Mobile Computing with App Inventor in Middle and High School

2014 CSTA Panel

Yu-Chang Hsu | Chinma Uche | Fred Martin | Josh Sheldon
Brief Introduction to MIT App Inventor
Choose Components in Design View
Specify How Components Work in Blocks View
Online Quest-based Learning
and
F2F Summer Camp

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Teaching Mobile App Design with AI

- 6-week online PD Workshop (Summer 2011)
- 16-week online Graduate Course (Fall 2011, 2012, 2013, 2014)
- 3-week online quest-based learning Teacher Camp (Summer 2012)
- 5-day F2F High School Summer Camp (Summer 2012)
- 2-week online quest-based learning Teacher Camp (Spring 2012, 2013; Fall 2013, 2014)
- 1.5-hour BSU Faculty Workshop (Fall 2012)
- 5-day F2F High School Summer Camp (Summer 2013, 2014)
Teaching/Modeling

Quest-based Learning Camp for Teachers

- Summer 2012
- 3 weeks
- 10 quests
- 3D GameLab
- Live meeting via Adobe Connect
- 34 Adult Learners
Quest-based Learning through 3D GameLab Platform
### List of Quests in Portal

<table>
<thead>
<tr>
<th>Quest Name</th>
<th>XP</th>
<th>Min</th>
<th>Rating</th>
<th>Category</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI:1 [Bonus Quest—App Design Research Participation]</td>
<td>10</td>
<td>30</td>
<td>★★★★★</td>
<td>App Inventor</td>
<td>No end date</td>
</tr>
<tr>
<td>AI:8 [App Component and Interface]</td>
<td>20</td>
<td>32</td>
<td>★★★★★</td>
<td>App Inventor</td>
<td>No end date</td>
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<tr>
<td>AI:9 [Blocks in progress of Your Final App]</td>
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<td>122</td>
<td>★★★★★</td>
<td>App Inventor</td>
<td>No end date</td>
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<tr>
<td>AI:10 [YOUR App!]</td>
<td>30</td>
<td>125</td>
<td>★★★★★</td>
<td>App Inventor</td>
<td>No end date</td>
</tr>
<tr>
<td>AI:3 [Practice and Customize: PaintPot]</td>
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<td>95</td>
<td>★★★★★</td>
<td>App Inventor</td>
<td>No end date</td>
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<tr>
<td>AI:7 [App Design Proposal]</td>
<td>20</td>
<td>120</td>
<td>★★★★★</td>
<td>App Inventor</td>
<td>No end date</td>
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</table>
Prerequisites and Standards Mapping
Forums on the Guild Site
Benefits

● Quest-based learning
  ○ Self-paced and flexible
  ○ No pressure [...]
● 3D GameLab Environment
  ○ Prerequisite setup
  ○ Convenient for teacher to map content with standards
  ○ Consistent interface design
  ○ Game-like environment
  ○ Built-in game elements (XP, badges)
  ○ Quest (product) rating by players (consumers)
Quests Completion

Q1: 51 (setup)
Q2: 22 (intro)
Q3: 16 (practice)
Q4: 10 (practice)
Q5: 8 (practice)
Q6: 8 (practice)
Q7: 3 (proposal)
Q8: 2 (interface)
Q9: 2 (blocks/programming)
Q10: 2 (completed apps)
Issues and Implications--Infrastructure

● Separate Sites instead of All-in-One
  ○ **Portal** for Quests
  ○ **Guild Site** for Discussions
  ○ **Adobe Connect** for Live Meeting

**Proximity** and **Integration** Matters
Issues and Implications--Consequences and Requirement

- Quest-based learning not tied with "consequences"
  - No sense of "failing", no pressure on completing all quests
    - Can always come back within a year
    - Simply quit when it's getting more difficult.
      - "Okay, I got the idea. I'll try it later."
      - You need a push sometimes to get through the bottleneck.
  - No requirement on providing peer feedback
    - Solution: Build in requirement of and encourage providing peer review
Issues and Implications--
Incentives and Motivation (system level)

- XP’s or Badges do not matter that much--in this case
  - Adult learners care about what they actually learn
  - Incentives have no practical values, unless tied to actual PD credits
    - Solution: Get buy-in from schools and make it acknowledged PD curriculum/content
  - What about XP’s for K-12 students?
- Other candies (strands of quests) in the shop
  - Solution: Focused offering of one strand and then move on to the other
In the spirit of Quest-based Learning

- Offer more “sub-quests” or fine-grained quests, in the unit of sub-components/sub-function
- Allow learners more freedom to choose
  - their sequences of completing the quests
  - which equivalent quests to complete no need to finish all; only those that interest them)
5-day F2F High School Summer Camp
Activities

- 5-day class as part of Exploratory Class or Digital Technology Class
- Hands-on/Tutorial/Facilitation/Mentoring
- Assistants
  - CS-major college student
  - Tech Coordinator
  - TRiO UB Academic Mentor (college student from past TRiO UB)
- Day 1-3: Build 3 to 5 Practice Apps
- Day 4: Design and Build their own apps
- Day 5: Presentation [a.k.a. sales pitch]
  - Interface
  - Prototype
  - Completed Apps
Student Profile:
TRiO Upward Bound Students

- Qualifications:
  - First-generation college bound
  - Limited income
  - In need of assistance to expand their educational opportunities.

- 13 high school students--6 girls and 7 boys
CT and Mentoring

- **Model** Design Problem Decomposition
- **Emphasize** major concepts and components in AI
- **Actively respond** to students' need in class and teachable moment
  - Where are the blocks?
- **Actively prompt** about design consideration (button size, usability, playability etc.)
- **Provide** Design Challenge by CS students
  - Encourage CS students' engagement in the curriculum
  - Encourage high school students to seek for challenge
SNAP The Music Player
VF Drum
Observations or interesting anecdotes
from working with students using App Inventor

- Love developing game apps and music apps (collection of music channel or videos; instruments etc.)
- Interested in completion first (how do i get all the blocks right)
- Social: Like to talk to each other during development to exchange ideas or seeing what others are up to
My 2-Cents: Some potential take-aways

- Set up everything to avoid waste of time on troubleshooting and get them to the fun of developing apps (if the curriculum duration is short)
- Let them take on the challenge of setting things up if you got time for them (necessary experiences for them to do it at home)
- Make them presenters and audience (role-play and constructive feedback)...and invite their parents if possible
More about My Work with AI in Education

● Syllabus
  ○ MOBILE APP DESIGN FOR TEACHING AND LEARNING

● Articles
  ○ Empowering educators with Google's Android App Inventor: An online workshop in mobile app design (in BJET)
  ○ Mobile App Design for Teaching and Learning: Educators’ Experiences in an Online Graduate Course (in IRRODL)

● Stories
  ○ Idaho Upward Bound Program Teaches College Readiness with App Inventor
  ○ Teaching Mobile App Design with App Inventor at Boise State University

● Press
  ○ Idaho High School Students Get A Taste Of College Life
  ○ Students Help Hikers Navigate Trails With Smartphone Guide
Chinma Uche
Math and Computer Science Teacher

Co-PI: Mobile CSP project
President: CTCSTA, www.ctcsta.org
App Inventor

0 Makes CS relevant to students and parents
0 A visual blocks-based programming language
0 Allows exploration of computational ideas
0 Allows students to be creative
0 Rewards achievement: Participation in contests; supported by school administration because of tangible products.
0 Cool CS Products: Grab-and-go qr codes.
App Inventor

0 Introduced to App Inventor by Professor Ralph Morelli’s HFOSS team through an NSF-funded CPATH grant in Summer 2011.
0 Found really fascinating and engaging
0 Started the development of curriculum for the K-12 classroom
0 Applied to be a pilot Instructor with Professor Morelli as college-partner.
CS Pilot: 2011 - date

0 Used App Inventor to as programming tool and to cover most of the seven big ideas

0 2011 – 2012: 10\textsuperscript{th} and 11\textsuperscript{th} graders, honors level students;

0 2012 – 2013: 9\textsuperscript{th} and 10\textsuperscript{th} graders, honors level;
19 students, 9F / 10M

0 2013 – 2014: 11\textsuperscript{th} and 12\textsuperscript{th} graders, non-honors.
11 students, 6F / 7M
Sample work
Informal Programs

0 CPEP: Saturday Program: 2012 – 2013

0 Technovation Challenge: a program for introducing high school girls to entrepreneurship through mobile app development. Provides detailed curriculum and support, recommends having industry mentors
Technovation Challenge: 2013, 2014

2013: Two teams, both made it to the honorable mention level. Honored at the school’s award ceremony.

2014: Four teams, developed cool products did not finish the documentation. Great experience. Honored at the school’s award ceremony.

Many students are not even aware of the school’s award ceremony but TC creates the opportunity.
A 2013 TC Team

- Sana
- Kaynaat
- Mariam
2013 TC App

**Pass It On!**

**Financial projections**

<table>
<thead>
<tr>
<th>Market</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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</thead>
<tbody>
<tr>
<td>Schools</td>
<td>$646.85</td>
<td>$1,940.56</td>
<td>$2,587.41</td>
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<tr>
<td>Students</td>
<td>$41,925.26</td>
<td>$125,775.79</td>
<td>$167,701.05</td>
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<tr>
<td>Total</td>
<td>$42,572.11</td>
<td>$127,716.35</td>
<td>$170,288.46</td>
</tr>
</tbody>
</table>

**Stay Connected!**

- Name: [Input]
- Point Value: [Input]
- Most recent activity: [Input]

**Get More points**

**Main Menu**

**Avatar**

- Face
- Body
- Clothes
- Accessories

**Update Avatar**

**Your Score**: 100

**Number of Acts**: 1

**Find Acts of Kindness**

**Stay Connected**

**Post Your Act of Kindness**

**Update Your Avatar**
Another TC 2013 Team
Another TC 2013 App

Presented at the 2013 App Inventor Summit

https://sites.google.com/site/uexerciseu/
Advantages of TC

- Collaboration
- The full design process
- Marketing and budget development
- Documentation
- Impressive

Encourage your girls to participate.
App Development Support

0 House App Challenge: http://housestudentapps.challengepost.com/

0 App Inventor Summit: http://summit.appinventor.mit.edu/

0 Verizon App Challenge: http://appchallenge.tsaweb.org/about-challenge
Post-AP projects
Other Resources

0 Moblie CSP: www.moblie-csp.org
0 Mobile CSP Online: https://sites.google.com/a/css.edu/mobilecsp/home
0 Technovation Challenge: http://www.technovationchallenge.org/
What is iSENSE?

- iSENSE is a set of free tools for collecting, sharing, and visualizing scientific data.
- iSENSE was created for use in middle school and high school classrooms.
- iSENSE can be used in teaching math, engineering, physics, chemistry, computer science, and more.
Key Concepts

- **Project**
  - Repository for data

- **Field**
  - Type and source of anticipated data

- **Data Set**
  - Table of values

- **Visualization**
  - Graphical view of one or more data sets
With iSENSE + MIT App Inventor, you can create apps publish data directly to iSENSE.

(You can also retrieve data from iSENSE.)
How does it work?

- We created a new iSENSE component in App Inventor
- You configure with your iSENSE project ID and contributor credentials
- iSENSE blocks let you upload data sets
- You can also retrieve data from your iSENSE project
Sensors

- Clock (time, date, and elapsed time)
- LocationSensor (GPS latitude & longitude)
- OrientationSensor (azimuth & altitude)
- AccelerometerSensor (X Y and Z forces)
- Camera (take picture)
Let's make a snowfall recording app
Let's make a snowfall recording app
Snow Depth Measurements - After the Storm
This heatmap shows the snow depth at the conclusion of snowfall from winter storm Hercules, January 2 and 3, 2014. Snowfall appears to have been heaviest nearer to the coast.
+ App Inventor

Apps from July 1, 2014 teacher workshop (1 of 2)

- **Crane Beach Erosion** — Kids measure the distance from a marker on the beach to the sand level, getting a profile of the beach. [isenseproject.org/visualizations/318](http://isenseproject.org/visualizations/318)

- **WTHS Basketball** — Keep track of scoring and goals in a HS basketball game. Records fouls and shots scored per player. [isenseproject.org/visualizations/319](http://isenseproject.org/visualizations/319)

- **Physical Activity Tests** — Record kids’ heart rate after doing various standardized physical activities in gym. Enter ID, class year, test type, and heart rate in BPM. [isenseproject.org/visualizations/320](http://isenseproject.org/visualizations/320)
● **Central Limit Theorem** — Simulation app which randomly draws items from a population and graphs results. [isenseproject.org/visualizations/321](http://isenseproject.org/visualizations/321)

● **Grade 8 Balloon Car Race** — Kids operate a balloon car, and record the elapsed time at a distance of 2m, 4m, 6m, 8m, and 10m. [isenseproject.org/visualizations/322](http://isenseproject.org/visualizations/322)

● **The Cambridge Ecosystem** — Data walk app for recording observations of birds, squirrels, and other things on map. [isenseproject.org/visualizations/323](http://isenseproject.org/visualizations/323)
Why Use iSENSE?

- Sharing projects and data online takes good classroom activities, which are often private, static, and ephemeral, and makes them public, evolving, and lasting.

- We are in the age of “big data,” and science is becoming a data-driven enterprise. It’s important for students to begin developing data science skills.

- Many of the eight cross-cutting Next Generation Science Standards science and engineering “practices” can be integrated into iSENSE activities.
Data and information is one of the 7 Big Ideas in CS Principles

When is data science more computing-oriented, and when is it more statistics-oriented? (thanks to Nate Titterton):

- Exploratory analyses vs. Confirmatory analyses
- Experimental studies vs. Observational studies
Going Forward

- This work was led by UMass Lowell graduate student Alan Rosenthal

- We have a custom App Inventor instance at isense-ai2.appspot.com and AI Companion app bit.ly/isenseaicomp1

- We want to work with you to integrate iSENSE with your teaching

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