

Problems We Encounter in Teaching:

see Ideas for possible solutions/approaches/resources

Explaining the difference between parameters vs. arguments (scope)

Relating to students' real life experiences (relevance)

Expectations that all teaching and learning has to occur during F2F class time

Access to computer outside of schools cannot be assumed

How to teach problem solving

How to get around the "abstraction gap"

How to motivate students to:

- problem solve

- like the project

- develop independence

- try it out

- use intuition

- "play" productively, think outside the box

- overcoming "road block" to learning

- step outside their comfort zone

- get through fear of failure

- help other students without candy coercion

How to temper desire for instant gratification

Students (and us) forgetting resources available to them

Teaching software that is not open source, need to buy materials

Slow emulator

Device funding for testing

How to manage mix of hi-end/low end students, maintain motivation across gender and skill level

RE: peer mentoring hi- and low-end students, hi-end may just tell low end students the answer, want them to model/teach

Problems with backing up work

How to keep students focused

Ideas:

Teaching ideas/methodology/philosophy

- Use tools with LF HC WW (low floor high ceiling wide walls)

- Have students "build it right, build it wrong"

- Use IPOS algorithm for problem-solving: Input Processing Output Structures

- Show relevance, make the abstraction tangible

- Go slow to go fast

Introduce journaling as a tool for students to document activity, including roadblocks or mistakes (give credit for reflection)
Talk aloud: modeling, vocalize what you know
Model failure (but don't freak out)
Live coding (model failure), write code from scratch, leave something out (have an error and have students figure out the error/solution)
Teach students to teach others: peer mentoring
Teach students to ask each other for help
Tailor projects to student interests
Clickers: use peer discussion for students to identify correct answers through persuasive reasoning
Bring in current events
Find out what technology is and what it does, use info to tailor instruction for current unit and future units
Flipping, use class time for doing projects, record lectures for teaching outside of school online (like Khan Academy)
Individually paced curriculum
For example see: <http://dwheadon.net/> (first unit wasn't done because our webserver wasn't set up yet)
include check in at end of class to see what the students did that day
include oral assessments of knowledge

Access for resources, thinking about teaching:

ECS (great resource for inquiry-based lessons)
Mark Guzdial education blog <http://comutinged.wordpress.com/>
Low floor high ceiling wide walls: fritzing.org

Access for software, hardware, instructional materials:

CSTA has some lending kits: phones, PicoBoard
freegeekchicago.org
freecycle.org
pcrr.com/pcsforschools (donations of PCs for schools from industry)
Comcast. Internet access for \$9.95, computer access
donorschoose.org [Post at beginning of school year, tax time, keep an eye out for corporation matching funds]
vendor direct donations: industry recycle programs
Raspberry Pi <http://www.alliedelec.com/RaspberryPi/>
(UK not for profit \$25/\$35 computer, TV hook up, USB mouse, keyboard)
shapeways.com (ordering stuff printed with 3D printer, case for RaspberryPi)

Learning/Teaching Tool, Online Resources:

Google docs (document sharing and interaction)

www.prezi.com (Prezi presentations, produces embed code)
framethief.com (hook up camera to computer, grab images: Claymation, etc.)
lightbot.com (free Flash game)
sparkfun.com (electronics for projects, including Arduino)
<http://picocricket.com/>
Pivot stickman (animation, frame rate, multiple frames)
pivot-stickfigure-animator.en.softonic.com
appinventor.com
Microsoft <https://www.dreamspark.com/>
Clickers: <http://www.polleverywhere.com/>
testmoz.com (test generator)
Communications: piazza.com
Learning Management Systems for centralizing resources (Moodle, etc.)
Mozilla's newly released free web design tool [Thimble](http://thimble.mozilla.org/)

Other:

Visit from Dale Reed (UIC) and Dr. R [Ron Greenberg (Loyola)]
Industry engagement: field trips or in-class visits from industry folks
Cotton Candy
Open source 3D printer
Sparkfun offers workshops in electronics/arduino.

Fabrication Resources:

[Pumping Station One](http://pumpingstationone.com/) - [hackerspace](http://hackerspace.com/) in Chicago located at 3517 N. Elston. Monthly membership starts at \$40. Open meetings Tuesday nights at 8pm.

Museum of Science and Industry's [Fab Lab](http://fablab.msi.edu/) offers free 45 minute workshops on cutting edge fabrication techniques, participants make a keychain using a laser cutter.