



Computing in the Classroom: Coding for Kids Working Session

Shelley Olds
UNAVCO, Education & Community Engagement
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Session Goals

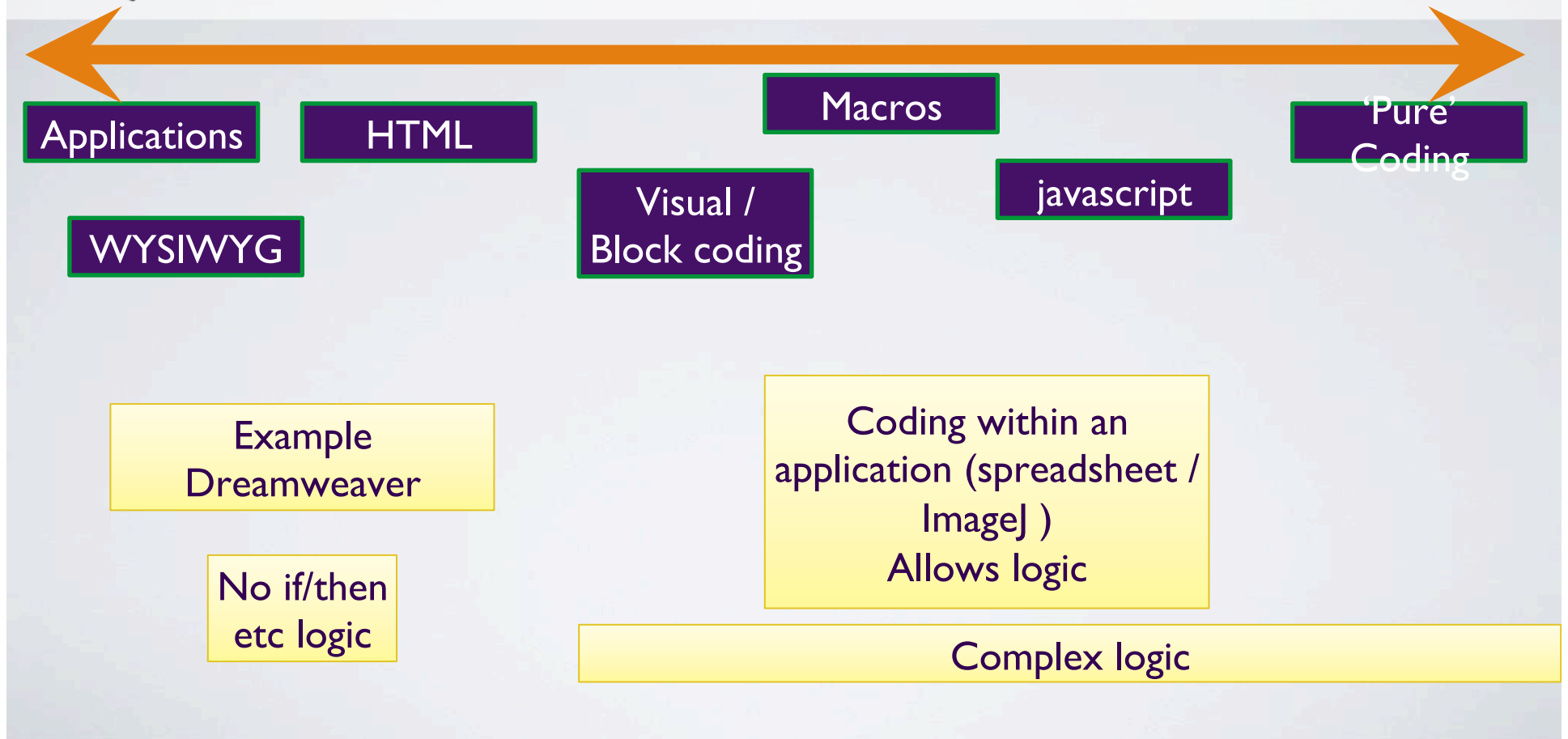
- Discuss options for computing activities for summer workshop,
- Identify the best fit(s) for ESIP Education,
- Plan the workshop session for the 2018 ESIP Summer Meeting.

Draft Project Goal:

To promote the use of Earth Science data through coding

- not creating a computer programmer
- logical thinking skills with fun
- Excited students to go on to do more
- To gain familiarity and comfort at looking at what's under the hood
- To be able to ...
- To appreciate that coding allows scientists to analyze data... data is integral to coding... understanding what data looks like

Coding Complexity/Abstractedness Spectrum



Storymaps as a coding platform

- Using as a coding tool
- Where to find data
 - Map servers at NOAA - reads in netCDF
 - Data.gov
 - mynasadata.gov - great for getting ideas for projects
- Premaking the map products - writing a script to derive - too advanced? to write

What is coding?

- Language that codifies commands, example: Goto; for - next; if - then;
- Lines of code: each line is a 'command' - a sequence , not necessarily linear
- Logic: Decision making based on input
- Abstraction... as a key concept of programming
- Ability to manipulate and change
- Using a programming language
- Hidden Figures. The transition from computers as people to computers as they are now.
- What does the computer know ? eg, the vocabulary list of the language
- Not coding - an application that helps you do something, has its own language, however there's no sequencing or logic
- Its a sequence - process through the code -

Behaviors of Good Coders

- Coding in pairs: switch roles to do coding and do QC
- Analyzing programs: debugging, predicting the behavior of someone else's code, and thinking about efficiency.
- Coding can be social and interactive and rely on stuff folks have done before.

Code activity & workshop org ideas

Looking for premade coding examples that could be reused

Earth Science Interactives that could be coded (using libraries of code for complex sections)

Coding Activity ideas

- Tie in the movie, Hidden Figures. The transition from computers as people to computers as they are now.
- Using cards with instructions to create a program
 - Move from one location to another using basic walk, turn, stop commands
- Create a simple science model using code: coalescing water sprites, for instance.
- Some EET chapters have coding within them
- Some folks prefer going right into a programming language.
- Block languages help young kids get into it faster. Enables early success.
- Kids write a program to make a physical object move
- Equations in a spreadsheet - Macros in a spreadsheet with variables changing
 - What portion of Earth's water is fresh and accessible?
 - Decades of ice-off dates in Madison.
- Show an example of a simple GitHub?
- Code a simple app for iphone / html5?

Coding Activity Ideas

- StoryMap / Image J
 - Show a final storyboard ... then show edit page ... then dig in to find maps (urls that in in /mapserver)
 - Build/extend a storymap - making a choice for the teachers
 - Play time – to explore and experiment (give 3 choices of what to explore)
 - it can be extended.
 - Make their own macros
 - Here are things that others have created - that social component / GitHub
- [ESRI GeoInquiries](#) are paired sets of prepared AGOL maps and PDFs of instructions. One possibility for a bounded workshop activity would be to use this existing content and turn one or more of them into Story Maps.
- Showing a list of projects on GitHub (pointing specifically to ones that have been forked from other sources) also seems like a valuable thing.

Education Workshop Organization Ideas

- Start w/ block activity (that can show the language); move to similar activity with language; macro activity;
- Consider organizing based on teacher comfort vs how it might be taught in the classroom
 - Start with Excel / spreadsheets ... then macros ... then block ... then ...
- the plethora of versions of Excel is a real problem – can Google Sheets be a solution?
- HTML5 runs in every browser (Flash is going away)
- Storymaps – can be both an application and coding environment (ex?)
- WYSIWYG ... Macro ... simple coding environment
 - See the real tool, then see ‘under the hood’ ... its just a language

Example programming languages

- Macros in ImageJ
- Excel macros / functions
- html
- Intro languages: Hello Processing
- Block languages
 - Scratch (Flash based?)
 - SNAP,
 - Tynker (Swift)
 - Block Py
 - NetLogo(?), Turtleworks (still supported?)
- What are the most common languages used in ESIP community?
- Working environment languages
 - Python
 - C++
 - Javascript
- MatLab
- Modeling programs

Educational Perspective

- Educational learning theory along with how we teach coding
- Learning is socially constructed / mediated
 - Gaming - minecraft
 - Constructivist approach is still there too

Discussion about coding & summer session [input from session, page 1]

What is coding to you?

- everything on a computer is coding
- scratch - might be a hurdle to move from visual representation of coding - lines of text

What are we doing 'coding' for?

- Creativity and critical thinking? or to create programmers?
- Manipulating data and getting it into a format that I can use
- Kalo: coding is being creative to solve a problem.. creating something or changing it for what you want it to do
- Command line / script line coding
- Good bridge between object and text coding is Jupyter notebooks - Add something to an editor and compile: constant feedback is very useful

What can we do during the summer workshop?

- Get educators to learn coding AND? accomplish something Earth Science related?
- Regardless of which platform you choose, it will take 4 hours and be a major accomplishment.
- What about NEO? Ten easy step to analysis? ← An example of a very simple earth science problem. Not a good coding example. Tool is all wrapped up.
- Excel: copy temp data from a website and generate a graph.
- Use a macro to make this happen repeatedly?
- Google Sheet.
- Start from Scratch? Macros in Image J? Story Map? Experiments with creativity?
- Convert something coded in Flash to another format?
- ERDDAP - tool for the ocean community. Query capability to customize map or export in a certain format.

Discussion about coding & summer session [input from session, page 2]

What can we do during the summer workshop? (cont)

- A bridge: you give them just enough to get interested and then encourage them to participate in a community conversation. Could be an educational tool.
- NCAR: ContainerWrf Docker
- Start with a few terminal commands. Spits out imagery. Visualizations from Hurricane Sandy
- If you have MS, HS, and college, may need some modification.
- You feed it some lines, and it generates a visualization. Available on GitHub
- ^ terminal commands alone can amaze someone.
- Jupyter notebooks can be hosted online for a course. A strategy would be to develop a template Jupyter notebook, in which they add their own code in sections.
- Ideas from Ryan Bowe: LIDAR site: Make it spatial. Finding a dataset near your own community, read the metadata, plot the bounding box in a KMZ. Take metadata, parse out the bounding box, and draw it in Google Earth.
- Tools that help students do something creative: Story Maps could be an assignment for students. Not make teachers better lecturers.
- Google My Maps - low entry bar for getting folks using maps and visualizations.
- We have a lot of great tools for different skills: What about creating a couple lesson plans? Provide some scaffolding around existing resources.
- Earth Exploration Toolbook (EET): Examples of using tools to get and analyze data. Help teachers use Earth Science Data Analysis tools. Explicit step-by-step instructions. In teaching those workshops, we discovered people don't even understand what "data" are.

Programmers talking to classroom - making a list of speakers who would be interested in talking about their trajectory into coding