Programming is Cool Again

The Beauty and Joy of Computing

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Berkeley UNIVERSITY OF CALIFORNIA

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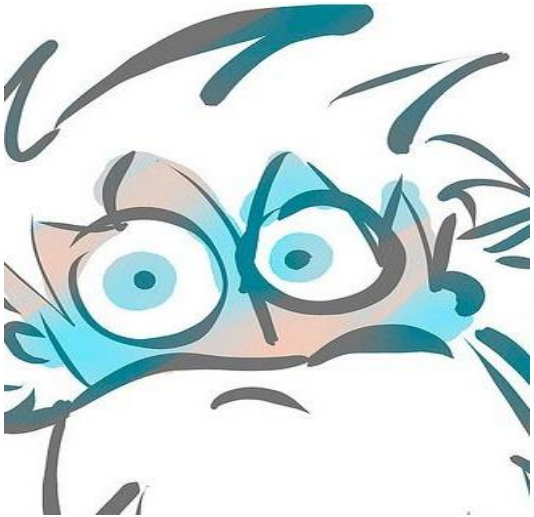
The Old Conventional Wisdom



- “Girls and minorities are seriously underrepresented in computer science.” **(**True!**)**
- “That’s because programming is thought to be nerdy, isolating, and irrelevant.” **(**Not any more!**)**
- “Therefore, to attract girls and minorities we have to define computer science in a way that deemphasizes programming.” *(NO!)*

CS Principles

Computational Thinking Practices

- Connecting Computing
- Creating Computational Artifacts
  (does this mean programs?**)**
- Abstracting
- Analyzing Problems and Artifacts
- Communicating
- Collaborating

Big Ideas

- Creativity
- Abstraction
- Data and Information
- Algorithm
- Programming
- The Internet
- Global Impact

Things have changed!

girls who CODE

Programming 4 Girls

Encouraging girls to explore computer science

black girls CODE

imagine. build. create.

GIRLS TEACHING GIRLS TO CODE

HOUR OF CODE

Made w/ Code Google

SCRATCH *uses* visual metaphors *to teach computer science ideas*

This is a *loop.* The arrow pointing back to the top is a subtle hint.

This *event* block can be used only at the top of a script.

This hexagonal yes-or-no question block...

... fits into this hexagonal slot in the IF block.

uses visual metaphors to enable learning of more advanced ideas

For example, the idea of *function as data* is considered difficult partly because it looks mysterious and painful in text-based programming languages:

```
>>> [round, (lambda x: x+3), len]
[<built-in function round>, <function <lambda> at 0x1005ed938>, <built-in function len>]
```

```
STk> (list round (lambda (x) (+ x 3)) length)
(#[closure arglist=(x) 278e30] #[closure arglist=(x) 2e41f4] #[subr length])
```

uses visual metaphors to enable learning of more advanced ideas

But in a graphics language, if you already know that 

is a function, and 

is a list, then this is much easier to interpret even without teaching:

The Moral: Programming is...

- ...motivating! **(**Programmers were the first “makers.”**)**
- ...at the *heart* of computer science. (All that stuff about algorithms, data, and abstraction is to help us program better.)
- ...no longer intimidating, especially in visual languages.
- ...valuable in every subject. (When kids write *programs* about fractions, or about parts of speech, or about the Trail of Tears, they have to understand the topic before they can write a program about it.)
- ...empowering, especially for generally-disenfranchised students, because the locus of control shifts to the learner.

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(But there's lots more to learning than just STEM or computers.)

- You know this already, but there's a lot wrong with schools that has nothing to do with technology:
  - boring curriculum
  - jumping through hoops
  - high stakes testing
  - etc.

  These issues can be addressed only by changing how the institution of school views kids: as real people now, not as future adults. **(**This is not an attack on teachers individually.**)**
- Computers can help *because* they don't impose a curriculum; the computer rather than the teacher is the judge of success; the programming culture *expects and cherishes* bugs **(**imperfect first attempts**)**.
- Let's not get in the way with *too much* curriculum.

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