Emerging Citizen Science Initiatives at Esri

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At Esri we are concerned not only with supporting basic and applied science, but recognize that there are many major themes of compelling interest to society that will drive scientific research for the next two decades. Four of these are [on the slide]. And thus we view science as helping us to understand much more than solely “how the Earth works” but …

How the Earth works… (process)
How the Earth should look… (design)
How we should look AT the Earth… (data)
“Teaching geography in the 21st Century includes working with mobile and online mapping tools, in addition to traditional focuses such as physical and cultural geography, fieldwork, and understanding landscapes”
Five converging global trends that present geography with new global opportunities.
For Citizen science → **Illustration of why phenomena can be understood more completely WHEN it is mapped.**

Geoliteracy can be conceptualized as being supported by content knowledge, skills, and the geographic perspective (or spatial thinking)
Now to review several citizen science data collection methods supported by Esri technology

Method 1 – Collector for ArcGIS
Utility and ease of use of the app spans, all the way from projects for local children in US neighborhoods
To local community projects in developing countries
Citizen science data collection methods

Method 2 – Geoform template – easier form-based data editing of a Feature Service in an AGOL web map
Citizen science data collection methods
Method 2 – Joseph Kerski video
Could spend lots of time showing many maps resulting from data collection efforts. This is just one, collected by students – simple analysis via buffering of points to show light cast by a single street light and hence what areas of a neighborhood are the darkest and potentially most dangerous.

83 T3G educators collected 2,000 points in 90 minutes using the Collector app.
“People are moved by emotion. The best way to emotionally connect other people to our agenda begins with “Once upon a time...” Science backs up the long-held belief that story is the most powerful means of communicating a message. Over the last several decades psychology has begun a serious study of how story affects the human mind. Results repeatedly show that our attitudes, fears, hopes, and values are strongly influenced by story. In fact, fiction seems to be more effective at changing beliefs than writing that is specifically designed to persuade through argument and evidence.”

http://www.fastcocreate.com/1680581/why-storytelling-is-the-ultimate-weapon

Scientists are often encouraged not to publish their work until it constitutes a complete story.

Why not combine BOTH, especially to take advantage of the power of maps and geography to educate, inform, and inspire people to action as well?

Story maps is about using maps in new and innovative ways to get people excited and involved in the world.

Thanks to continuing changes in the Internet, cloud computing, mobile and tablet platforms, and to constant improvements in the software itself, we can now put the power of GIS into the hands of managers, CEOs, reporters, school kids—even policy makers.
Example of a compelling story map made by professional cartographers...
But anyone can put together a great story map. This one by a user: “Collective catalog of indigenous art in the Caura River Basin of Venezuela”
Great variety of map styles and apps with which to make them
Made by high school students from photos taken in the field. They could have used Snap2Map
A new story map app in development focusing only on photos
Now I would like to share some recent papers that have just come out, which hopefully can inform our discussion of citizen science and indigenous knowledge.
Geoenabled Citizen Science

Every issue from pollution to habitat to biodiversity and beyond has a geographic component, and thus can be studied in the field. Because the world is rapidly changing, and because large organizations have cut back on many of their field staffs, much of the critically needed field data can and should come from citizen scientists.

What is "citizen science"?

"Citizen science is scientific research conducted, in whole or in part, by amateur or nonprofessional scientists, often by crowdsourcing and crowdfunding."

—Wikipedia

Consider the major environmental issues of our 21st Century world: Coastal erosion, oil, salt, and water pollution, urbanization, desertification, habitat loss, invasive species, and deforestation, just to name a few. Each of these issues occurs somewhere, and often in multiple locations and at multiple scales. For example, climate change is a global phenomenon that also impacts local weather and crop yields. Each phenomenon exhibits a spatial pattern in its source and in its diffusion. Each affects multiple facets of the human and physical environment. Therefore, the geographic perspective is key to understanding these issues, and citizen science initiatives provide data that can be used within a GIS environment. In such an environment, multiple variables can be displayed and analyzed as map and image layers, at multiple scales, in two dimensions and in three dimensions.
Crowd science user contribution patterns and their implications

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Scientific research performed with the involvement of the broader public (the crowd) attracts increasing attention from scientists and policy makers. A key premise is that project organizers may be able to draw on unused human resources to advance research at relatively low cost. Despite a growing number of examples, systematic research on the effort contributions volunteers are willing to make to crowd science projects is lacking. Analyzing data on seven different projects, we quantify the financial value volunteers can bring by comparing their unpaid contributions with counterfactual costs in traditional or online labor markets. The volume of total contributions is substantial, although some projects are much more successful in attracting effort than others. Moreover, contributions received by projects are very uneven across time—a tendency toward declining activity is interrupted by spikes typically resulting from outreach efforts or media attention. Analyzing user-level data, we find that most contributors participate only once and with little effort, leaving a relatively small share of users who return responsible for most of the work.

to relatively rare skills and knowledge, including those that are not typically part of scientific training (10). Fourth, projects that require creative ideas and novel approaches typically benefit from rich and diverse knowledge inputs (13), and involving a larger crowd of individuals with diverse competences and experiences is more likely to provide access to such inputs. Fifth, crowd science projects can involve contributors across time and geographic space, allowing them to increase coverage that is particularly important for observational studies (14). Finally, in addition to potential impacts on productivity, involving the general public in research may also yield benefits for science education and advocacy (1, 15, 16).

In light of these potential benefits, crowd science is receiving increasing attention within and outside the scientific community. For example, the National Institutes of Health (NIH) is discussing the creation of a common fund program for citizen science (17), and the US Federal Government highlights the crowd-sourcing of science as a key element in its Open Government
An Esri colleague on our Nonprofit and Global Organizations team, Charles Brigham, wrote a citizen-science focused chapter in this book on the use of crowdsourced data and big data in INTERNATIONAL development research, including ethnography and political geography, particularly in subSaharan Afirca.
Esri’s Charles Brigham is also involved in this AAAS program that we all might want to connect with and track, if not doing so already.
Thank You

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esriurl.com/scicomm

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Extra Slide
Other Strategic Initiatives

Big Data
Open Source
- Geoportal Server, ArcGIS Editor for Open StreetMap, Flex Viewer
- acquired geolQ, new Development Center
- Blog posts: bit.ly/O4hLXL, blog.geolq.com
- Blog post: bit.ly/RV2JDO