

Lessons in Mentorship

Teaching High-School Girls to Code

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- 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

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- 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

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- 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

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- 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

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- 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:

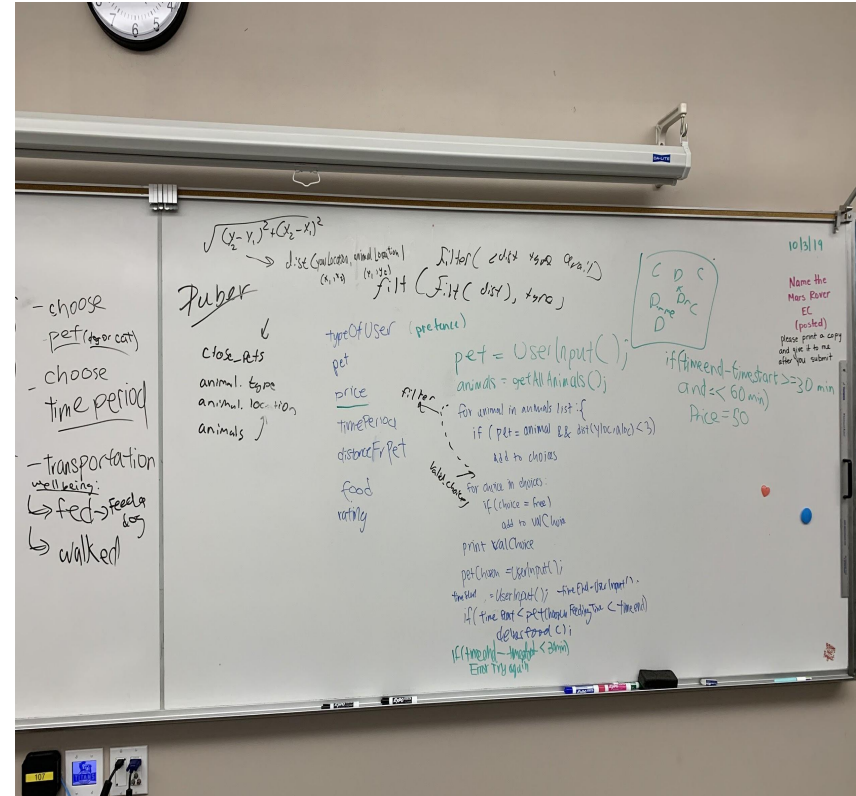
- Lectures
- Complex Instructions
- Small Classes

Methods for Inspiring Passion

Make Lessons Approachable

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

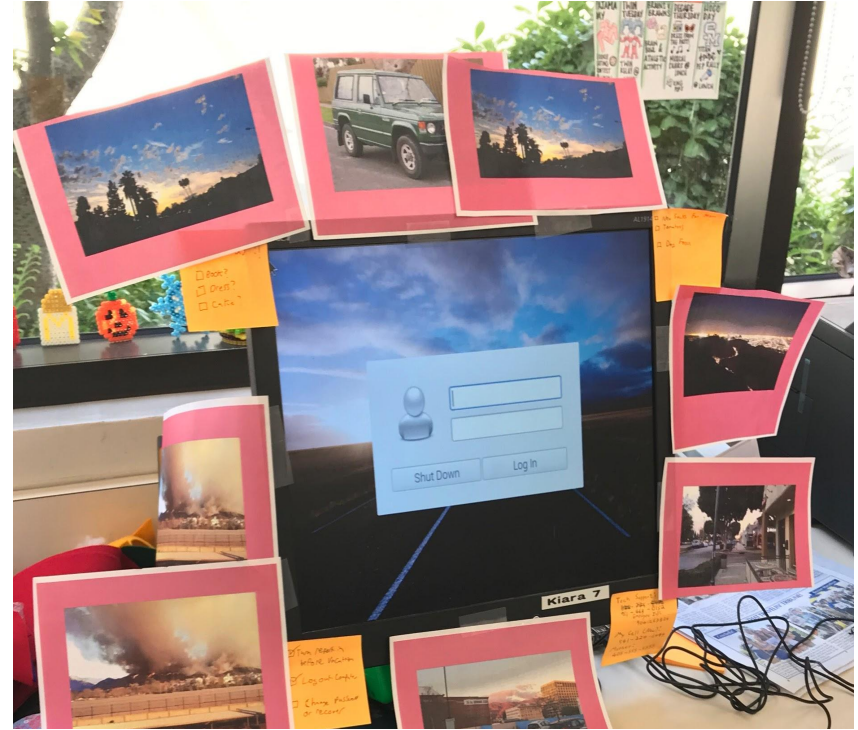
Example: pseudocoding teaches problem solving without syntax



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

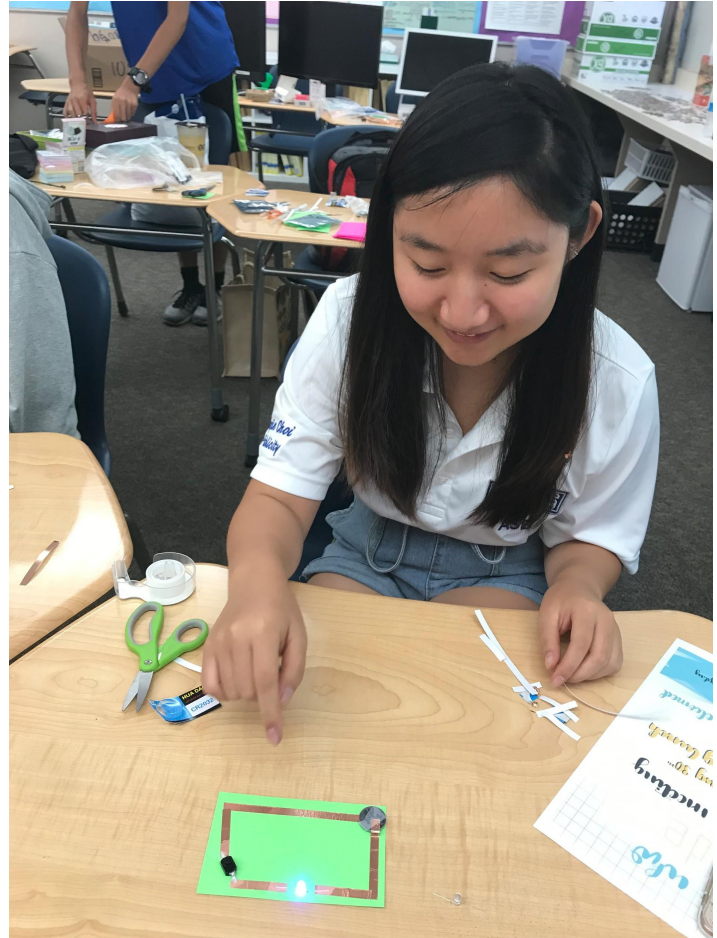


Handling Different Skill Levels

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

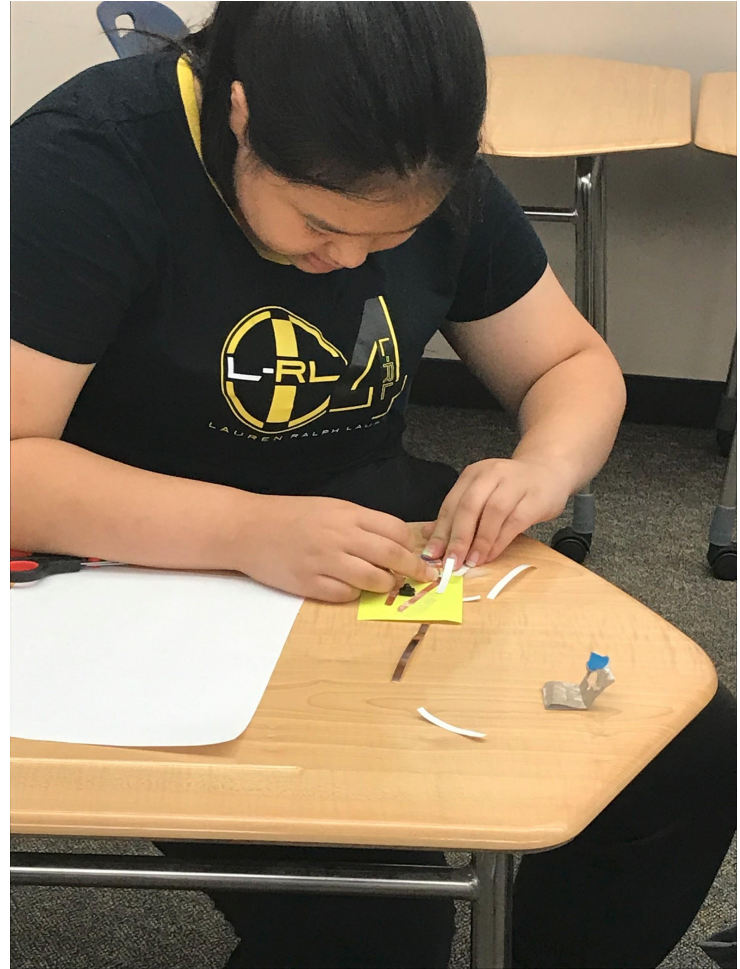
Example: a moving robot is a lasting memory



Encourage Questions

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

Example: each year we have a question bounty

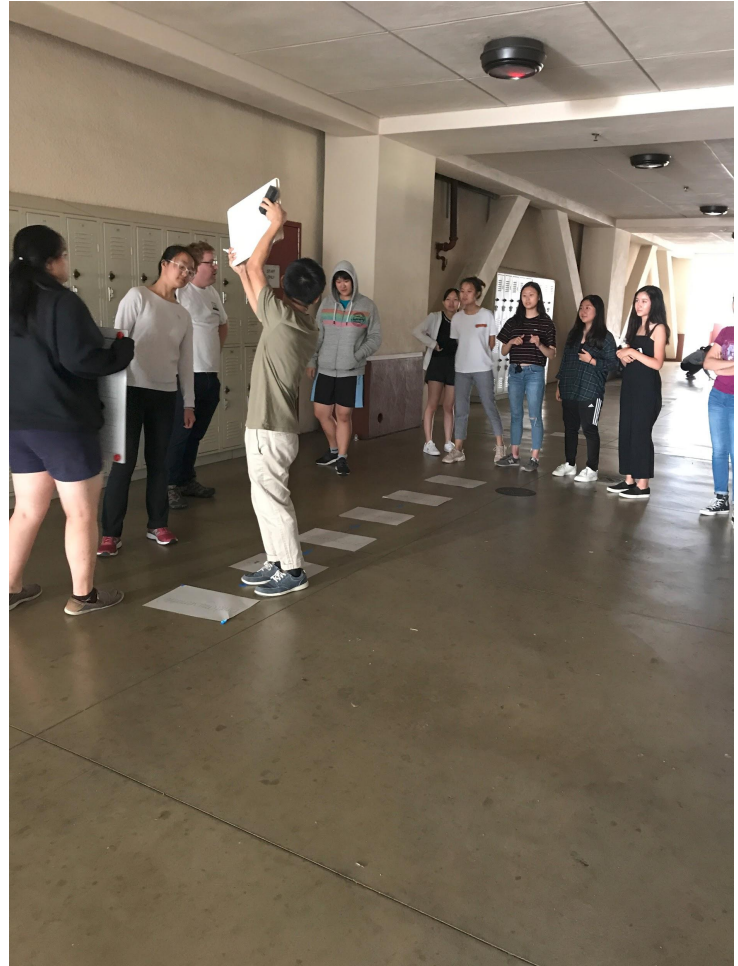


Methods for Encouraging Women

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



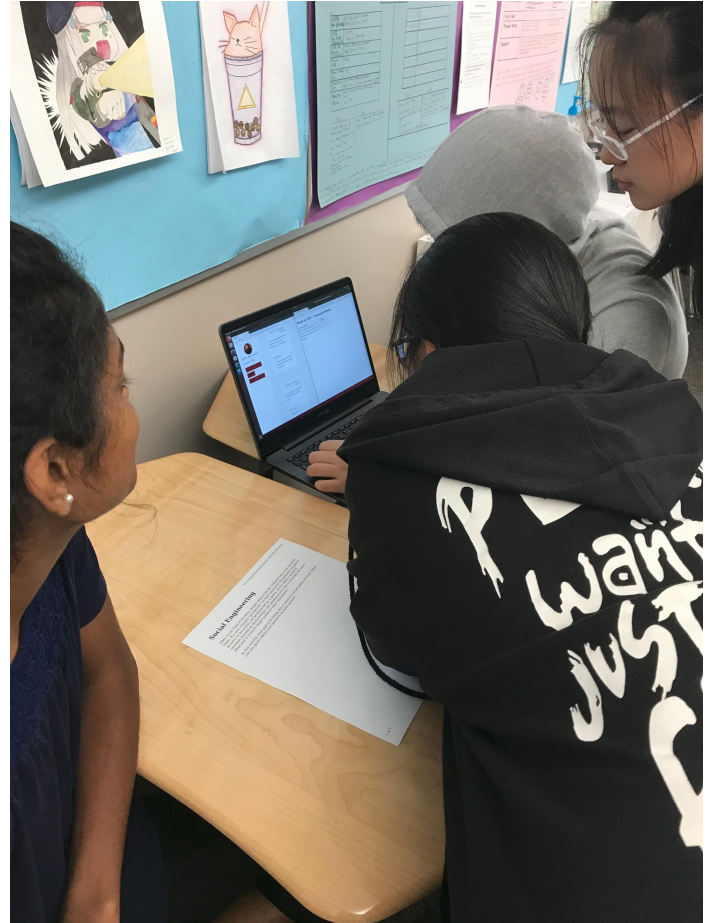
General Advice for Teaching

Embrace You The Mentor

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- 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

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

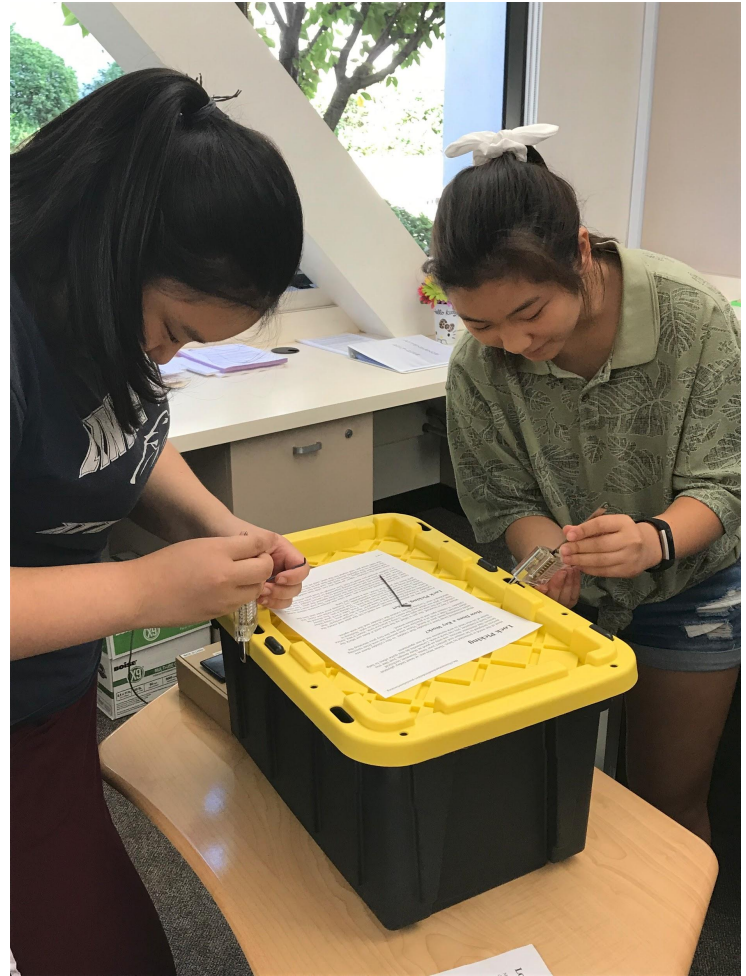
Question: what would make the lesson a learning moment for you?



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

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- 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.
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- Thank you!

Questions?

Extra Slides, For Potential Questions

Where Are We Headed

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Handling Missing Students

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