AP Computer Science: From Gridworld to Labs

- Presenter: Lester L. Wainwright
- Charlottesville High School
- Charlottesville, VA
- College Board Advisor
Who are you?

- Please stand if –
  - You will be teaching APCS for the first time beginning in the fall
  - You have been teaching APCS less than three years
  - You have been teaching APCS for more than three years
  - You teach at a college or university
  - You have participated in the APCS Reading
What is new in the Course Description?

- Increased focus on student hands-on, in-class laboratory experience (20 hrs min):
  - Teachers have latitude.
  - The three APCS Labs are a great option.
  - Search and Sort code examples are included.
  - Students need to understand that 2-dimensional arrays are stored as arrays of arrays.
What do I need to know for the 2015 exam?

- Read and understand the changes to the curriculum of the Course Description.
  - Gridworld is no longer tested on the exam.
  - The Labs are not Case Studies. The coding of the labs will not be tested on the exam.
  - The Java Quick Reference is only one page.
Will Java 8 be tested on the 2015 exam?

- No .........
APCS Labs

- Magpie
  - A chatbot (Eliza, Siri, Watson / Jeopardy)
  - Focused on conditionals, loops, and Strings
- PictureLab
  - Mediacomp based image processing
  - Focused on 2D array processing
- Elevens
  - A solitaire game
  - Focused on OOP, arrays, lists
APCS Labs Materials

- Documentation
  - Student Guide
  - Teacher Guide

- Software to support lab activities
  - Starter Code
  - Sample Solutions

- Sample Questions (M/C and F/R)
Magpie Lab

Laurie White, Mercer University, Macon, Georgia
Magpie Lab

- Algorithmic Oriented
  - Natural Language Processing (NLP)
  - Responds to English Sentences
    - Search for key phrases
    - Restructure user input
  - Considers algorithm opportunities and limitations.

- Java Constructs
  - Conditional and Iteration
  - Strings and their methods
  - Arrays (Optional)
## Magpie Lab Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hrs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chatbot Research (Optional)</td>
<td>1/4-3/4</td>
<td>Internet access required.</td>
</tr>
<tr>
<td>2. Introduction to Simple Magpie Code</td>
<td>1-3</td>
<td>Strings - basic search/replace. if statements / simple String ops.</td>
</tr>
<tr>
<td>5. Arrays and the Magpie (Optional)</td>
<td>1/2</td>
<td>Natural application for arrays. Can be used later in course.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4-8</strong></td>
<td><strong>3-7 hours + 1 hour (Optional)</strong></td>
</tr>
</tbody>
</table>
Picture Lab

Barbara Ericson, Georgia Institute of Technology, Atlanta, Georgia
Picture Lab

- Image Processing (2D Arrays of Pixels)
  - Traversals in row-major / column-major order
  - 2D Arrays are an array of arrays
  - Pixels, RGB color model, bits and bytes, binary numbers, java.awt.Color

- Algorithms to Modify Images
  - Mirroring (all or part of a picture)
  - Create Collages
  - Detect Edges
<table>
<thead>
<tr>
<th>Activity</th>
<th>Hrs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intro. to Digital Pictures and Color</td>
<td>1/3-1</td>
<td>Pixels, RBG, binary #s, bit, byte</td>
</tr>
<tr>
<td>2. Picking a Color</td>
<td>1/3-1</td>
<td>Make Colors from Red, Green, Blue</td>
</tr>
<tr>
<td>3. Exploring a Picture</td>
<td>1/3-1</td>
<td>Pixels, Coordinates, Pixilation</td>
</tr>
<tr>
<td>4. 2D Arrays in Java (Optional)</td>
<td>1/2-1</td>
<td>Traversals, Array of Arrays</td>
</tr>
<tr>
<td>5. Modifying a Picture</td>
<td>1-2</td>
<td>Interfaces, Abstract Methods, Constants, Inheritance</td>
</tr>
<tr>
<td>6. Mirroring Pictures</td>
<td>1-2</td>
<td>Traverse part of a 2D Array</td>
</tr>
<tr>
<td>7. Mirroring Part of a Picture</td>
<td>1</td>
<td>Traverse range of rows / columns</td>
</tr>
<tr>
<td>8. Creating a Collage</td>
<td>1-3</td>
<td>Overload Method (add parameters) Copy / Modify to a Larger Image</td>
</tr>
<tr>
<td>9. Simple Edge Detection</td>
<td>1-3</td>
<td>Edge Detection Algorithm</td>
</tr>
<tr>
<td>Total</td>
<td>6 1/2</td>
<td>6-14 hours + 1/2-1 hour (Optional)</td>
</tr>
</tbody>
</table>
Michael Clancy, University of California at Berkeley
Judith Hromcik, School for the Talented and Gifted, Dallas, TX
Robert Glen Martin, School for the Talented and Gifted, Dallas, TX
Elevens Lab

- Object Oriented
  - Encapsulation / Inheritance / Polymorphism
  - Classes – Simple / Collection / Abstract classes
  - Illustrates refactoring for extensibility
- Algorithms – shuffles / use of indirection lists
- Optional Extensions
  - Testing
  - Simulation
  - Thirteens
<table>
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<tr>
<td>1. Design and Create a Card Class</td>
<td>1</td>
<td>Simple class</td>
</tr>
<tr>
<td>2. Initial Design of a Deck Class</td>
<td>2</td>
<td>Collection of Cards</td>
</tr>
<tr>
<td>3. Shuffling the Cards in a Deck</td>
<td>2</td>
<td>Perfect Shuffle and Selection Shuffle (2)</td>
</tr>
<tr>
<td>4. Adding a Shuffle Method to Deck</td>
<td>1</td>
<td>Efficient Selection Shuffle</td>
</tr>
<tr>
<td>5. Testing with Assertions (Optional)</td>
<td>2</td>
<td>Java assert statements</td>
</tr>
<tr>
<td>6. Playing Elevens</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7. Elevens Board Class Design</td>
<td>1</td>
<td>Single “combined” ElevensBoard class</td>
</tr>
<tr>
<td>8. Using an Abstract Board Class</td>
<td>1</td>
<td>Board and ElevensBoard classes</td>
</tr>
<tr>
<td>9. Implementing the Elevens</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10. ThirteensBoard (Optional)</td>
<td>1</td>
<td>Different Elevens-like game</td>
</tr>
<tr>
<td>11. Simulation of Elevens (Optional)</td>
<td>2</td>
<td>Simulation instead of human player</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>11 hours + 5 hours (Optional)</td>
</tr>
</tbody>
</table>
Pass Out College Board Survey