Computational Art & Creative Coding
Teaching CS 1 with Processing
High School Sample Materials

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This folder is a sample materials resource for high school teachers interested in teaching computing through Processing (see http://Processing.org)

Based on experiences by Aaron Cadle and Darby Thompson it provides an initial set of materials based on the work by Ira Greenberg, Dianna Xu and Deepak Kumar via a National Science Foundation, TUES II grant (DUE-0942626 and DUE-1323463) Comments, contributions etc. are welcome.

The Computational Art & Creative Coding Approach

The following outline from the textbook authored by Ira Greenberg, Dianna Xu and Deepak Kumar only enumerates concepts from introductory computer science as traditionally taught in High School and freshman college courses. The broad range of concepts and skills presented in this extensive text are not listed here. Rather this list is a proof of concept that the CA&CC approach can be adapted to various needs. The chapters also cover concepts and algorithms for generative art, visualization and topics traditionally deferred to advanced courses in computer science such as image processing and emergent systems. The list below identifies the core foundations of programming, computational thinking and software design.

Both Darby and Aaron's students in 2013-2014 were in "intermediate" or "introductory" courses (e.g. pre CS AP). As the definition of college level “CS 1” and “CS 0” change as the new CS AP “Principles of Computing” comes to fruition, these materials may be appropriate in array of courses throughout high school.

Chapter 1: Programming, Computer Science Processing Environment
Chapter 2: Fundamentals, variables and functions, 2D primitives, coordinate system, polar coordinates
Chapter 3: Control structures, functions, override, scoping, matrix transforms and rotations (Processing, not Linear Algebra).
Chapter 4: Animation, more on scoping, returning a value, mouse, lots of trig.
Chapter 5: Data, arrays, min, max sorting, data modeling, maps, space/time
Chapter 6: Object-oriented Programming and Design
Chapter 7: Abstraction, Strings
Chapter 8: Recursion
Chapter 9: Big data visualization - dimensional arrays, bitwise operators, emergent systems
Chapter 10: Image processing – techniques using algorithms
Chapter 11: Teasers for more: 3D, Java (programming beyond the Processing environment), Android in Processing.

Aaron Cadle's Resources

Aaron's resources focus on chapters 1 - 3, with some material from chapter 4, and a brief foray into Chapter 7. They consist of

- Documents - worksheets quizzes etc. Two folders, electronic and documents
- Labs – A "beta" set from this year that articulate more directly with the CA&CC approach than a completed set from 2013.
- Warm Ups - quick puzzles solved at the start of class

Within the "documents" topics referenced as follows.
Documents referenced:

- Basics Blank: 20140522182629.pdf
- Basics Drawn upon: 20140522182648.pdf
- Smiley Face lab 20140522182707.pdf
- Basics worksheet 20140522182733.pdf
- Basics quiz 20140522182807.pdf
- Binary/ASCII 20140522182848.pdf
- Primitives, Variables 20140522182929.pdf
- Binary/ASCII, Variables Quiz 20140522183015.pdf
- Binary/ASCII, Variables Review 20140522183034.pdf
- Binary/ASCII, Variables Tests 20140522183059.pdf
- Methods and Math20140522183152.pdf
- Methods and Math quiz 20140522183247.pdf
- Methods and Math quiz 20140522183307.pdf
- Methods and Math Test 20140522183332.pdf
- Method Overloading 20140522183400.pdf
- Strings 20140522183441.pdf (chpt 7)
- Strings Worksheet 20140522183506.pdf
- IF QUIZ 20140522183540.pdf
- IF worksheet 20140522183605.pdf
- IF ELSE worksheet 20140522183624.pdf
- IF else worksheet 20140522183711.pdf
- IF quiz 20140522183822.pdf
- IF/ELSE/Strings review 20140522183851.pdf
- IF and Strings 20140522183929.pdf
- IF/ELSE test 20140522183958.pdf
- Methods grade sheet (polygon) 20140522184022.pdf
- FOR LOOPS 20140522184044.pdf
- For loops worksheet 20140522184120.pdf
- Loops that count 20140522184228.pdf
- Loops that change value 20140522184241.pdf
- Loop quiz 20140522184302.pdf
- Loop quiz 2A 20140522184331.pdf
- Trace a loop 20140522184351.pdf
- Trace a while loop 20140522184406.pdf

- Loop quiz 3 20140522184424.pdf
- Loops and whiles test 20140522184444.pdf
- Loops answer sheet 20140522184513.pdf

Warmups: are slides presented at the start of class, with points awarded to the first correct answer.

Overloading Pre-APWarmup0109.pptx
Mouse Pre-APWarmup0113.pptx
Mouse Pre-APWarmup0115.pptx
Basic methods Pre-APWarmup0117.pptx
Pfont Pre-APWarmup0122.pptx
Arcs Pre-APWarmup0128.pptx
Arcs Pre-APWarmup0130.pptx
Coordinates Pre-APWarmup0203.pptx
ASCII Pre-APWarmup0207.pptx
Type Conversion Pre-APWarmup0211.pptx
Type conversion Pre-APWarmup0215.pptx
Type Conversation Pre-APWarmup0219.pptx
Datatypes, Math Pre-APWarmup0224.pptx
Math Pre-APWarmup0226.pptx
Math Pre-APWarmup0228.pptx
Return Values Pre-APWarmup0306.pptx
Return Values Pre-APWarmup0314.pptx
Return values Pre-APWarmup0321.pptx
Math, and increment Math println Pre-APWarmup0325.pptx
Average method Pre-APWarmup0327.pptx
Binary convert Pre-APWarmup0404.pptx
If/else Pre-APWarmup0408.pptx
If/else method Pre-APWarmup0414.pptx
Trivia Pre-APWarmup0416.pptx
If String test instructions Pre-APWarmup0421.pptx
For loop Pre-APWarmup0425.pptx
For loop Pre-APWarmup0501.pptx
For Loop Pre-APWarmup0505.pptx
While loop Pre-APWarmup0507.pptx
While loop Pre-APWarmup0509.pptx
Binary convert, while loop Pre-APWarmup0513.pptx
While what does it do Pre-APWarmup0515.pptx
While to For Pre-APWarmup0519.pptx
For to while Pre-APWarmup0521.pptx

Labs: The well-organized “2013” labs are self-explanatory. The “Beta” labs offer a perspective on how Aaron develops labs over the course of the year.

Darby Thompson's Resources

Darby's teaching style and her school culture de-emphasize the extensive materials approach that Aaron uses, and emphasizes project work. Her resources are organized into "Labs." There are 10 of them. They articulate directly with the textbook chapters as follows:

Chapter	Darby Lab
1	0_Holiday Card
2	1_Drawing a Sea Creature
3	2_Object-oriented Sea Creature
4	3_Bouncing Ball
5	4_Fish Inheritance
6	6_Fish Interfaces
7	7_Space Invaders 8_Paint Program 9_Data Visualization
8	9_Robot Maze Problem
9	
10	

Her final lab (10_Final Project) is an open-ended side scroller/platform game intended to pull together concepts from Object Oriented Programming. Her materials include a document "Schedule Spring 2014" that gives a sense of timing necessary to complete these projects.