CONNECTED CODE
A New Agenda for K-12 Programming in Classrooms, Clubs, and Communities

Yasmin B. Kafai
University of Pennsylvania
AGENDA for K-12 Education

- Computational Thinking
- Participation
- Broadening
- Deepening
- Participation
PART 1
Computational Thinking
Computational Participation
Computational thinking
Computational thinking involves solving problems, designing systems, and understanding human behavior by drawing on the fundamental concepts of computer science. Wing (2006)
“Everybody in this country should learn how to program a computer... because it teaches you how to think.”
Literacy as Adaptation

Literacy as Power

Literacy as Grace

Sylvia Scribner (1984)
“Literacy in Three Metaphors”
Adaptation  
On a **functional** level, a basic understanding of code allows for an understanding of the design and functionalities that underlie all aspects of interfaces, technologies, and systems we encounter daily.

Power  
On a **political** level, understanding code empowers and provides everyone with resources to examine and question the design decisions that populate their screens.

Grace  
Finally, on a **personal** level, everyone needs and uses code in some ways for expressive purposes to better communicate, interact with others, and build relationships.

Kafai & Burke (2014)
From Computational THINKING

To Computational PARTICIPATION
MINDSTORMS
Children, Computers, and Powerful Ideas
All about LOGO—how it was invented and how it works

SEYMOUR PAPERT

Personal
Social
Cultural
“[Constructionism] then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity whether it’s a sand castle on the beach or a theory of the universe.”

(Papert, 1991, p.1)
“These are not schools as we know them; they are social clubs with memberships that may range from a few hundred to many thousands. Each club owns a building, a place for dancing and getting together. ... During the year each samba school chooses its theme for the next carnival, the stars are selected, the lyrics are written and rewritten, and the dance is choreographed and practiced. **Members of the school range in age from children to grandparents and in ability from novice to professional. But they dance together and as they dance everyone is learning and teaching as well as dancing.**”

Papert, 1980, p. 178
“Since, increasingly, computers are the tools people use to write, to design, to play with ideas and shapes and images, they should be addressed with a language that reflects the full range of human experiences and abilities. Changes in this direction would necessitate the reconstruction of our cultural assumptions about formal logic as the ‘law of thought’. ... Epistemological pluralism is a necessary condition for an inclusive computer culture.

Turkle & Papert, 1990, p. 88
From Computational THINKING

To Computational PARTICIPATION
Personal From Code to Applications

Social From Tools to Communities

Cultural From Scratch to Remix

Computational Participation
Project: k2b
---------
Stage
Costumes (0):
  blank (480x360)
  OutdoorTennisCoup (480x360)
  DanceHall1 (480x360)
  Graffiti1 (480x360)
  Graffiti2 (480x360)
  street (480x360)
  trees (480x360)
  sun space (480x360)
Sounds (1):
  pop (800:100)
Stacks (1):
  when green flag clicked
    forever
      set costume to "OutdoorTennisCoup"
      wait 15 secs
      set costume to "DanceHall1"
      wait 15 secs
      set costume to "Graffiti2"
      wait 15 secs
      set costume to "Graffiti3"
      wait 15 secs
      set costume to "street"
      wait 15 secs
      set costume to "Graffiti5"
      wait 15 secs
      set costume to "Graffiti5"
      wait 15 secs
      set costume to "sun space"
    end

Personal From Code to Applications
Personal From Code to Applications
Social From *Tools* to Communities
Social From Tools to **Communities**
Cultural From Scratch to Remix
Cultural From Scratch to Remix

Monroy-Hernandez, 2012
Computational participation sees problem solving, designing systems, and understanding human behavior in the context of computing **not as an individualistic act but as a communal practice that allows for participation in networked communities**. Kafai & Burke (2014)
PART 2

Broadening Participation

Deepening Participation
Deepening Access
Deepening Activities
Deepening Communities
DEEPENING PARTICIPATION
Programming as Participation

Community statistics at a glance

- 5,506,335 projects shared,
- 3,298,289 users registered,
- 26,736,388 comments posted,
- 428,804 studios created

...and growing!
5000 users  Random Sample January – March 2012

Browsers
2775 leave no traces
(55%)  

Creators
2225 post projects
(45%)  

Low network
Downloader
Commenters
Networkers
High network

Programming as Participation

Fields, Giang & Kafai (2013)
Programming as Participation

Creators 2225 post projects (45%)

January
- Low network
- Down-loaders
- Commenters
- Networkers
- High network

February
- Low network
- 89.6% likelihood
- Commenters
- Networkers
- High network

March
- Low network
- 64.4% likelihood
- Commenters
- 29.7% likelihood
- Networkers
- 5.9% likelihood
- High network

Fields, Giang & Kafai (2013)
January 2012

Loops	Booleans	Operators	Broadcast	Variables

Programming as Participation

Fields, Giang & Kafai (in preparation)
## Deepening Participation

<table>
<thead>
<tr>
<th></th>
<th>BY CHOICE</th>
<th>BY DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scratch</td>
<td>School</td>
</tr>
<tr>
<td><strong>Joining</strong></td>
<td>Hard if you are Newcomer</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Participating</strong></td>
<td>Girls only in low numbers</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
<td>Only Top 5% Engage and Program</td>
<td>?%</td>
</tr>
</tbody>
</table>

Deepening Participation
Deepening Activities
Electronic Textiles
Deepening Access
Deepening Activities
Deepening Communities
HackyBird
Stitch & Assist

www.stitchfest.org

http://2014f.pennapps.com
Architects and city planners realized some time ago that it was the citizens who needed a voice in urban planning if cities were to become livable places again. Now it is computer scientists and educators who must come to realize that citizens also need to have a voice in computation to make the digital publics a livable space for all.

Kafai & Burke (2014)