Increasing K-12 Students' Interest in Computing

Barb Ericson
Director, Computing Outreach
College of Computing
Georgia Tech

Presented by Maureen Biggers, Indiana University, co-PI "Georgia Computes!"

Background

- Research on why students don't go into computing shows that
  - students don't know what computing is
  - and/or they believe the negative stereotypes
    - boring
    - anti-social
    - not creative
    - irrelevant
    - only for White and Asian males
  - they think there are no jobs
  - girls and underrepresented minorities have less experience with computing

Goals

- Introduce computing in a way that
  - is fun, social, relevant, and creative
  - gives girls and underrepresented minorities more exposure to computing
  - provides female and underrepresented minorities as role models

YWCA Teen Girls in Technology

- Started fall 2007
  - at 2 middle schools
  - expanded to 3 schools in spring 2008
- 1.5 hour workshops
  - PicoCrickets
  - Scratch
  - Storytelling Alice
  - LEGO NXT robots
  - FIRST LEGO League
    - all female and mostly African American team
    - the girls said that they wouldn't join the school's existing team

YWCA Evaluation

- Pre surveys at the beginning of a semester
- Post surveys at the end of a semester

Biggest increases in
- computing is fun
- girls can have jobs in computing

Alliance Partners

- YWCA Teen Girls in Technology Program
  - after school program at 4 middle schools
  - up to 15 girls at each school
  - Girls Scout Council of Greater Atlanta
    - approx 40,000 girls
    - 4th grade to high school
  - CEISMC
    - handles registration for our summer camps
    - handles evaluation

YWCA Evaluation

- Computing is fun
  - Pre (n=19)
  - Post (n=14)

- Girls can have jobs in computing
  - Pre (n=19)
  - Post (n=14)
Girl Scout Activities

- Started fall 2005
  - huge growth since then
  - especially with the BPC

- Types of activities
  - Dad and me – 1 hour
  - Mom and me – 1 hour
  - Longer computing workshops – 4 hour
  - Hispanic Girl workshops
    - 3 - 2 hour sessions
    - bused girls in for a 4 hour session
  - Summer camps – 1-2 weeks

Dad and me (Mountain Jubilee)

- Girls and their dads go camping for a weekend
- Girls program a pre-built robot in one hour sessions
  - courses of different levels of difficulty

Benefits
- Dads and girls see female role models
- Dads get career brochures
- Research says dads heavily influence girls, especially in non-traditional female fields
- Recruit for 4 hour workshops

Mom and Me (Serendipity)

- Girls and their moms go camping for the weekend
- One activity is PicoCrickets
  - musical pickle
  - kinetic sculpture
  - reaction game
  - birthday cake
- Benefits
  - Moms and girls see female role models
  - Moms get career brochures
- Research says moms influence girls
- Recruit for 4 hour workshops

Four hour Girl Scout workshops

- Activities
  - Robot basics
  - Extreme robots
  - PicoCrickets
  - Scratch
  - Storytelling Alice

Benefits
- longer time to work
  - build and program robots
  - female role models
  - pre and post attitude surveys
  - about 30% take >1 workshop

Robot Basics

- Girls build and program LEGO NXT robots
  - build the model that comes with the kit
  - 1-1.5 hours
  - program the robot to go through courses
  - of various difficulties
  - girls program a 30 second dance
  - girls learn about
    - sequential programming
    - loops
    - creating procedures

Extreme Robots

- Girls build more complicated NXT robots
  - 1.5-2.5 hours to build
  - more complex challenges
  - using sensors
  - girls learn about
    - loops
    - conditionals
    - event handling
PicoCrickets
- Girls create arts and crafts for the digital age
  - start with existing activities
    - reaction game
    - kinetic sculpture
    - musical pickles
    - birthday cake
  - challenge the girls to do something creative
    - Park theme
    - Halloween theme
  - girls learn about
    - sequential programming
    - random numbers
    - event handling

Scratch
- Girls create 2D animations and games
  - show girls the basics of Scratch
  - walk them through creating a simple 2D game
  - challenge them to create their own animation or game
  - girls learn about
    - event handling
    - loops
    - conditionals
    - variables
    - message passing and receiving
    - random numbers

Storytelling Alice
- Create 3D stories and games
  - work on an Alice tutorial
  - plan a story using a storyboard
  - work on their own story
  - girls learn about
    - Objects and classes
    - invoking methods
    - creating methods
    - sequential and parallel programming
    - random numbers
    - variables

Hispanic Girl Scout Workshops
- We went to an elementary school
  - 3 visits
  - 2 hours each visit
    - LEGO Robots
    - PicoCrickets
  - Bused in girls to Georgia Tech for a 4 hour workshop
    - PicoCrickets

Some Comments from Post Surveys
- PicoCrickets
  - "That we could program things and make them move"
  - "Being creative"
  - "I really liked this workshop. You should have it more often!"
- Robot Basics
  - "Having fun building a robot with my best friend"
  - "That I learned so much in 4 hours"
  - "This workshop was fun. I am pretty sure I will be back :)"
- Extreme Robots
  - "Working with my best friend and getting to work with my favorite thing"
- "This was an awesome experience"

Comments - Continued
- Scratch
  - Best things
    - "I got to play a Harry Potter game and make a video"
    - "Making your own game"
- Alice
  - Best things
    - "It was awesome! It is so much fun making animated movies"
    - "You could be really creative and make it funny"
    - "I thought it was so much fun. I was leaning toward graphic design and know I really want to do it"
    - "It was awesome. I never knew there was such thing"
Lessons Learned

- Start with some example activities but always challenge the girls to create something on their own
  - if we just did the example activities with PicoCrickets the girls would finish and sit there
  - Most girls cite the ability to create something new as their favorite thing about the workshop
- Some girls don’t want to do a tutorial
  - they want to follow along while someone shows them what to do
  - but this can also lead to complaints about speed
- What some girls really like
  - others will not – robots tend to get increases in both positive and negative attitudes towards computing
  - some love the robots and buy their own
  - some have difficulty in building the robot

Teaching HCI to Teens – Sarita Yardi

- 6-week HCI summer course with 10 Atlanta youth
- Motivating youth through personally relevant, design-based projects
  - builds off higher education HCI curricula
- Participants learned about
  - sketching ideas
  - designing prototypes
  - conducting interviews
  - usability

Chat Client for OLPC – Jill Dimond

- 2-weeks with 15 girls at a Girl Scout camp in Northwest Georgia
- Motivating girls by designing and programming a chat client
  - like the AOL instant messenger or MSN Messenger
- for the One Laptop Per Child XO
- The girls learned about
  - user requirements
  - designing low and high fidelity paper prototypes
  - communicating ideas
  - and implementing their designs by programming a functioning chat client

Game Testers to Technologist - Betsy DiSalvo

- African American males play video games more than any other group. Yet, their interest in video games is not leading them in to computer science fields.
- We are developing a game tester job-training program
  - Teach them to “look under the hood”
  - Teach them game testing skills
- Ran workshops during Fall 2008
  - “I really want to learn how to read stuff like that [computer programs], to understand what it means not just letters and objects in a square, but to understand.”
  - Jailen, age 15, workshop participant

Georgia Tech Summer Camps

- High school camps
  - 2004 – 2006
    - 2 weeks
  - 2007 – 2008
    - 3 weeks
  - Alice, LEGO robots, RoboCup Jr, Media Computation in Python

- Middle school camps
  - 2006 – 3 weeks
  - 2007 – 5 weeks
  - 2008 – 5 weeks
    - Scratch and PicoCrickets
    - LEGO robots and Alice
    - RoboCup Jr
      - rescue
      - dance
Summer Camp Evaluation

- Pre surveys the first day
- Post surveys the last day
- Biggest changes in
  - computing is fun
  - I am good at computing
  - 93% want to know more about computing

Impact from our Summer Camps

- At least 2 students have gone on to major in computer science at Georgia Tech
  - one was an African American male who originally was planning to major in Chemistry
- One parent told us that, "her son had gone from an A to F student to a A to B student"
  - "because he wanted to get into Georgia Tech"
- We plan to do a follow-up survey with all the students from 2004-2008

Seeded Summer Camps

- 2007
  - Darton College
  - Kennesaw University
  - Columbus State University
- 2008
  - Albany College
  - Georgia Tech Savannah
  - Kennesaw University
  - 2nd location
  - Georgia Southwestern State University
  - Columbus State Un. offered 4 weeks of summer camp in 2007 and 10 in 2008

Future Plans

- YWCA
  - follow-up with girls in 2010-2011 (8th graders will be in high school)
- Girl Scouts
  - increase the number of 4 hour workshops
  - encourage "seed money" grant winners to also offer Girl Scout workshops
  - train teachers/parents to be FIRST LEGO League coaches in spring 2009
- Summer Camps
  - add rising 4th-5th grade camps
  - add wearable, web design, and Scribbler robot camps
  - seed summer camps in local high schools (Google RISE award)
  - follow up with kids from 2004-2008
- Cool Girls
  - afterschool programs for low income girls at local schools
  - started computing workshops at two middle schools in fall 2008
  - planning to do Webinars to potentially reach many clubs
- RRISA – Refuge Girls
  - Planning on a computing workshop in Jan 2009

Challenges

- Afterschool programs
  - we have to hire people who can drive to the location
  - and bring materials
  - only 1 – 2 hours of work time
  - not the same students each visit
  - students often want to socialize
- Weekend workshops
  - have to avoid home game days
  - only so many days we can hold these
  - students need transportation
  - students often forget to bring lunch

Dissemination

- Presentation on getting kids excited about computing at NECC 2008
  - handed out 2Gig USB's with material
  - Material is available on the ICE web site
  - http://coweb.co.cc.gatech.edu/ice-gt/
- Suggestions on AP and Systers mailing lists
  - individuals have downloaded and used the materials
- Contributions to NCWIT materials
  - talking points for parents and teachers
  - promising practices
- Planning to write a paper for the Journal for Computing Teachers (JCT)
  - how to attract students to computing
Evaluation Results

- 240 Girl Scouts receive contextualized computing instruction
- X YWCA facilitators mentor and provide contextualized computing instruction to 225 YWCA girls over 3 years
- Female students express excitement over their participation in a vibrant, active community

Evaluation Results

- 240 Girl Scouts receive contextualized computing instruction:
  - 2005-2006: 190
  - 2006-2007: 372
  - 2007-2008: 1595

Evaluation Results

- X YWCA facilitators mentor and provide contextualized computing instruction to 225 YWCA girls over 3 years
- Results
  - 10 Facilitators
  - YWCA: 99
  - Boys & Girls Club: 20
  - Cool Girls: 52
  - RRISA (Refugee Girls): starting Jan. 09

Evaluation Results

- Female students express excitement over their participation in a vibrant, active community
  - "I learned more about how to use computers."
  - "It was fun. I learned about the coordinate plane."
  - "I got to meet new 7th graders and the field trips."
  - "I like building the robots."
  - "I liked that we got to learn in an environment that allowed us to learn with our friends."

Evaluation Results - Interview

- African American male
  - Planning to major in chemistry/Engineering
  - His mother pushed him into the Georgia Tech summer camp
    - "This is going to be a lot like school"
    - "People who do computing are people who memorize pi to the 100th decimal place."
  - At the camp, he used Media Computation, Mindstorms robots, and built a computer
    - Motivated him to take AP CS in high school (scored a 3)
    - His friends told him, "there are no black kids in computing. It is for geeks, nerdy kids."
  - Came to Georgia Tech and majored in Computer Science
    - Because of the Threads program
    - Intrigued by research he saw in the summer camps
  - 3rd year CS student expecting to graduate in 2010
    - Teaching Assistant for Media Computation
    - His friends now come to him with ideas for computer games and applications
    - Planning to go to graduate school