



Open and accessible education for all.

And Now the Hard Work Begins: Achieving the Promise of Computer Science Education

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January 2016: And So It Begins



But How Did We Get Here?

- 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

But How Did We Get Here?

- 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

To Quote Grumpy Cat

Are we done yet?



The Challenges Ahead

Research

A research-based understanding of how students learn computer science, how to scaffold conceptual learning across grades, and what practices and interventions are most effective.

Curriculum

A shared and clearly articulated understanding of what students should know and be able to do in each grade.

Assessment

High-quality assessment tools that accurately measure learning and enable successful interventions.

The Challenges Ahead

Tools and Resources

Engaging IDEs that support transitions from one program mode to another.

Professional Development

Opportunities for teachers to continually improve their computer science knowledge and teaching practices.

Pre-service Programs

Meeting the legislation-driven demand for CS teachers in every school.

The Challenges Ahead

Rigor and Engagement

Overcoming the myth that programmers are “born that way”.

Diversity

Making it clear that diversity is critical to innovation. Addressing capacity and retention challenges. Expanding the pipeline.

Equity

Addressing the full range of systemic barriers, including gender, race, ethnicity, and poverty.

Why Google Cares about CS Education

Culture - Technology and innovation are core to Google's culture and Google has a role to play in inspiring the next generation of computer scientists.

Learning - Computational Thinking is the new literacy and we (the CS education community) need to define it, make it available and accessible to all students, and help all teachers incorporate it into their teaching.

Jobs - There is a huge demand as computer science jobs continue to outstrip CS graduates. Economic prosperity will go to the states that focus now on building strong CS pathways



Public expectation:
Improving CS Edu is a key area of responsibility for tech companies

Our Focus

Expanding the Pipeline

Bridging the socio-economic divide to support computer science education and innovation for all students.

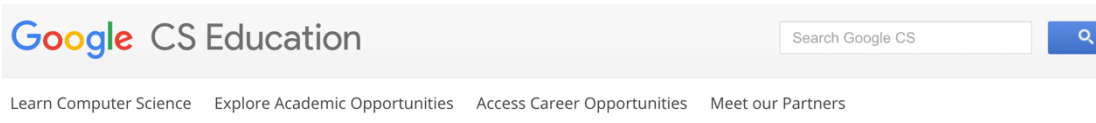
Equipping students with technical skills

Equipping the next generation with the skills required to be creators, and not just consumers, of technology, and to solve real world problems, whatever their passion.

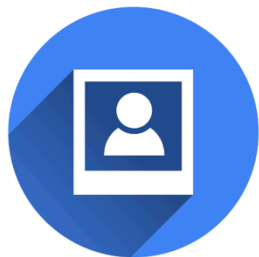
Advancing teaching and learning in CS

Developing high-quality learning programs, tools and resources to empower teachers. Advancing research supporting improvements and new approaches in teaching & learning.

Our New CS Education Website



Computer science (CS) education is a pathway to innovation, to creativity and to exciting career opportunities. We believe that all students deserve these opportunities. That is why Google is committed to developing programs, resources, tools and community partnerships which make CS engaging and accessible for all students.



Learn
Computer
Science



Explore
Academic
Opportunities



Access Career
Opportunities



Meet our
Partners

CS First

Empowering all students to create with technology through free computer science clubs.

Program Impact to Date:

- 15,800 clubs
- 449,700+ students(45% female, 54% URM)
- 28% desirable increase with statement: Do you like programming?
- 36% desirable increase with statement: People like me are good at computer science.

Program Objectives:

- Increase confidence when using computers
- Grow perseverance when tackling difficult coding problems
- Provide a sense of belonging in tech for underrepresented students
- Demonstrate the impact that CS has in careers and communities
- Teach basic CS concepts like sequencing, variables, conditionals, loops, events, and lists



cs-first.com

Exploring Computational Thinking

A curated collection of more than 130 lesson plans aligned to international standards. It promotes computational thinking throughout the K-12 curriculum to improve and enhance teaching and learning.

Program Impact to Date:

- 309,228 site visits in 2015 (249% increase over previous 3 months)
- 22,277 instructional material downloads
- 56,513 views of new CT videos

Program Objectives:

- Provide a better understanding of CT for educators and administrators
- Support those who want to integrate CT into their own classroom content, teaching practice, and learning.



[google.com/edu/
computational-thinking/](https://google.com/edu/computational-thinking/)

Computational Thinking Course

The “Computational Thinking for Educators” online course introduces computational thinking to educators so that they can integrate, apply, and share Computational Thinking concepts across multiple academic subjects.

Program Impact to Date:

- 389,193 lesson pageviews
- 40,498 pageviews complete to the final content
- 22% completion rate (2nd highest Google course)
- 3,500 educators participated in community

Program Objectives:

- Help educators learn about computational thinking (CT)
- How it differs from computer science
- How it can be integrated into a variety of subject areas

Computational Thinking



for Educators

CS4HS

An annual grant program promoting computer science education through teacher development world wide.

Program Impact to Date:

- 677 workshops/courses globally
- 40,487 teachers receive professional development
- 2M students impacted



cs-first.com

Program Objectives:

- Improve computer science teaching and learning
- Support universities, colleges, and nonprofits dedicated to providing exemplary CS PD
- Support the development of local communities of practice to drive and support implementation and ongoing innovation in the classroom
- Support collaborative partnerships across educational levels

Google Programs to Inspire Girls

CS Education Outreach with a focus on Girls.

Online:

Made with Code - Inspirational stories, fun resources to start learning, opportunity finder.

- Total unique visitors 12M+ site visit
- 8.6M+ coding engagements

Interfacing directly with female engineer role models:

Girls@Google

- Visits to Google offices to learn about careers in engineering
- Peer mentoring programmes to equip girls who are passionate about CS to inspire their fellow students
- Summer camp: 4 hours per week over the 12 weeks to develop beginners' skills and help prepare girls for competitions (IL)
- 2014: 5000 girls reached across 7 countries



Made
w/
Code

madewithcode.com

Blockly [\(https://developers.google.com/blockly/\)](https://developers.google.com/blockly/)

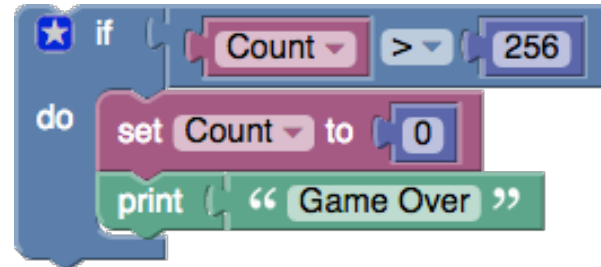
Create a visual, block-based editor that can be used for independent learning or integrated into web applications.

Program Impact to Date:

- Powers Scratch (12.7M users)
- Powers Made with Code (12M users)
- Powers MIT's App Inventor (3M users)
- Code.org Hour of Code (2M users)
- Powers Blockly Games (2M users)

Program Objectives:

- Enable easy creation of 3rd party educational applications
- Establish a common programming UI across these applications
- Encourage smooth transition from block-based coding to text-based coding
- Blockly and Blockly games are available in many languages.
- Supports RTL



developers.google.com/blockly

blockly-games.appspot.com

Pencil Code (<https://pencilcode.net/>)

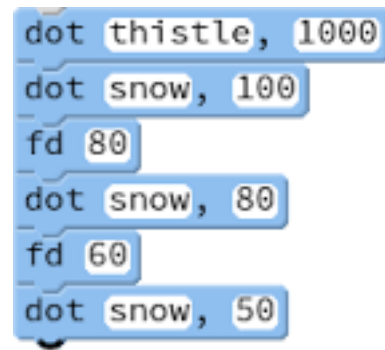
Provide an educational free and open source IDE to bridge the gap between programming as it is taught to beginners and programming as it is done in an authentic CS community of practice.

Impact

- 451,149 pageviews in the last three months
- 8,288 pageviews for the new Teacher Manual in the last three months
- 4246 downloads of new Teachers manual in the last three months

Program Objectives:

- Encourage creativity and exploration through programming
- Support bimodal visual and text coding
- Facilitate transition from block to text-based programming
- Introduce jquery using a turtle library
- Introduce coffeescript, javascript, html, and css



Mission: Addressing the retention problem in diverse student populations at the undergraduate level.

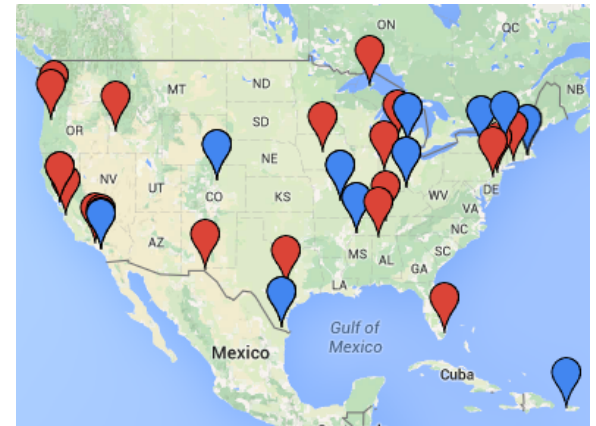
Program Impact to Date:

- 70+ university programs run (US and Canada)
- >1,000 students engaged in providing and receiving mentoring (77% URM and 65% female)
- >3,500 K-12 students mentored
- Increased confidence in CS for > 74% of participating undergraduate students
- 98% said igniteCS has had meaningful impact of the community

Program Objectives:

- Provide funding and support to groups of undergraduate students implementing near-peer computer science mentoring in their local communities
- Better understand the retention challenges facing underrepresented groups in CS

IgniteCS Programs



Everything Could Change in the Next Six Months

- CS4All in growing number of states and districts
- Revised CSTA standards
- Code.org/CSTA K-12 CS Framework
- Efforts to provide real federal funding for CS education
- The next president
- The next federal budget



What Should Oregon Be Doing

- Continue to support CS PD events with funding
- Update state standards
- Encourage schools to teach the new AP Computer Science Principles course
- Provide incentives for teachers to upskill their knowledge and pedagogy
- Look at integrating computational thinking concepts and practices at the elementary and middle school level

Thank You!

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<https://www.google.com/edu/cs/>