Lessons Learned:
The do’s and don’ts of using GIS tools to investigate socio-environmental science in the secondary classroom

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<tbody>
<tr>
<td>SCOTT RUTZMOSER</td>
<td>GISPRO &amp; CALGIS 2018</td>
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<td>OCTOBER 11, 2018</td>
<td>PALM SPRING, CA</td>
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<td>ALEC BODZIN</td>
<td>THOMAS HAMMOND</td>
<td>DAVID ANASTASIO</td>
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<td>BREENA HOLLAND</td>
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Presentation Outline

- About Our Research
- About Building 21
- Technology
- Activities
- Implementation
- Lessons Learned
About Myself
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Introductory Video
http://www.ei.lehigh.edu/eli/sesi/

Research Team
Dr. Alec Bodzin – College of Education
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Dr. Breena Holland – Political Science
Dr. Kate Popejoy – Grant Consultant
Dr. Dork Sahagian – Earth and Environmental Science
James Carrigan – Graduate Student
William Farina – Graduate Student
Robson Martins De Araujo Junior – Graduate Student
Socio-environmental science investigations (SESI) are a series of secondary level geospatial investigations that focus on social issues related to environmental science. The investigations focus on local problems and utilize fieldwork to gather data in a local setting. Students use the Esri Collector app to gather geo-referenced data outside their school. The student-collected data is then shared into a Cloud-based map service over the Internet. The collaborative data set is analyzed in ARCGIS.com, a Web-based GIS with interactive mapping visualization tools that students use to manage, query, and analyze geospatial data. Students use geospatial thinking and analysis skills for investigating geospatial relationships in the data in addition to critical thinking skills to synthesize, compare, and interpret information to solve problems in their local environment.
National Science Foundation

ITEST Grant  Innovative Technology Experiences for Students and Teachers

Year 1 – Pilot Exercises, design and test
Year 2 – Implementation, Pre & Post Testing 6 Classrooms
Year 3 – Implementation and Dissemination, Pre & Post Testing 6 Classrooms
Year 4 – Publication and Dissemination

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Building 21 Allentown is a non-selective competency-based high school in the Allentown School District. It is a new secondary model that seeks to facilitate an authentic learning experience that will address the unique social and academic needs of all learners.

City of Allentown Public School
Students Selected via Lottery

**Learning Model**

**Personalized Learning Pathways:** Students' own strengths, interests, and passion shape their pathway across foundation and design years toward college and career readiness.

**Strong Relationships**
Every student is known and understood – this provides the motivation, safety, and confidence that students need to discover and pursue their passions.

**Problem-based Learning**
Students learn through inquiry and problem-solving, then apply the lessons to make an impact on school and community.

**Real-World Learning Experiences**
Learning takes place in and among the larger community, through career-connected studios, mentoring, internships, and more.

**Competency-based Assessment**
Continual assessment ensures that students progress toward mastery of competencies and receive the right level of support.
Current Implementation (Year 3)

140 ninth-grade students
- 65% Identify as Hispanic or Latino
- 21% Identified by Districts as English Language Learners
- 19% Have Individualized Education Plans

Population is traditionally under represented in the STEM field.

Initial assessment approximately 30% are reluctant learners.
ESRI ArcGIS Online

Free for Education
Create Accounts
Manage Roles
Manage Groups
Create Data and Maps
Share Content
Plenty of Documentation

www.esri.com/en-us/industries/education/licensing
ESRI ArcGIS Collector App

Field Data Collection Activities

Check-out maps and data

Collector for iOS

ArcGIS Online Suite
  ◦ Same Accounts
  ◦ Groups
  ◦ Data and Maps

Five Field and Classroom Activities

- Ecosystem Scavenger Hunt
  - Items in Nature

- Built Environment Scavenger Hunt
  - Observations Man-made Resources

- Trees and Ecological Services
  - Benefits of Trees and Nature

- Urban Heat Island
  - Effects of Ground Surface

- Zoning
  - Buildings and Services
Field Data Collection
Classroom Analysis
Implementation
Required Pre-Preparation

Curriculum Based Activities
- Teacher Documentation
- Student Documentation
- Worksheets

6 Classroom Sections (20-30 students each)

6 Feature Services

7 Maps
- 6 Field Data Collection
- 1 Classroom (used by all six classes)
- Other Supporting Layers

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Lessons Learned

No pain | Discomforting | Distressing | Intense | Utterly horrible | Unimaginable unspeakable

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

Very mild | Tolerable | Very distressing | Very intense | Excruciating unbearable

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Lessons Learned

- Engage and Leverage Stakeholders
- Expecting Too Much
- Students Lost Focus
- Too Much Too Fast
- Taking it Outside
- Embrace Changing Technology
- Providing a Hook
- Use Our Stuff

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Engage and Leverage Stakeholders

Buy-in from Administration
• Field Trip Permission
• Classroom Mentors
• Geo Mentors

Fully Committed Teachers
• Provide Training
• Confident with GIS

Support from IT Staff
• Mobile Devices
• User Accounts
• Internet Access (Wireless)

Success
Expecting Too Much

Do as much as you can in advance and remove as many moving parts as possible.

Accounts and Passwords

Class Groups

Organize Data

Create Maps

Install Software Collector App

Confirm Student Access PRIOR to Implementation

Field Data Collection
Students Lost Focus

Avoid non-essential technology and apps when possible.

- ArcGIS Collector
- V-Tree
- Leaf Snap
- Tree iBook App

Does the tree have needles or leaves?

- LEAVES
- NEEDLES

What are Needles?

BACK TO DIRECTIONS  MORE INFO
Too Much Too Fast

Plan on spending the initial exercise focusing on software. Integrate small amounts of content to help provide context.
Taking it Outside

Day 1

ArcGIS Collector
Login
Start Check-out

Pre Instruction
Concepts
Subject Matter
Background
Terms

Outdoor Data Collection

ArcGIS Collector
Sync

Day 2

Classroom Analysis

Additional Learning
Details
Experimental

Classroom Analysis

Culminating Artifact

Check-out process can be sloooow! Get started right away.

Spend 15 minutes before Day 1 logging in to ArcGIS.com and confirm accounts.
Embrace Changing Technology

- ArcGIS Collector is Improving
- Interface Changes
- New Permissions Roles
- Bugs in Tiled Layers

Stay Calm and Map On!

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Providing a Hook

Different for Every Class and Activity

- Engagement
- Fascination
- Flow

Lead to Motivation

Examples

Taking Photos

Viewing Creator/Editor Information

Zoning Activity – Students engaged when they mapped beauty salons.

Trees and Ecological Services - We used a local park to identify and map trees with students.
Use Our Stuff

http://b21.maps.arcgis.com
  ◦ Feature Layer Templates
  ◦ Example Applications

http://www.ei.lehigh.edu/eli/sesi/
  ◦ Teacher Documentation
  ◦ Student Documentation
  ◦ Student Worksheets
Thank You

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