CS 10K and CS Principles: Towards Increased Participation in CS

Grace Hopper 2011

Amy Briggs, Professor of Computer Science
Middlebury College
Co-PI, CS Principles Project
CSPrinciples.org
CS Principles

- A rigorous, creative, alternative new first course in computer science for HS and college
- Introduce central ideas of computing
- Computational thinking practices
- How computing changes the world
- Engage and emphasize creativity

Appeal to a broad audience through content and pedagogy
CS Principles Commission

- Don Allen, Troy High School, CA
- Christine Alvarado, Harvey Mudd College
- Stacey Armstrong, Cypress Woods High School, TX
- Owen Astrachan, Duke University (PI)
- Charmaine Bentley, FDR High School, Dallas, TX
- Amy Briggs, Middlebury College (Co-PI)
- Mark Guzdial, Georgia Institute of Technology
- Rich Kick, Newbury Park High School, CA
- Jody Paul, Metropolitan State College of Denver
- Chris Stephenson, CSTA
CS Principles Advisory Group

- Duane Bailey, Williams
- Tiffany Barnes, UNCC
- Gail Chapman, CSTA
- Tom Cortina, CMU
- Stephen Edwards, Virginia Tech
- Dan Garcia, Berkeley
- Joanna Goode, Oregon
- Susanne Hambrusch, Purdue
- Michelle Hutton, CSTA
- Deepak Kumar, Bryn Mawr
- Jim Kurose, U Mass
- Andrea Lawrence, Spelman

- Richard Pattis, UC Irvine
- Eric Roberts, Stanford
- Katie Siek, U Colorado Boulder
- Beth Simon, UC San Diego
- Larry Snyder, U Washington
- Lynn Andrea Stein, Olin
- Fran Trees, Drew University
- Lien Diaz, College Board
- Cameron Wilson, ACM
- Jan Cuny, NSF
- Kathleen Haynie, Ext Evaluator
Project Timeline – past + present

• 2009-10
  – Big Ideas, Practices, Claims/Evidence

• 2010-11
  – Pilot I: Five colleges
  – College Curriculum Survey
  – College attestation/support

• 2011-12
  – Pilot II: 10+ colleges, 10+ high schools
  – Assessment of prototype test items
Project Timeline – future

• 2012
  – Pilot III: small group, high school and college
  – Portfolio-based assessment
  – Curriculum Framework finalized

• 2013 –
  – Develop exam and course
  – Professional development

• 2015-16 (?)
  – AP Course and Exam
College Curriculum Study (2011)

- Sampling plan included 100+ institutions
- Professors rated importance of evidence statements for 117 student learning objectives

Attestation process (2011)

- College credit and/or placement
- Over 80 college departments attested
Evidence-Centered Design

Big Ideas (Content) \times Computational Thinking Practices (Skills)

Claims (Student Learning Objectives) + Evidence (specific evidence of claims)
Big Ideas

1. Computing is a creative activity
2. Abstraction
3. Data and information
4. Algorithms
5. Programming
6. The Internet
7. Global impacts of computing
Computational Thinking Practices

1. Connecting computing
2. Developing computational artifacts
3. Abstracting
4. Analyzing problems and artifacts
5. Communicating
6. Working effectively in teams
A sample learning objective under Algorithms:

Learning Objective 18:
The student can evaluate algorithms analytically and empirically.
Learning Objective > Evidence statements

Student work is characterized by:

18a. Evaluation of an algorithm’s efficiency, correctness, or clarity.
18b. Location and correction of errors in an algorithm.
18c. Explanation of how an algorithm functions.
18d. Explanation of how different correct algorithms for the same problem can have different efficiencies.
CS Principles Pilot Expectations

• Develop and implement a recruitment plan – special focus on enrollment of women and under-represented minorities
• Participate in pre and post surveys
• Develop syllabus aligned to course content
CS Principles Pilot 1 Sites

- UNC Charlotte: Tiffany Barnes
- UC Berkeley: Dan Garcia & Brian Harvey
- Metropolitan State College of Denver: Jody Paul
- UC San Diego: Beth Simon
- University of Washington: Larry Snyder
CS Principles Pilot 1 Highlights

• Diverse student populations – each site was unique in potential student recruitment

• Diverse class size: ranged from 20 to 600+ students in a given pilot classroom

• Diverse set of tools and languages that were used in pilot classrooms, e.g., Alice, Scratch, Python, etc.
# CS Principles Pilot 2 Sites

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<thead>
<tr>
<th>High School, teacher</th>
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<tbody>
<tr>
<td>North Gwinnett HS - Deepa Muralidhar</td>
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<td>Northside College Prep and Chicago Lab HS - Don Yanek, Baker Franke</td>
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<td>Greater Hartford Academy of Math and Science - Chinme Uche</td>
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<td>Booker T Washington Magnet HS - Bill Cowles</td>
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<td>Springdale HS - Marilyn Sue Carrell</td>
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<td>S Philadelphia HS - Anne Urevick</td>
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<td>West HS - Andrew Kuemmel</td>
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<td>Patrick Henry HS - Rebecca Dovi</td>
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<td>Newbury Park HS - Rich Kick</td>
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<th>Partnered University, contact</th>
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<tr>
<td>Georgia Tech - Charles Isbell</td>
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<td>Illinois Institute of Technology - Matthew Bauer</td>
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<td>Trinity College - Ralph Morelli</td>
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<td>U of Alabama - Jeff Gray</td>
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<td>U of Arkansas at Little Rock - Remzi Seker</td>
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<td>U of Pennsylvania - Jean Griffin</td>
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<td>U of Wisconsin, Madison - Andrea Arpacidusseau</td>
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<td>Virginia Tech - Manuel Perez-Quinonez</td>
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<td>Stanford University - Nick Parlante</td>
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*GHC 2011, Portland, 11.10.11*