Piloting CS Principles: A First Hand Experience by K-12 Teachers

http://csprinciples.org
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The computing community in the U.S. faces three significant and interrelated challenges in maintaining a robust IT workforce.

1. Underproduction
2. Underrepresentation
3. Lack of a presence in K-12 education
Computing is significantly under producing postsecondary degrees
Overall student interest in computing is very low, but especially in females:
And computing has a long standing underrepresentation of minorities.

URMs receive just:
10.6% of undergrad,
4.8% of master’s, and
3.6% of Ph.D.s
degrees in computing.  —Taulbee Data, 2011
Computing does not have a presence in K-12.

The percentage of U.S. high school students taking STEM courses has increased over the last 20 years across all STEM disciplines except computer science where it dropped from 25% to 19%.

—2009 NAEP High School Transcript Study

- NCAA doesn’t count CS courses in eligibility for college sports
- No state requires a CS course for graduation.
- Only 14 states use a reasonable number of CSTA’s K-12 standards
- Just 9 states count CS a math or a science
- In 2011, only 17,413 students took the AP CS test, 267,772 took calculus, 144,984 took biology, 142,910 took statistics
- AP CS A has the worst gender balance of any of the AP tests
The **CS 10K Project** aims to transform computing in high school.
The CS 10K Project is centered on two new courses: Exploring Computer Science (ECS) and a new Advanced Placement course, called *CS Principles (CSP)*.

### Why AP?  
- Often the only CS course that carries college prep credit  
- Attractive to students & schools  
- 2,000 CB-audited teachers  
- Single point of national leverage  
- Fidelity of replication

### Why ECS?  
- Non-AP (seen by some as less intimidating)  
- Broad Ideas  
- College prep & CTE credit
The computing community supports the development of the CS Principles course, and has moved it past milestones.

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
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<tbody>
<tr>
<td>2009-2010</td>
<td>✔ Course framework</td>
</tr>
<tr>
<td>2010-11</td>
<td>✔ Pilot I: Five colleges</td>
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<tr>
<td></td>
<td>✔ College Survey</td>
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<tr>
<td></td>
<td>✔ College attestation/support</td>
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<tr>
<td>2011-12</td>
<td>✔ Pilot II: ~20 colleges, ~40 high schools</td>
</tr>
<tr>
<td>2012-</td>
<td>Train 500 teachers, Summer</td>
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<td></td>
<td>NSF has made six ~$1M Awards for PD and will make another round of Awards upcoming</td>
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CS Principles Big Ideas

- Creativity
- Abstraction
- Data
- Algorithms
- Programming
- Internet
- Impact
CS Principles is focused on the fundamental concepts of computing; it is rigorous but engaging, accessible, and inspiring and focuses on problem-solving.

“Seriously, why doesn’t everybody take computer science??”

—CS Principles Student
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Internet Scavenger Hunt

Generating Binary Coding Trees

Individual projects
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North Gwinnett High School, Gwinnett GA

Georgia CSTA Cohort Leader
CS Principles in my classroom

- Problem Solving
- Logic Development
- Impact of computer science in society
• Group Projects: Open Ended

• STUDENT SAMPLES
  – Big Idea III: Data

  – Final Project: Flash based project
How to market consumables to teenagers as their tastes in style change.
Sample Size = 22 students

Q1: Do you wear the same pair of shoes every day?

Q2: What is your shoe preference from the following brands: Nike, Adidas, Puma, or Other (a brand not listed)?

Q3: Would you like shoes with laces or no laces?

Q4: Do you prefer style over comfort or would you want both?
• Give them the tool
or
• Give them the topic

Always:
• Give them rubrics
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Baker’s CS Principles Tips

1. **DO NOT**
let it turn into a programming course

2. **REMEMBER**
CS Principles is supposed to be a game changer

3. **DESIGN**
projects/activities that cover as many learning objectives as possible.
Early Course Example

• Homework: what is #hashtagging?"

  Where did it come from?
  Who invented it?
  Why does it exist?

• Write your answers in a discussion on Piazza
Read chapter 1

Instead of taking notes in the margins, write hash tags

How would you hash tag this?
Early Course Example

Mode: User's name will be logged and shown with answers

Enter the 10 (exactly 10) tags you want to use from the Rushkoff reading.
Enter each tag on its own line.
evolution_of_technology
computing
Rushkoff
doom_and_gloom
misuse_of_technology
technological_shift
passivism
digital_technologies
program_or_be_programmed
a_design_for_our_collective_futures
- Control_panel
Civilization
Freedom_of_Choice
blueprint_future
collaboration
new_world
accentuation
networking
fresh_education
culture_god
- shaping_the_world
living_computers
future
shared_thinking
short_attention
new_victims
impossible
why
evil_computers
future_of_tools
- programming
history
digital_influence
virtual_power
progress
domination
get_results_fast
surprise
unexpected_disconnection
computer_generation
- program
tool
digital_caution
- digital_life
cybernetic_organism
doom_and_gloom
raise_the_stakes
ignorance
- control
more_than_tools
blueprint
our_future
shared_thinking
bounty_of_information
intuitively_multitask
backfired
opportunity
conscious_participants
- tech_progression
computer_control
computers'_societal_influence
consent
disincentives
conformity
destroying_opportunities
vapid
programming_participation
automatic_access
- bounding_technology
emerging_absolute_necessity_of_computing_literacy
dire
similar_but_different
light_at_the_end_of_the_tunnel
emergent_phenomena
consequences_of_uninformed_evolving_language
internet_usage
lack_of_organization_in_online_living_organisms
society
understanding_breeds_ability
take_control
- language
key_to_future
animal
shared_thinking
collaborative_participation
technological_evolution
information_quality
juvenile_focus
technological_substitutions
digital_technologies
- societies_control_panel
blueprint
networked_activity
axial_age
new_medium
elite
configurable_nervous_systems
wikipedia_is_the_answer
program_or_be_programmed
digital_world
- #No_Child_left_behind
#dualism_of_Knowledge
#control_our_world
#program_our_future
#Robots_by_2012
#baby_genius_in_control
#Dr.Who
#APOCALYPTIC
#1984
#blogging_over_action
-
- extension_of_consciousness
- digital_literacy
digital_reality
digital_future
cultureCreators
faceless_social_media
social_media_values
internet_society
collective_future
digital_culture_shift
spineless_social_media
digital_collective_consciousness
- literacy
human_programming
software
user
creator
life
molding_technology
chaos
rooted_in_technology
the_matrix
9/9/11 Wordle Assignment

Rushkoff's introduction summarized in a Wordle.

As defined at TeachingHistory.org, Wordle is a "program that generates a word cloud—a graphic that amplifies font sizes of words based on how frequently they are used in the material you've provided."

This Wordle is a digital summary of the key concepts proposed in the introduction to Rushkoff's book, *Program Or Be Programmed* as defined by the CS Principles class. The
Websites:

- **CS Principles:**
  - [http://www.csprinciples.org/](http://www.csprinciples.org/)

- **Rebecca Dovi:**
  - [http://supercomputerscience.blogspot.com/](http://supercomputerscience.blogspot.com/)
  - [http://hcps.us/phhs/comsci/cs_principles.htm](http://hcps.us/phhs/comsci/cs_principles.htm)

- **Baker Franke:**
  - [http://tinyurl.com/brugow2](http://tinyurl.com/brugow2)

- **Rick Kick:**
  - [https://sites.google.com/a/conejo.k12.ca.us/rkick/Home/csprinciples](https://sites.google.com/a/conejo.k12.ca.us/rkick/Home/csprinciples)

- **Deepa Muralidhar**
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