It's Time to Weave Computational Thinking into K-12

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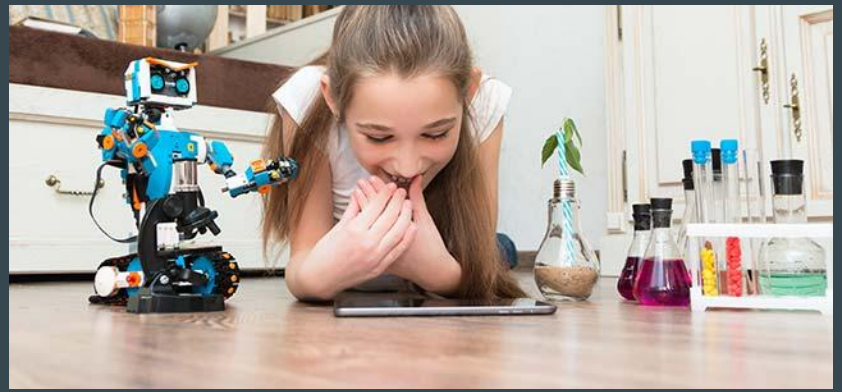
What is Computational Thinking?

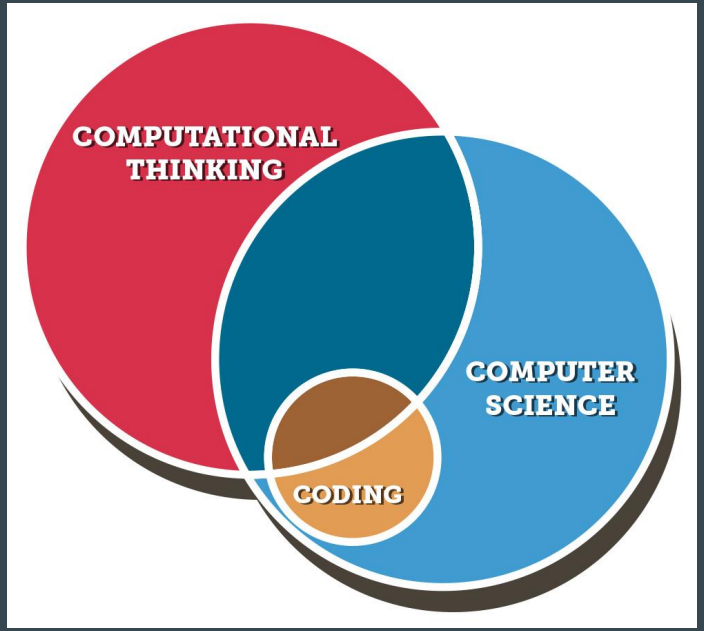
- Problem solving!
- Gathering and organizing data
- Creating algorithms
- Creating computational models to simulate complex situations
- Studying computational models to draw conclusions



It is “a way of solving problems, designing systems, and understanding human behavior that draws on concepts fundamental to computer science.”

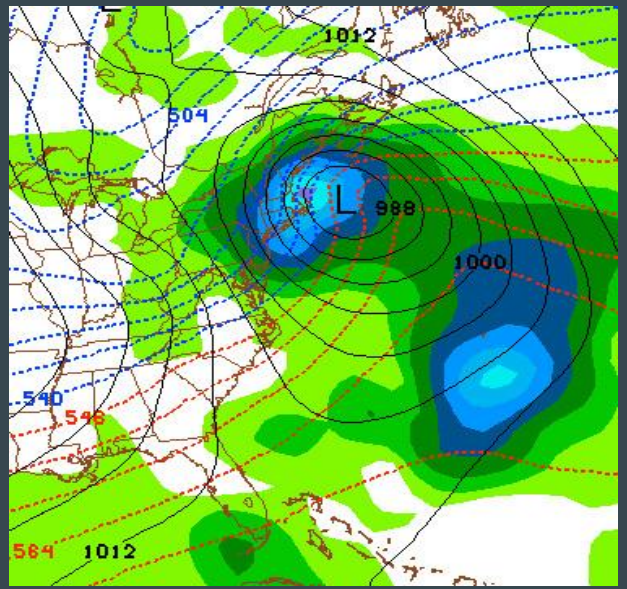
“The skill required to tell a computer what to do is programming. The thought process behind programming is computational thinking. What it isn’t is humans thinking like computers.”

Computational Thinking and CS are related, but NOT the same

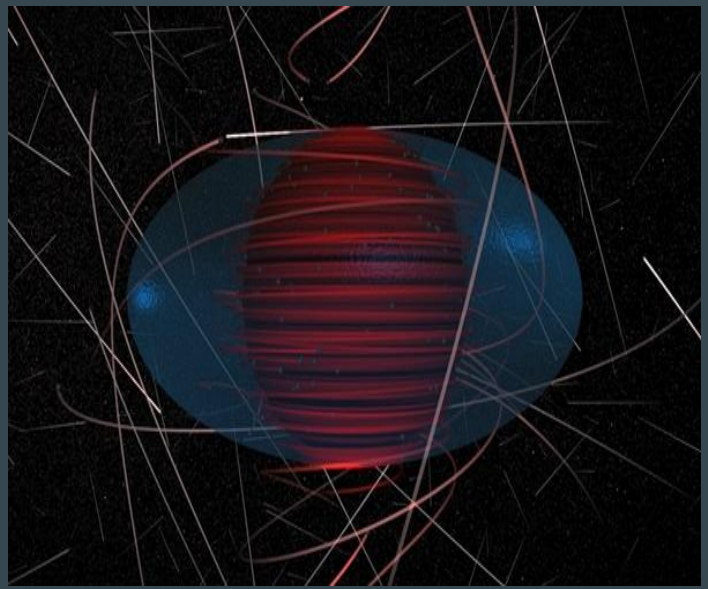


Examples of Applications

Weather Predictions



Study of Black Holes



Computational Thinking Initiatives™

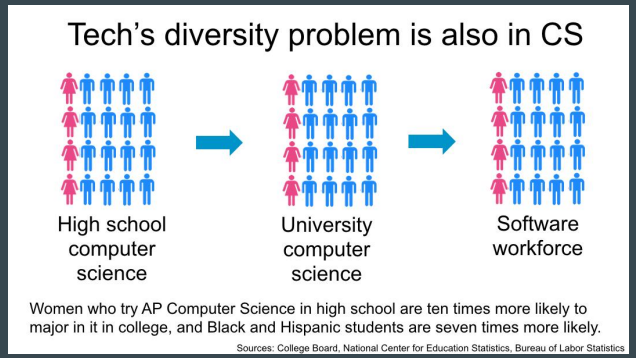
There happen to be a lot of people who care about this issue.

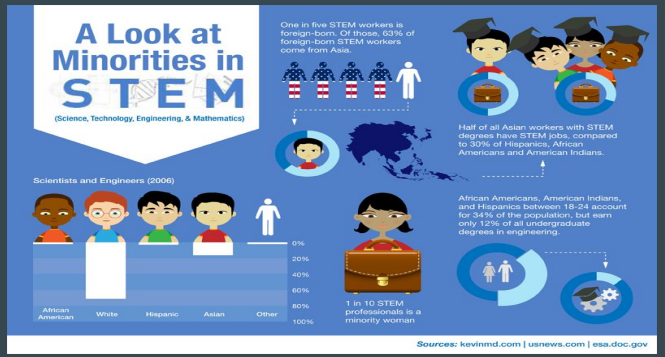
Why do we need to teach it?

- Technology is changing how we live and work
- Kids begin using technology at a very young age
- Movement towards children coding
- Eventually all jobs will require basic coding skills

Why this may be problematic

- Too much of a “career-centered” education for young children
- No centralized standard in schools
- Beneficiaries of this new initiative may reinforce the pre-existing profile of the “professional programmer”
    - For example, if not all schools get equal opportunities to implement these programs due to economic divides
- Worries it could take away from other subjects





Solutions

Computational thinking can be integrated into all subjects taught in schools.

With the emphasis on equity, this can actually help groups who are historically underrepresented (i.e. women, cultural minorities) make their impact on the STEM field.

girls who code

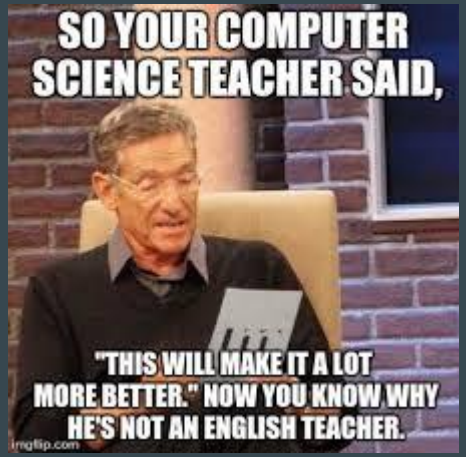
black girls CODE
imagine. build. create.

CODE NOW

One More Problem...

In order to do this, we need capable teachers.

Not only do we need CS teachers to understand computational thinking, but teachers from ALL subjects to understand and incorporate it as well.



Solution: Implementation of Microcredentials

- Key elements of Computational Thinking:
  - Creating Computational Models
  - Creating Algorithms
  - Developing Computational Literacy
  - Understanding Systems with Computational Models
  - Working with Data
- Pedagogical practices
  - Creating an Inclusive environment
  - Using Computers as Tools for Thinking
  - Assessing Computational Thinking
  - Integrating Computational Thinking into Curriculum
  - Selecting Appropriate Tools for Computational Thinking

Moving Into The Future...

- Goal: integrate computational thinking into the fundamentals of K-12 education
  - Will require interdisciplinary corporation
  - Will result in a cultural shift
- Eventually all educators and schools will appreciate the importance of computational thinking
- Create more opportunities for youth through the creation of nonprofits, specialized schools, and passionate individuals!

What is happening in our own backyard

- Carnegie Mellon - Center for Computational Thinking
  - “Exploring Computer Science” course was tested in the UCLA unified school district
  - Course of teaching materials and lesson plans for 1 complete year
- Student activists
  - Ex. Society of Women Engineers
    - Lobbying Trips

Resources

December 6, 2017 | by Colin Angevine. “Advancing Computational Thinking Across K-12 Education.” *Digital Promise*, 6 Dec. 2017, digitalpromise.org/2017/12/06/advancing-computational-thinking-across-k-12-education/.

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Questions?