Lessons in Mentorship

Teaching High-School Girls to Code
About the Speaker - Michael Starch (石大衛)

- Embedded Systems Engineer in Pasadena, CA, USA
- 4 years experience teaching high-school students
- San Marino High School Girls Who Code Club
- Teach Computer Programming, Electronic Circuits
Girls Who Code (GWC) at San Marino High School

• GWC: organization designed to encourage women to code
• Weekly after-school club focused on learning technology
• Open to all students; focus on teaching women
• Entirely voluntary
• Typically 3 mentors, 10-20 students

Note: I do not speak on behalf of the “Girls Who Code” organization only for our local club at San Marino High-School.
Today’s Talk

- Our Challenges
- A Brief History of Our Club
- Successful and Unsuccessful Lessons
- Methods to Encourage Passion
- Handling Different Skill Levels
- Methods to Encourage Women
- General Advice
- Questions!
Challenges With Our Club

- Students are often absent due to conflicting priorities (classes, exams, family)
- Huge variation in skill-levels in the class
- Students are reserved and quiet
- Interests vary across class

Many Students believe coding is too hard for them.
Supplied Lessons and Scratch: Year One

- Used lessons based on Scratch, Khan Academy
- Provided to our club
- Mentors only had general knowledge of the subject

Feedback:
- Students were bored and confused
- Mentors were disengaged
- Little room for uniqueness
Overviews and Project-Based Lessons: Year 2

- Started year with a survey of technology
- Transitioned into project-based lessons
- Provided by mentors of club

Feedback:

- Students did not like lecture format
- Workflows for projects were overly complex
- Long project duration made absences difficult
Lesson Arcs and Smaller Phone Apps: Year 3

- Switched to shorter lesson arcs
- Created apps for use on Android phones
- Some off-topic lessons

Feedback:
- Short arcs make absences less problematic
- Easier workflows eased lesson overhead
- Felt limited in scope
Stand-Alone Lessons: Year 4

- Each lesson was independent of others
- Variety of lessons across technology field
- Focused on interactive, exploration-based lessons

Feedback:
- Absences cause no problems at all
- Students learned many topics
- Exploration cements learning
Successful and Unsuccessful Lessons

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Successes:
- Paper Circuits
- Pseudocoding
- Hacking, Lock Picking, and Security
- Sounds and Music

Failures:
- Lectures
- Complex Instructions
- Small Classes
Methods for Inspiring Passion
Make Lessons Approachable

- Brief introductions prevent boredom
- Remove expert knowledge from the core lesson
- Put success first

Example: pseudocoding teaches problem solving without syntax
Break The Norm

- Teach something no one else will teach
- Go against societal perceptions
- Surprise students with creative topics

Example: hacking grabs students attention
Connect With Other Passions

- Students come with their own skills and passions
- Classes they take in school all benefit from technology
- Technology is everywhere

Example: musical students thrive playing music with a microcontroller
Handling Different Skill Levels
Focus on Exploration

- Self-exploration encourages personal connection
- Questions arise naturally
- Students have fun!

Example: paper circuits have many paths that all lead to knowledge
Remember “Success Moments”

- Confidence comes from accomplishment
- Students remember when they succeeded
- Technology is demystified

Example: a moving robot is a lasting memory
Encourage Questions

- I LOVE Questions
- Questions allow students to guide their education
- Questions betray misunderstandings

Example: each year we have a question bounty
Methods for Encouraging Women
Granting a Voice

- Students can be afraid to talk or speak out
- “Granting a voice” is asking students to start a lesson with sharing
- Makes the classroom an open place to share

**Try it:** ask students to share before a lesson
Creating a Focused Environment

- Know-it-all students establish unrealistic baseline
- Confidence can hide struggling students

Try it: have students rotate rolls (pair programming)
Encouraging Inter-Student Learning

- Students know where students struggle most
- Seeing their peers makes lessons seem possible
- Helps make class more supportive

Try it: ask knowledgeable students to help others
General Advice for Teaching
Embrace You The Mentor

- Your passion will be contagious
- You are an example of what they may become

Question: what do you bring that no one else does?
Invest in Your Lessons

- Your lessons benefit from your hard work
- Be prepared for possible questions
- Learning can be fun for you too

**Question:** what would make the lesson a learning moment for you?
Fear Not

- Teachers are invaluable
- You are not the only teacher of a given student
- Fear of failure may limit creativity

**Question:** where might your fear limit students?
Conclusion
Things to Take With You

- Amaze students by attaching to their passions and challenging misconceptions.
- Encourage success, exploration, and questions.
- Understand students’ backgrounds to support their unique learning. Important for teaching women technology.
- Better yourself and it will better your students.

- Thank you!
Questions?
Extra Slides, For Potential Questions
Where Are We Headed
Handling Missing Students