CREATING INCLUSIVE CS PROGRAMS FOR YOUTH
Libraries Can Influence Girls’ Participation in Computing

Lecia Barker, National Center for Women & Information Technology (NCWIT)
Claudia Haines, Youth Services Librarian, Homer Public Library
Overview

What social influences affect young person's choices to study computing?

How can libraries support reform through strategic recruiting?
   Create messages
   Reach out and raise visibility
THE VALUE OF DIVERSITY TO COMPUTING

- Promotes equality
- Reflects user/consumer base
- Enhances innovation
- Expands the qualified employee pool
- Improves the bottom line
PROJECTED EMPLOYMENT FOR 2026

INTENDED MAJORS, 2017

Data Source: UCLA Higher Education Research Institute, 2019
INTENTIONS DON’T MAP WELL TO DEMAND

2017 Intentions

- Biology
- Business
- Health Professions
- Engineering
- Social Sciences
- Arts/Humanities
- Other
- Undecided
- Computer, Math 6.2%

2026 Demand

- Healthcare Professions
- Management
- Education/Library
- Financial Ops
- Engineering
- Arts
- Legal Sciences
- Social Svcs
- Computer, Mathematical 14%

Source:
- HERI
- BLS
COLLEGE FRESHMEN SHOW DIFFERENT PATTERNS OF INTENDED MAJOR FIELD (2017, 4-YEAR COLLEGE ONLY)

Data Source: Higher Education Research Institute, UCLA; N=120,357 students at 168 colleges and universities
REASONS GIRLS DON’T TAKE ADVANTAGE OF OPPORTUNITIES TO LEARN COMPUTING
OCCUPATIONAL CHOICE

• Choosing an *occupational identity* – not just pursuing interests
• Identity is shaped by gender, ethnicity, class, sexuality, age, ability status, personality, and later in life, occupation
• Some occupations are “gendered”
OCCUPATIONS CAN HAVE A BAD REPUTATION

Computing

• Work alone
• “Sit in a cubicle all day”
• Work on a computer only
• Difficult pathway into the field
• Not creative

Harris Interactive. 2004; Knight & Cunningham, 2004; Committee on Public Understanding of Engineering Messages, 2008; Barker, Snow, Garvin-Doxas, & Weston, 2006; Corbett & Hill, 2015; Margolis & Fisher, 2002
When an occupation’s public image is especially negative or does not align with a person’s personal or social identity or interests, it becomes especially unlikely that a person will participate in learning activities needed to pursue that career.
UNCONSCIOUS BIASES AND STEREOTYPES SHAPE OUR EXPECTATIONS FOR SELF AND OTHERS

INFLUENCERS COMMUNICATE BELIEFS ABOUT CAREERS AND ABOUT WHO IS CAPABLE

Adults, other kids share these perceptions and pass them along to youth, explicitly or implicitly.

Parents communicate gender schemas

- Sons: Plan for future family responsibilities
- Daughters: Be happy in career choice

Stereotyping is reinforced, repeated at school, home, in the media.

*Kids understand gender expectations and roles by age 10*

Yasar, Baker, Robinson-Kurpius, Krause, & Roberts, 2006; Bregman & Killen, 1999; Corbett & Hill, 2015; Blum, Mmari, & Moreau, 2017
“I’m only creating the design ideas,” Barbie says, laughing. “I’ll need Steven’s and Brian’s help to turn it into a real game!”
Children quickly pick up that computer science is a job men do.

- When students conjure up an image of a computer scientist, they tend to imagine a male who is unattractive, pale and thin, and wearing glasses (Mercier et al. 2006).

- 1st graders in a recent study—girls and boys alike—thought boys were better at programming and robots. (Masters, et al, 2017)

"Stereotypes get inside our heads in subtle ways. When you see a computer scientist on television or in a book, it's usually a man—probably a white man or an Asian man," said Master. "Every little instance of that builds up into these big stereotypes inside our heads. To counteract them is very, very difficult."

— UW psychologist Allison Masters
THESE BELIEFS ARE DIFFICULT TO DISLODGE

• These subtle, pervasive messages can become deep-seated, unconscious beliefs that seem to represent the natural order of things.

• Confirmation bias – we interpret new information through the lens of what we already believe.

Jonas, Schulz-Hardt, Frey, & Thelen (2001)
HOW DO WE EXPLAIN DIFFERENCES IN PARTICIPATION IN COMPUTING EVENTS?

• Misconceptions about occupations
• Occupational choice is linked implicitly to unconscious beliefs about identity – not just interest
• Identity is shaped by cultural beliefs about gender, ethnicity, class, sexuality, age, personality, and later in life, occupation
• Stereotypes and biases shape our expectations for selves and others; these are communicated everyday, repeatedly, reinforced in subtle ways
BOYS ARE MORE LIKELY THAN GIRLS TO TAKE CS CLASSES, PURSUE COMPUTING-RELATED CAREERS

- Boys are more likely to be steered toward occupations that are high paying, steady by important influencers.
- Boys are more likely to be encouraged for their mathematics skills than are girls.
- Boys desire to live up to stereotypes that boys are good at technology (that is, to perform what is considered a high status, masculine role).

Blum, Mmari, & Moreau, 2017; Google & Gallup, 2016; Jacobs, 2001
LIBRARIES CAN HELP TO DIVERSIFY COMPUTING

• Identify target audience(s)
• Messaging to address several issues: interest, confidence, belonging, and identity (ICBI)
• Reaching target audiences
WHICH GROUPS DO YOU WANT TO TARGET?
Approach, message those who can succeed – and their influencers

Articulate the prerequisite competencies for the event, if any

Family
Parents
Friends
Teachers
Counselors
Other adult leaders
Celebrities
CRAFTING MESSAGES: ICBI

Confidence

Belonging

Interest

Identity

Choice of Occupation
ICBI

Messaging should seek to address all four: identity, confidence, belonging, and identity.
TARGETED MESSAGING
PRINCIPLES, THEMES

Appeal to specific audience

• Appeal to present beliefs, goals, values
• Consider opposing viewpoints
• Consider competing goals and activities

Future impact

• Economic security
• Flexibility: industry, geographic
• Job projections
• High salaries for 4-year degree
• Can use math and science knowledge
• Job satisfaction
• Social relevance
• Challenging, problem solving
• Work with others
• Time for personal life
Interest
Create interest by describing activities that are "worth it" and let youth know they can learn

<table>
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<tr>
<th>PROS</th>
<th>CONS</th>
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= INTEREST
WHAT ARE MIDDLE SCHOOL GIRLS’ CAREER INTERESTS?

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
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<tbody>
<tr>
<td>Veterinarian/Work with Animals</td>
<td>455</td>
</tr>
<tr>
<td>Doctor</td>
<td>431</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>423</td>
</tr>
<tr>
<td>Engineer</td>
<td>227</td>
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<tr>
<td>Performance Artist</td>
<td>209</td>
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<tr>
<td>Teacher</td>
<td>208</td>
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<td>Lawyer, Judge</td>
<td>194</td>
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<tr>
<td>Forensics-related</td>
<td>141</td>
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<tr>
<td>Scientist, non-specific science</td>
<td>127</td>
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<td>Fashion- or beauty-related</td>
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<tr>
<td>Architect</td>
<td>77</td>
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<tr>
<td>Astronaut, Astronomer, Rocket Scientist</td>
<td>69</td>
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<tr>
<td>Nurse</td>
<td>68</td>
</tr>
<tr>
<td>Athlete</td>
<td>67</td>
</tr>
<tr>
<td>Marine Biologist</td>
<td>67</td>
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<tr>
<td>Writer</td>
<td>60</td>
</tr>
<tr>
<td>Designer, Interior Designer</td>
<td>57</td>
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<tr>
<td>Computer-related, Technologist</td>
<td>41</td>
</tr>
<tr>
<td>Chef</td>
<td>34</td>
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<tr>
<td>Miscellaneous</td>
<td>457</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>3,500</strong></td>
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Barker, Snow, Garvin-Doxas, & Weston, 2006
IDEAS FOR APPEALING TO KIDS’ AND PARENTS’ PRESENT BELIEFS AND GOALS
CONNECT COMPUTING TO WHAT YOUTH ARE FAMILIAR WITH
MEANINGFUL WORK THAT AFFECTS OUR WORLD AND PEOPLE
HEALTHCARE AND EDUCATION
CREATIVITY AND HUMAN POTENTIAL
DESCRIBE THE RELEVANCE OF YOUR EVENT FOR KIDS’ LIVES

“There are few activities today that do not depend on computer science.”

- Computational (fill in the blank)
- Biomedical engineering
- Digital humanities
- Tourism
- Statistics
- Video game development
...

Flexible: computing work in every industry

Source: dotdiva.org
Your teens and tweens? Observe, ask

Do a little survey

Observe the “identity statements” on t-shirts, backpacks, etc.
CAUTION: MESSAGES ARE EMBEDDED IN ACTIVITIES, ASSIGNMENTS, AND EXAMPLES
CONFIDENCE
But I can’t...
But I don’t know how...

Of course not. This woman wasn’t born knowing how to make clothes embedded with lights. She had to learn. I had to learn. You’ll have to learn. Take little steps first.
EMPHASIZE GROWTH IN INTELLIGENCE

Some students are likely to already have experience (experience ≠ intelligence)

Avoid implying that you have to be a genius

Words we use can create, reinforce, sustain beliefs.

» Intelligence praise: “Wow, you must be smart.”
» Effort praise: “Wow, you must have tried really hard.”

Dweck, 2008 and many others
Image: Andy Falconer
DESCRIBE HOW THE CLASS OR EVENT PROMOTES SUCCESS

What you do to make sure participants are successful
Interesting projects and assignments
Relevance to school, other interests

“You’d be great at this. I hope you will come.”

“This will be new for you, so you will have to work. But I think you’re up to the challenge.”
BOYS/GIRLS HAVE DIFFERENT STYLES AND EXPECTATIONS FOR COMMUNICATION

Girls more than boys

- Okay to express weakness, ask for help
- Encouraged to perform for the approval of others
- Confidence levels dependent on others
- Lack of encouragement seen as discouragement
- Discouraged from self-promotion

Boys more than girls

- Encouraged to display confidence and ability
- Independence from nurturing
- Inappropriate to express weakness

Seymour & Hewitt (1997)
DON’T MISTAKE CONFIDENCE OR EXPERIENCE FOR ABILITY

I HAVE NO IDEA WHAT I'M DOING
BELONGING
PROMOTE BELONGING AND INCLUSIVITY

Consider what relationships you have with t/weens, other departments, schools, the community

Have friends/family recruit friends/family

Use inclusive language

Set up a welcoming physical environment

Recruit in groups
  » Girl Scout troops
  » After-school clubs
  » ...
You Cannot Not Communicate
Create a welcoming environment through décor, vocabulary, humor, dress, images
IDENTITY
SHOWING AN IDENTITY THAT DOESN’T FIT THE AUDIENCE’S SELF PERCEPTION

I never asked myself if girls see themselves in the Iron Sheik.
INTENTIONALLY PROVIDE ROLE MODELS TO HELP BUILD IDENTITY

• Highlight women’s contributions to computing

• Connect to community to provide access to role models

• Demographic similarity makes it easier, but is not required

And the One City, One Story selection is...
RISE OF THE ROCKET GIRLS BY NATHALIA HOLT

CODE GIRLS
The Untold Story of the American Women Code Breakers of World War II

NEW YORK TIMES BESTSELLING AUTHORS
LIZA MUNDY
KATHERINE JOHNSON
YOU SHOULD MEET

Katherine Johnson
"...a true legend..." - Oscars®-winning author of The Good Girls Guide to Greatness"
MYTHBUSTING? GEEKS, CUBICLES, CODE MONKEYS...

May actually reinforce stereotypes

Once implanted, difficult to dislodge

“I’ve heard that before so it must be true”

“How Warnings about False Claims Become Recommendations”
www.acrwebsite.org/topic.asp?artid=250
WHAT ABOUT UNDERREPRESENTATION?

Liken computing and engineering to other fields where women and minorities have historically been underrepresented, like medicine.

Show interesting and valued contributions of women and minority computer scientists and engineers.
REACH THE AUDIENCE

- Be visible, attention-getting
- Show up at local events
- Connect current with prospective participants
- Establish personal relationships where possible
- Social media
Claudia Haines
Youth Services Librarian

Homer Public Library, Alaska
Homer Public Library

A JOURNEY THROUGH ASPIRATIONS.org

Start here!

Win Affiliate Award

Teach AspireIT Program

Enter Workforce

Win Collegiate Award

Win National Award
Summer@HPL needs your help!

Makers2Mentors

TEEN VOLUNTEER CORPS

FOR AGES 14-17

Sign up online: www.cityofhomer-ak.gov/library or contact Claudia Haines at 235-3180.

Scan me
Mentorship
Make projects visible
Photos, posters in kids, youth, adult sections of library, media lab
Web pages, blogs, social media
Develop exhibits and posters; bring in guest speakers

Use successful messaging techniques (ICBI)

Photos on posters: People rather than things

I created a smartphone app for art museum visitors.
—MaCherie Edwards

Art, technology, and a great idea
As an intern at Wellesley College’s Human Computer Interaction Laboratory, MaCherie created a smartphone app that gives museum visitors background about the art they’re looking at. But it doesn’t just provide facts—it also asks questions that invite opinions and emotional responses from the viewer.
Visit ALA’s Libraries Ready to Code website to learn more
http://www.ala.org/tools/readytocode/home

Share your ideas
librariesreadytoCode@gmail.com

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