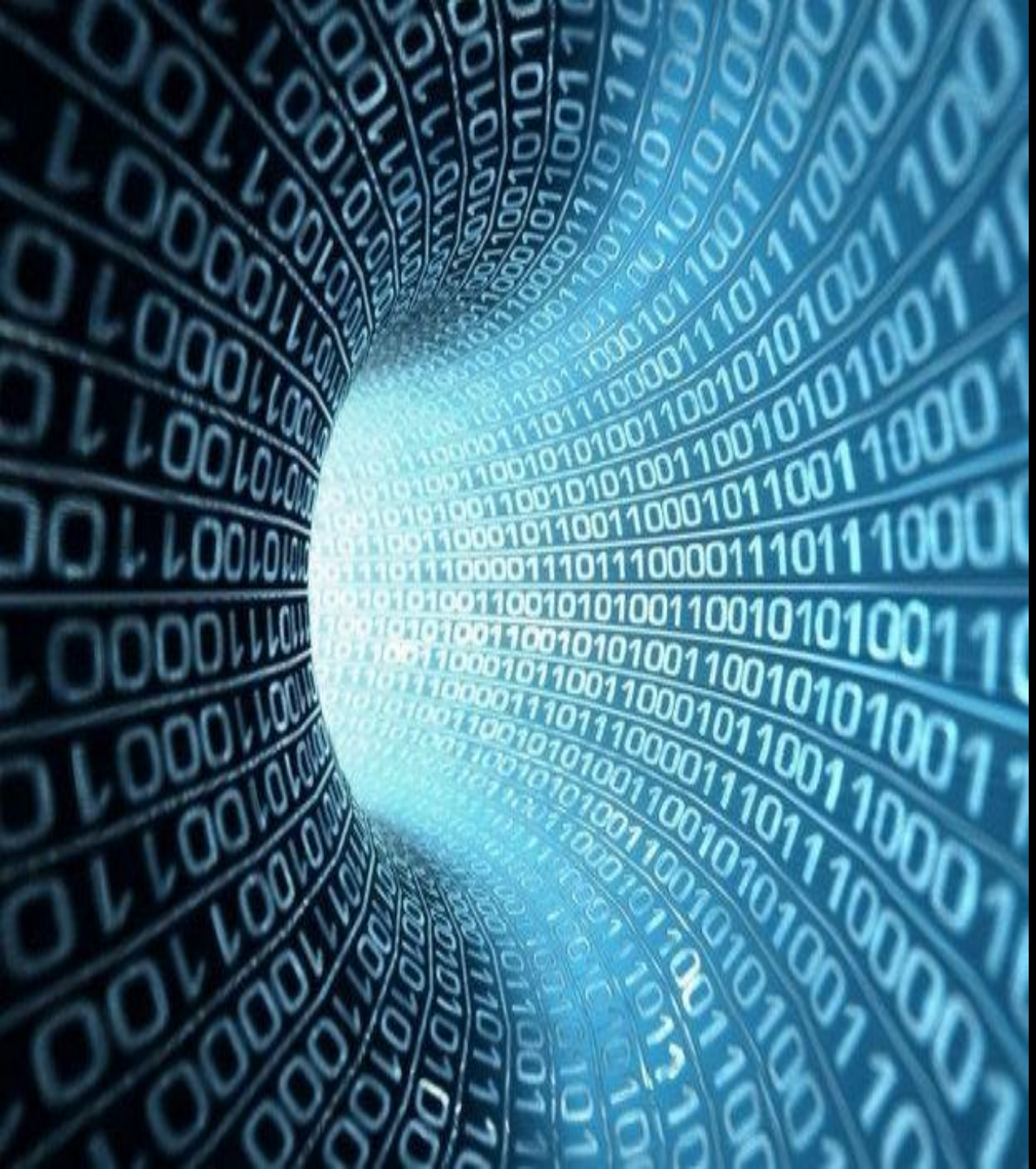

All of our work in CSA education is data-driven

Learnings from Google Gallup research

What

Two-year comprehensive landscape research surveying **awareness**, **perceptions**, **opportunities**, and **limitations** in CS education for K-12

Who (Year 2)

1,672	students	7-12	(228 Black, 310 Hispanic)
1,677	parents	7-12	(197 Black, 264 Hispanic)
1,008	teachers	1-12	
9,805	principals	K-12	
2,307	superintendents	K-12	
16,469	total		

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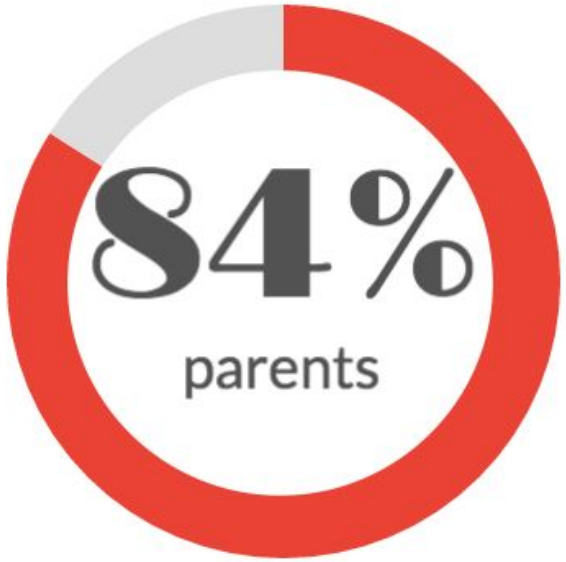
Learnings from Google Gallup research



say CS is ***at least as important as*** required classes like math, science, history, and English

agree CS should be ***required*** when available

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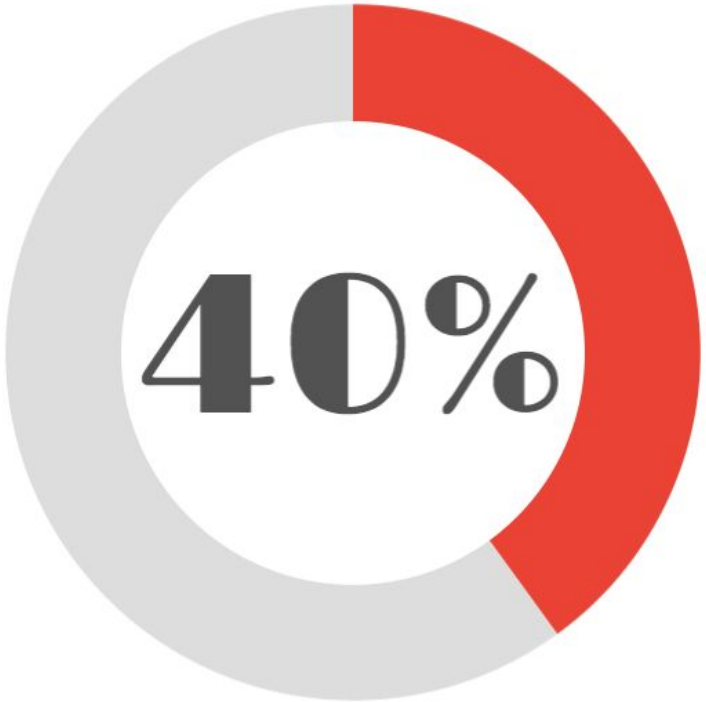
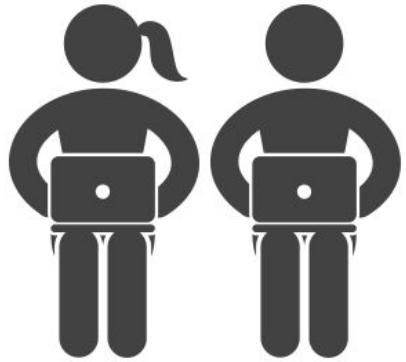
Learnings from Google Gallup research

But access is not universal yet



principals report having CS classes with programming/coding, increasing from

25% in Year 1



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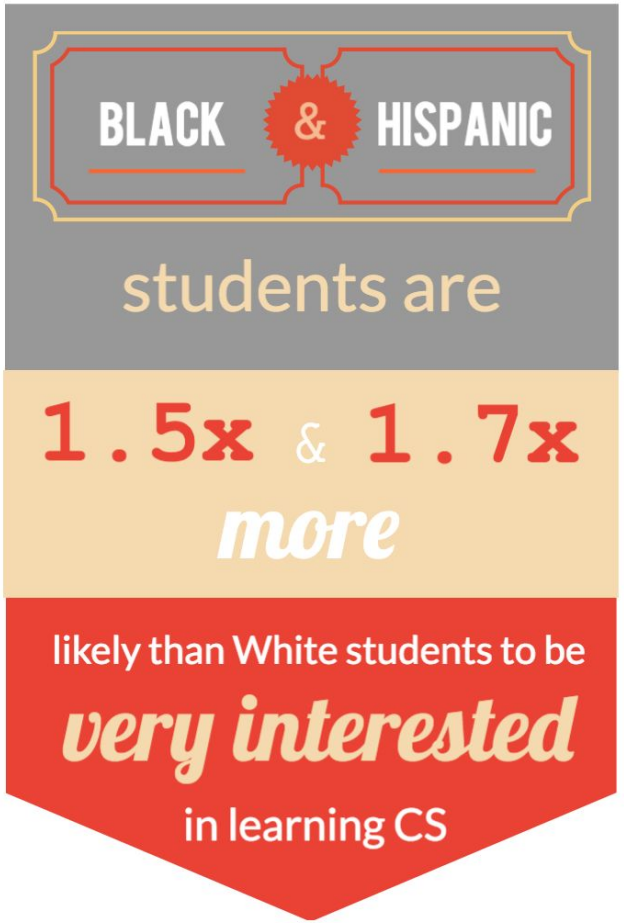

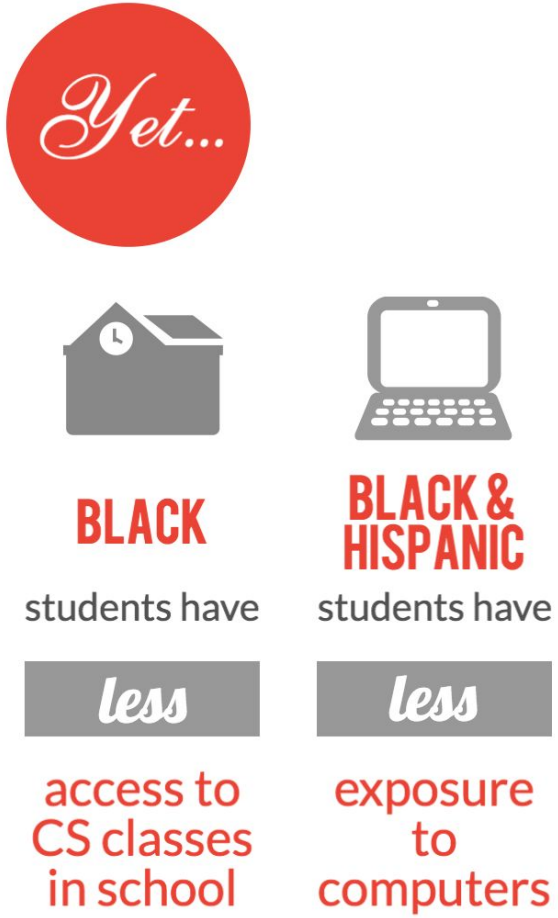

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Learnings from Google Gallup research

Boys receive

more

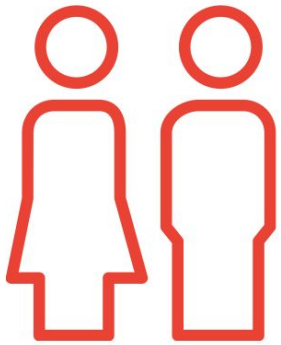
encouragement

than girls

1.5x likely to be told by teacher they would be good at CS

1.7x likely to be told by parent they would be good at CS

2x likely to see someone like them doing CS in the media



GIRLS

less

aware of CS opportunities on the Internet and in the community

&

BOYS

more

likely to have learned CS and to learn on their own

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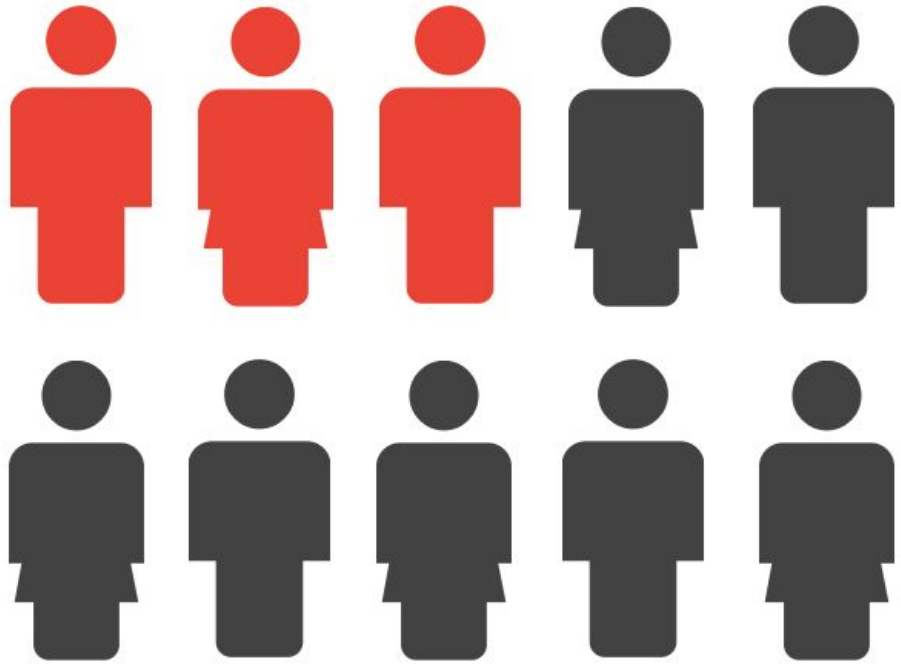
Learnings from Google Gallup research

less than

3 in 10

parents

have expressed support for CS to school officials



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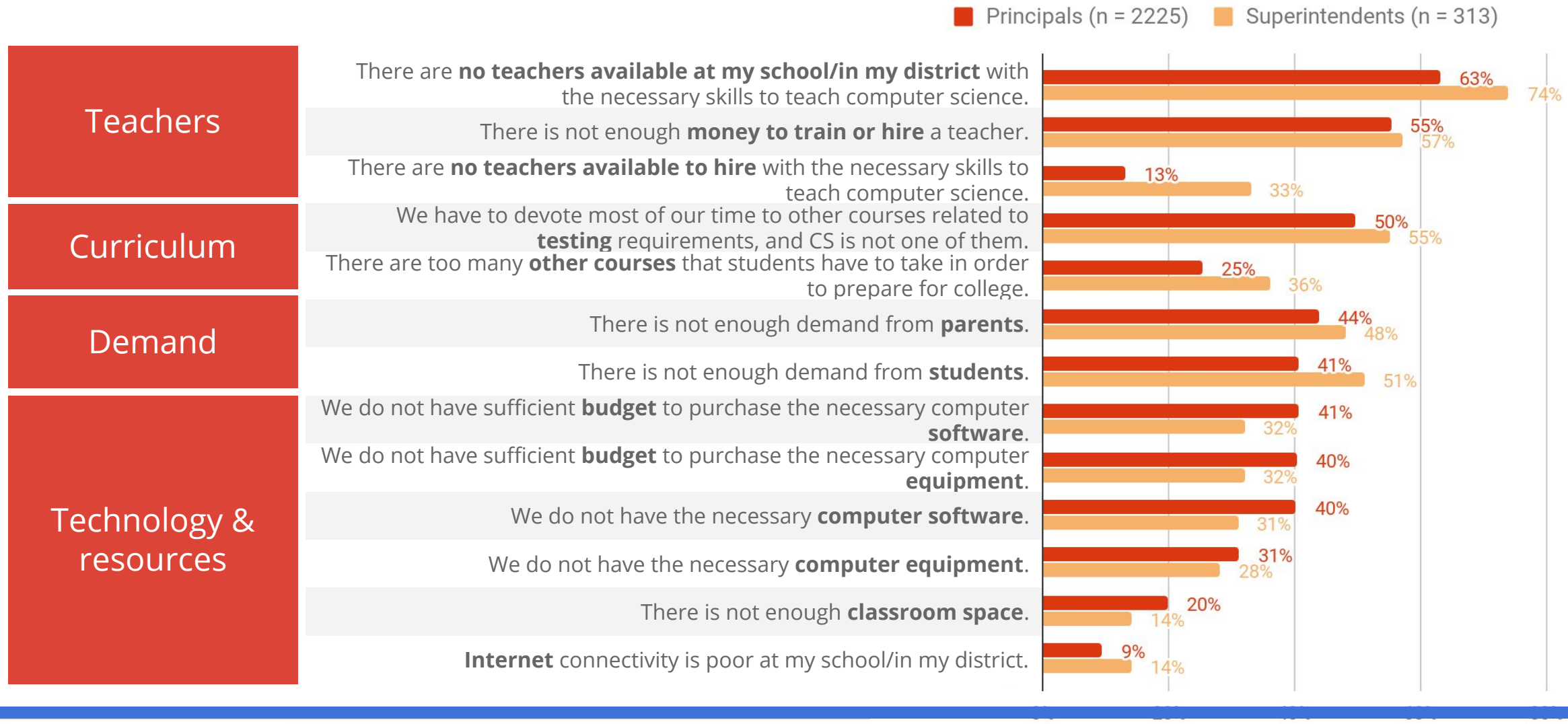
Learnings from Google Gallup research

Lack of trained teachers, testing requirements, low demand



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Google’s CS work in 2018

What Google brings to the table

- A global brand
  - We can use our power for good
- A leading technical employer
  - We can identify current and future workforce needs
- Outstanding computer scientists
  - We can draw upon collective knowledge and strengths
- A real commitment to diversity
  - We are making a real effort to walk the talk

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Google’s goals for CS education

Creating opportunities for all students

Building equity of access

Growing the potential workforce

Advancing the global economy

Being a good partner

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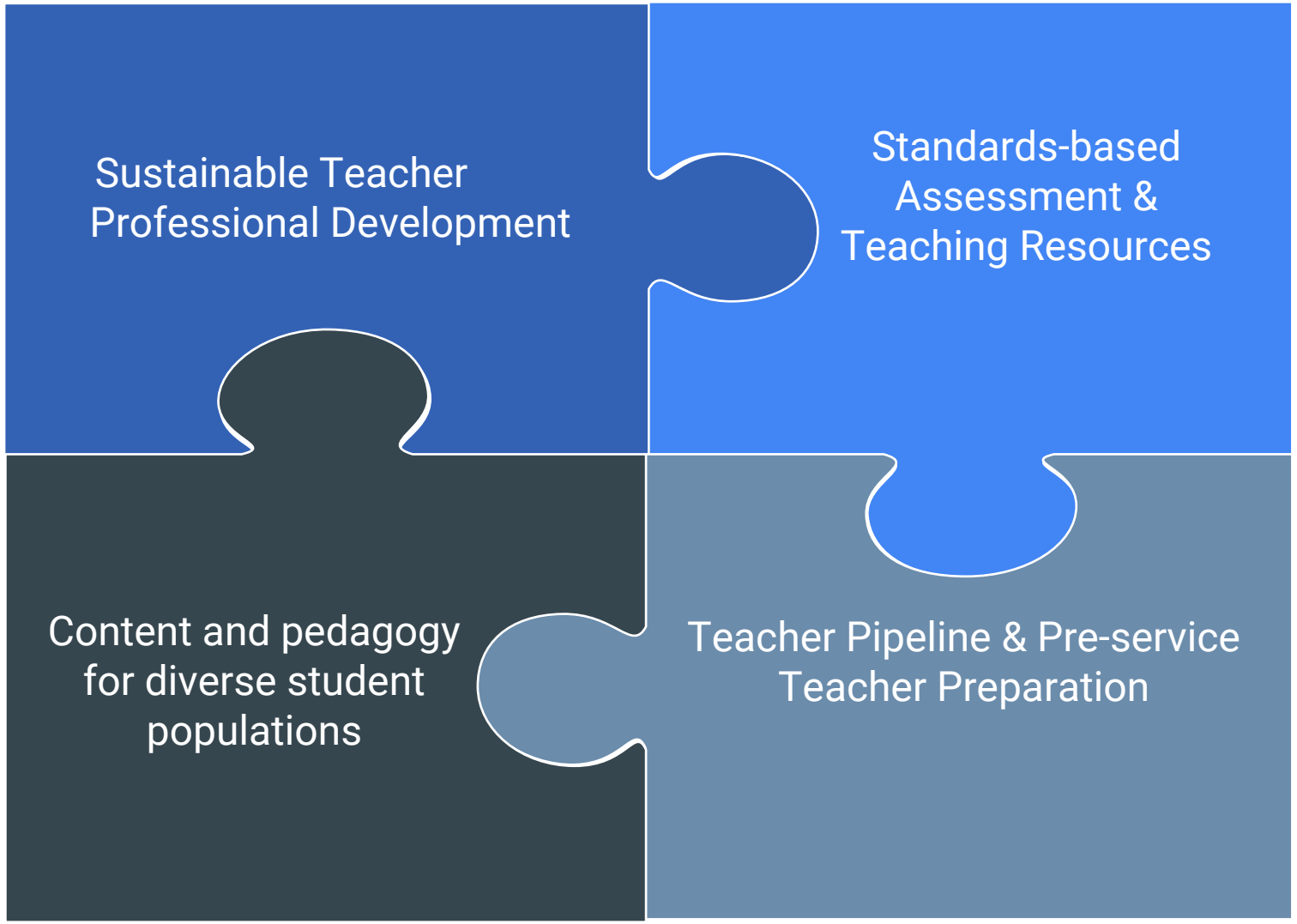
Key elements we've identified



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Questions we ask ourselves

- What needs to be done (and isn't already being done or should be done better)?
- What is being done but is under-resourced?
- What are we good at?
- What resources can we commit?
- Where do we have credibility?
- When will the new DOE funding begin impacting CS in schools

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Critical challenges we see

- Lack of access to rigorous computer science education
- Profound and complex issue of underrepresentation
- Confusion about what computer science is and is not
- A lack of relevant, high-quality, innovative professional development
- A system obsessed with high-stakes testing
- Dysfunctional teacher preparation and certification systems
- Poorly paid teachers who are not treated as professionals
- Administrators who have many more pressing concerns and may not be as informed/supportive as we would like

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What we are working on right now

- Sustainable professional development: CS4HS, CT MOOC for Teachers
- Content and pedagogy for diverse audiences: CS First, Applied Digital Skills, EngageCSEDU, Applied Computer Science
- *Teacher pipeline: conference sponsorship
- *Pre-service teacher education: funded research
- Student pipeline: Careers with Code, IgniteCS, Technical Development Guide
- Improving CS teaching and learning: CS Capacity, conference sponsorship
- CS image/representation: CS in Media

* Means watch this space

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What I would like Google to do more of

- Improving understanding of how students learn CS
- Capacity and community building
- Educator leadership development
- Convening critical conversations
- Addressing the deprofessionalisation of teaching and teachers
- Supporting the development of young faculty

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How can we best help you?

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