

Creating Positive Change: The use of GIS in Native Education

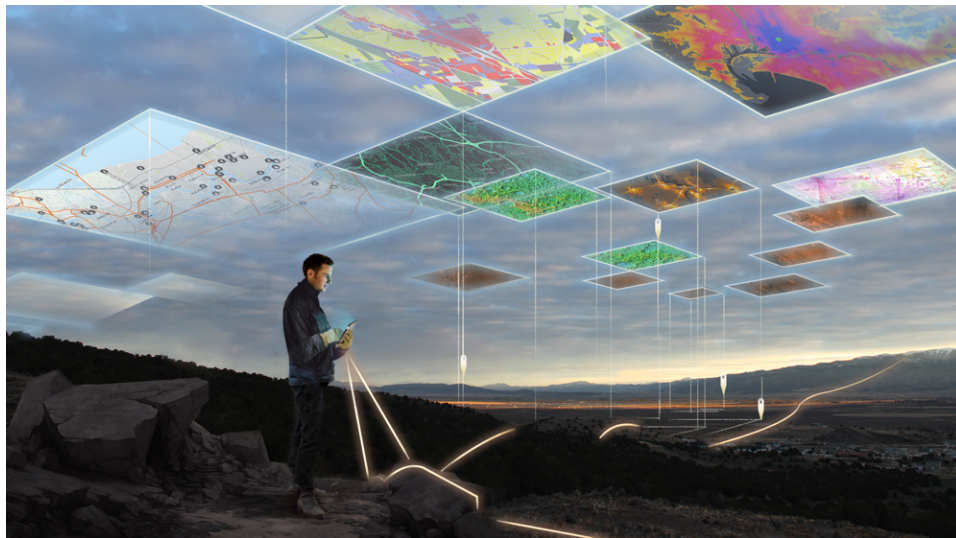
Using GIS is critical to engaging students to incorporate Native ways of learning and knowing and for building resilient communities.

Joseph Kerski

April 1, 2022

1. Why this matters.

*** We are confronted with serious and complex issues in the 21st Century that we need to solve to build resiliency and sustainability in our communities and in our world.**



*We are living in amazing times.
We have never before been so empowered--and yet so challenged.*



Geography and geotechnologies are essential for learning and also essential for the planet.

*** We are in need of bringing people together across a diversity of ages, cultural heritages, and disciplinary backgrounds to build community and chart a path forward.**



GIS can help bring people together!

2. Five forces bring us opportunity to press on toward these goals.



5 forces acting to position geography and spatial thinking on the world stage.

3. Why use GIS for learning and research?

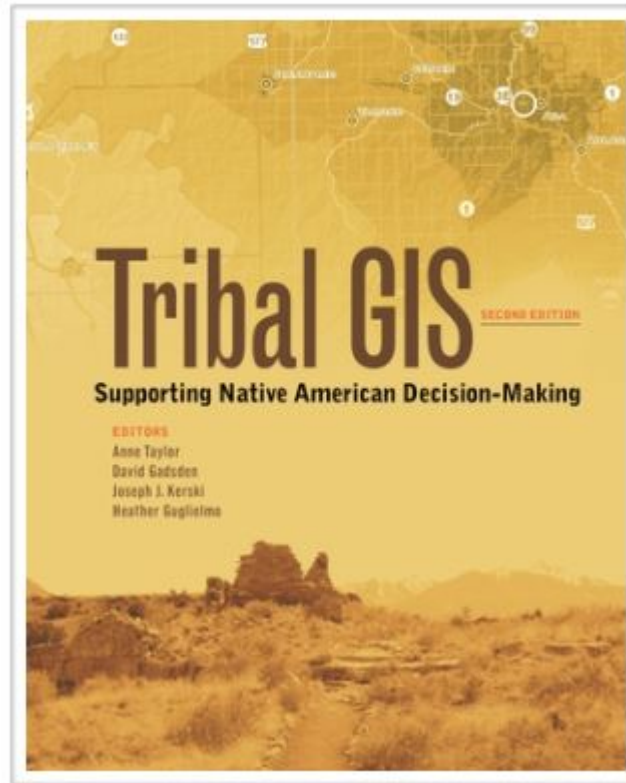
- *All 21st Century problems are spatial.*
- *Digital interactive maps are becoming the language of the planet.*
- *The Goal of GIS: To build a more resilient, healthier, smarter, sustainable world.*
- *GIS fosters: Spatial and critical thinking, connection to community, inquiry, problem solving, connection to content standards, connection to Native ways of learning and knowing, career pathways, creating portfolios, a way to foster communication; a way of assessing student work, and employability. [More benefits are here.](#)*
- *Further investigation: What are the 10 most important educational skills that GIS fosters?*

4. You are not in this alone.

Esri K12 Schools in USA map

This story map requires JavaScript, but running JavaScript is not currently allowed by your web...

<https://esriurl.com/usk12gis>



Tribal GIS book with stories about health, natural resource management, transportation, ... and education.



Joseph Kerski's pathway that shows that spatial thinking is valuable in a variety of organizations, and that you can change your organization from time to time. What's your pathway?

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Our Earth YouTube: <https://esriurl.com/ourearth>

[My CV.](#) | [My CV as a story map.](#) | [My Wikipedia page.](#)



I guess things haven't changed that much... still a geo-nerd.

Esri's mission: Education, Sustainability, Science. The Education Team at Esri: Since 1992.

About

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Education



Sustainability



Science

Esri's 3-fold mission.



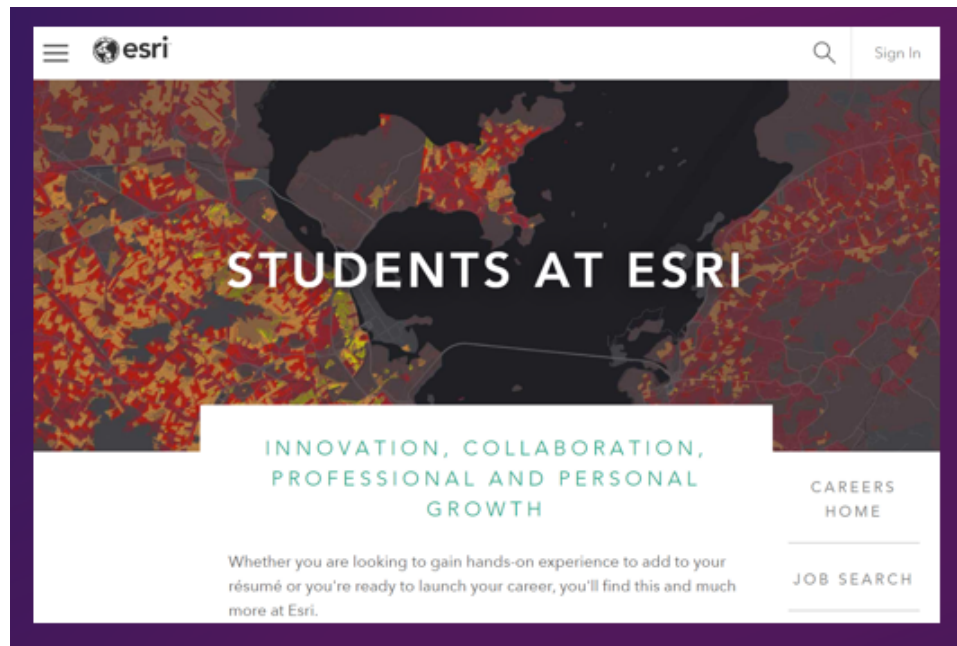
The largest donation of land ever given to The Nature Conservancy, by Esri founders Jack and Laura Dangermond (\$161 million). Esri also gave \$12 million to support E.O. Wilson's Half Earth Foundation.

Esri, like other organizations, depends upon and contributes to the development of science: <https://esriurl.com/scicomm> and <https://esriurl.com/agustories>. Maps have become the language of science.



GIS for Science--new book from Esri Press.

Could it also be that the fact that so many Esri employees studied geography that the Earth ethic pervades the organization?



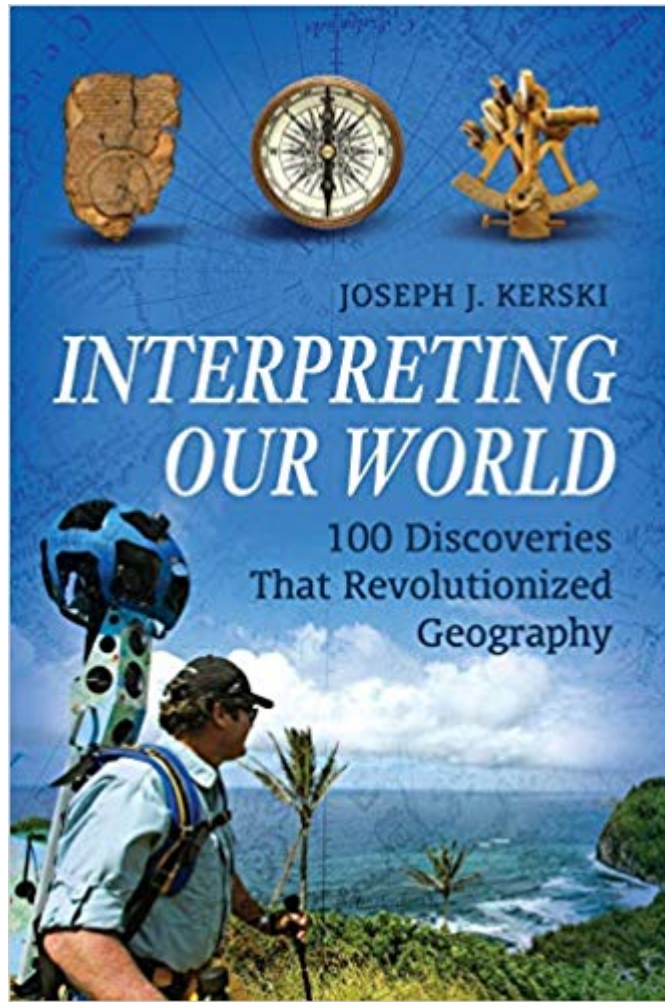
Esri, along with many other organizations, hires graduates--your students!--who can thinking spatially and critically.

Geography is also playing a key role in the research, development, and education surrounding the [UN's Sustainable Development Goals](#).

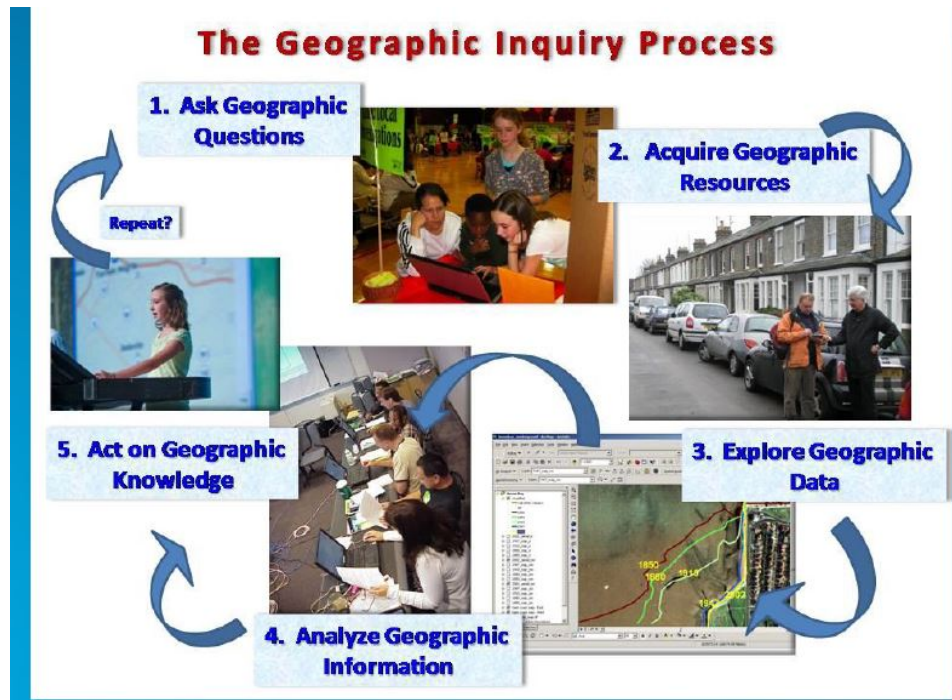
5. GIS fosters systems thinking, inquiry, and content knowledge.

Scale, Systems Thinking, Holistic Thinking, Spatial-temporal thinking: Patterns, relationships, trends, Acting on geographic information, [and more](#).

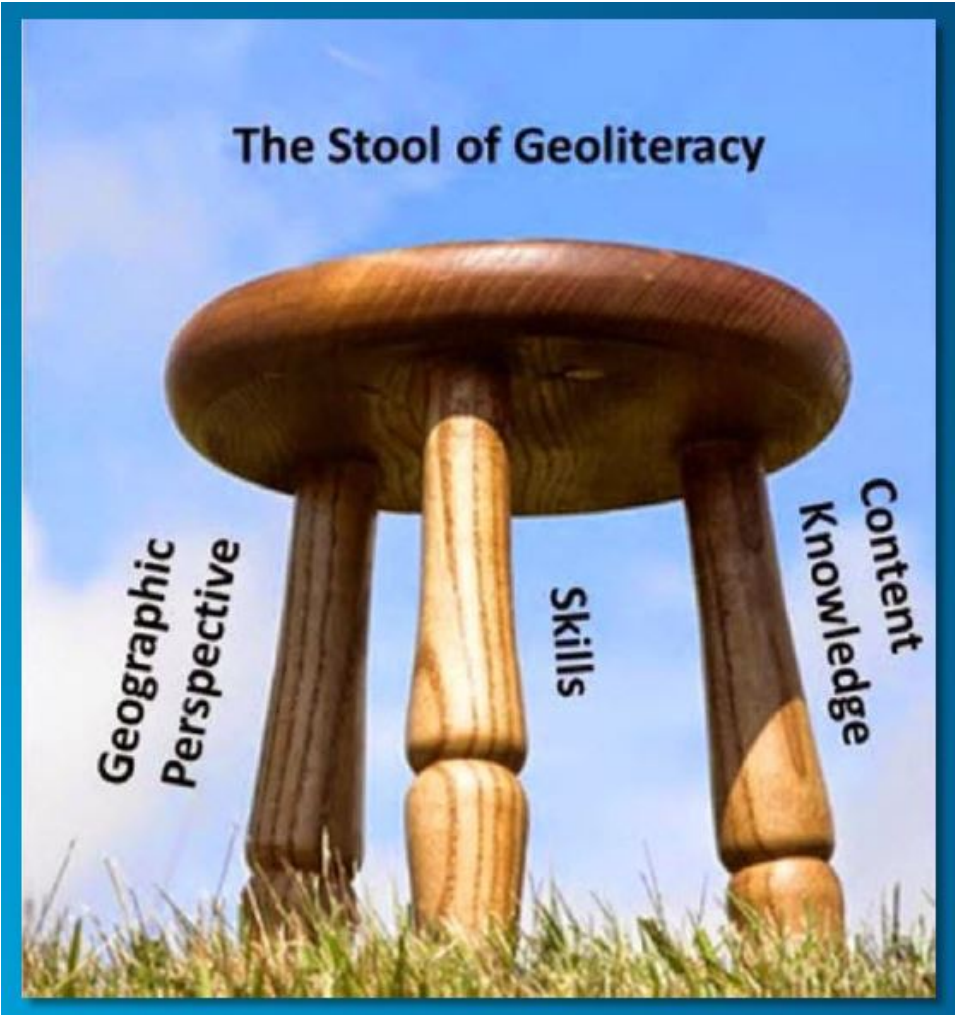
Many Indigenous people view every aspect of creation as continuously interacting with one another. As the observer is interacting with the observed, objectivity is impossible as the two cannot be separated. (Harris 2002).



Geography is actually--revolutionary!



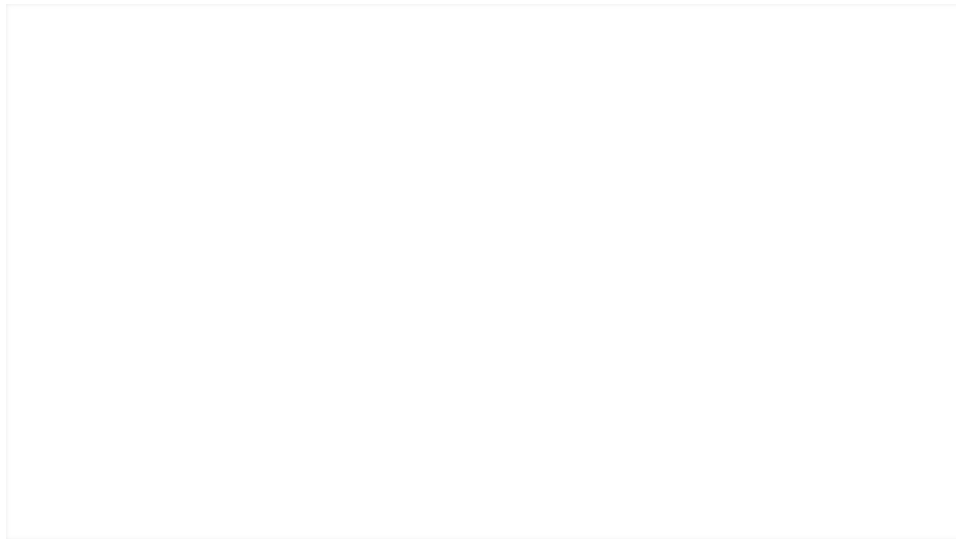
The Geographic Inquiry model. Key to the whole process: Asking questions.



GIS use fosters geoliteracy through these 3 components.



Lakota Language: Lakota Wicowoyake Canku owapi



Headcut erosion study Santo Domingo Pueblo.

Dr. Peter Arthur - University of British Columbia - Okanagan:
**Metacognitive
Knowledge.**

Describes anything one knows about thinking, especially one's own.

- **Declarative knowledge** - Knowledge about one's self as a learner and what can influence one's performance.
- **Procedural knowledge** - Skills, heuristics, and strategies. Knowledge about how to do things.
- **Conditional knowledge** - Knowledge about when and in what conditions certain knowledge is useful.
- **Metacognitive Regulation** - The process of managing one's own learning; includes planning, monitoring, and evaluating.

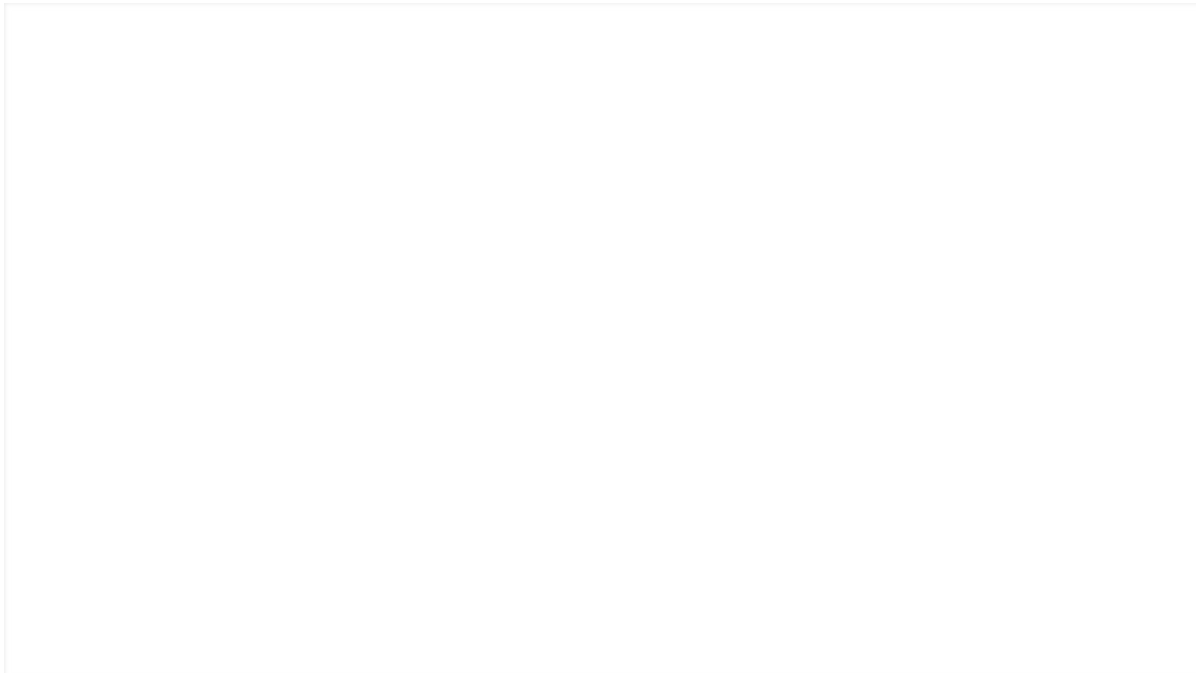
Jukes et al. (2010) prefer the term fluency over literacy (to imply lifelong learning). They state that 5 types of fluencies are important in education: Solution (whole brain thinking), information (including *assessing*), collaboration, creativity (the *process by which artistic proficiency adds meaning through design, art, and storytelling*), media (the *ability to look analytically at any communication media to interpret the real message, determine how the chosen media is being used to shape thinking, evaluate the efficacy of the message, and the ability to publish original digital products to match the media to the intended message*).

Cherokee educator L.A. Napier observed, “One of the most significant barriers we face in education is that we are not communicating—we are not working together” (2008). As a consequence, schools must be reconnected to families and communities in order for children to become truly “educated” “whole” people.

Dr Wildcat (2001) (Haskell Indian Nations University, identified a disconnection problem in schools: "Today what counts as knowledge in mainstream education is too often short-term memorization of “facts.” What counts as understanding is specialization in a narrow topic within a field or discipline. Understanding is

so narrowly framed that it is often difficult for the specialists, let alone students, to effectively connect or relate their knowledge and understanding to the everyday lives of nonscientists. Because people desire just the “facts” without any understanding of the relations and connection between the “facts” and the rest of the world, we have the search-engine model of education. (p. 29).

Nansemond Virginia Indigenous Life [Story Map](#):



Indigenous Life on the Nansemond River

Voices of the Grand Canyon. Including [Jim Enote, a traditional Zuni farmer and director of the A:shiwí A:wán Museum and Heritage Center](#). Jim is working with Zuni artists to create maps that bring an indigenous voice and perspective back to the land, countering Western notions of place and geography and challenging the arbitrary borders imposed on the Zuni world ([Counter Mapping](#)).



Conservation

Restoring Culture and Life back to an Urban Landscape

Lake Sammamish

The Snoqualmie People have lived in the southern Salish Sea region for time immemorial. In this stor...

<https://snoqualmie.maps.arcgis.com/apps/Cascade/index.html?appid=4c162d1c016e4f0eaf0c786e4100d32f>

Tribal Treaty Areas

The Confederated Tribes of the Grand Ronde Community of Oregon located, georeferenced, and...

<https://ctgr.maps.arcgis.com/apps/Cascade/index.html?appid=2ba01436bde9445786f0c2a0a669f82d>

Brownfields Tribal Response Program: A Tour

Keweenaw Bay Indian Community's efforts to protect and preserve the land is, in part, illustrated by our continuous efforts to identif...

<https://www.arcgis.com/apps/MapTour/index.html?appid=0fb5e9efef9d4426a34a83a9ea4fd937>

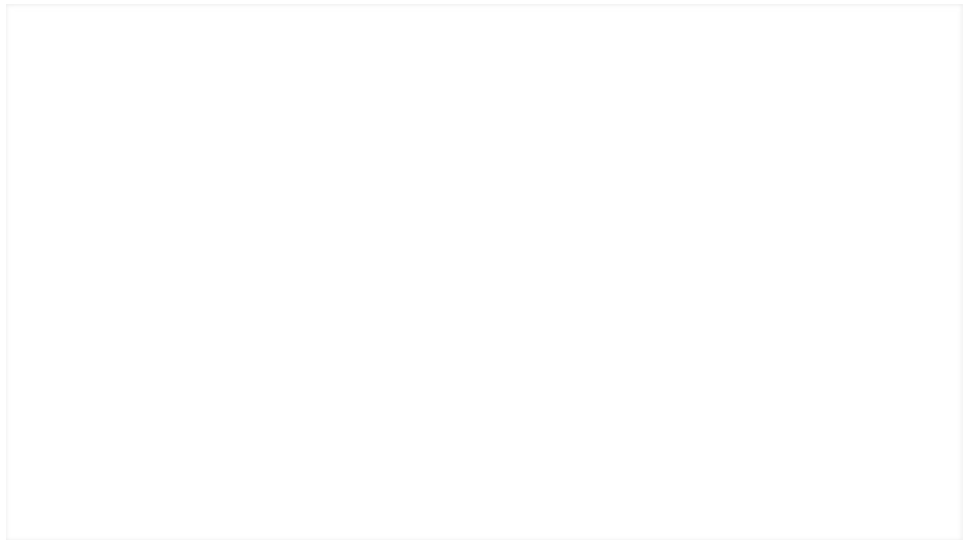
1. Stories are not separate from theory; they constitute theory and are, therefore, real and legitimate sources of data and ways of being.
2. Theory and practice are connected in profound ways that educators can make use of with geotechnologies.

6. GIS is in the Cloud!

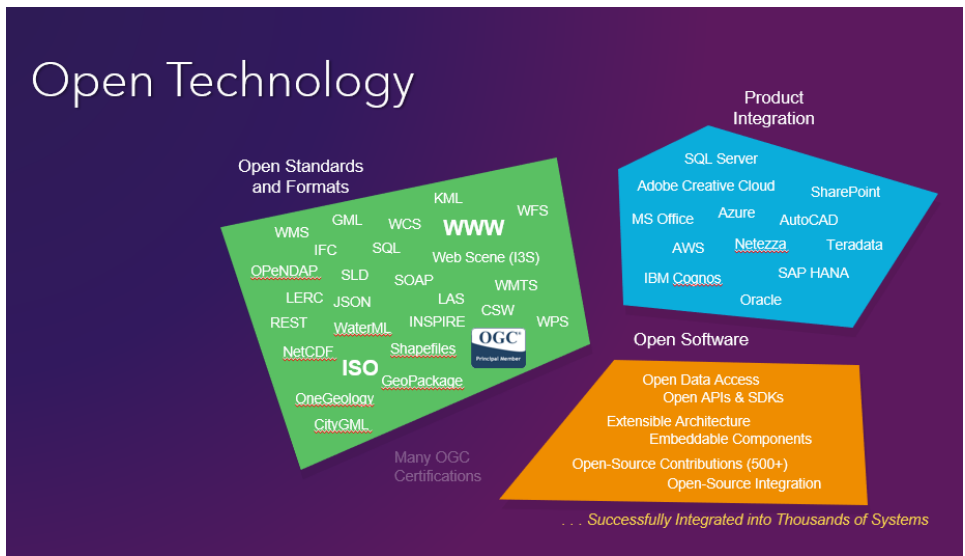
Modern GIS: (1) Cloud-enabled. Interoperable. Accessible. (2) App-based. Shareable. (3) Data and analytical tools as services. (4) Tied to major IT developments: IoT, AI, open data. (5) Tied to societal issues: Location privacy, copyright, citizen science.

Citizen science, mapping, and analysis:

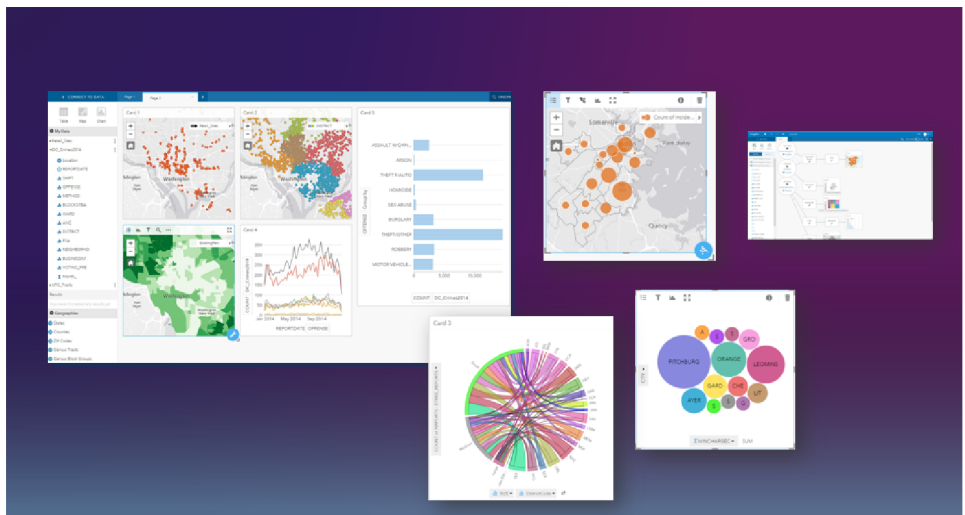
<https://esriurl.com/citizens>



Story Map Series

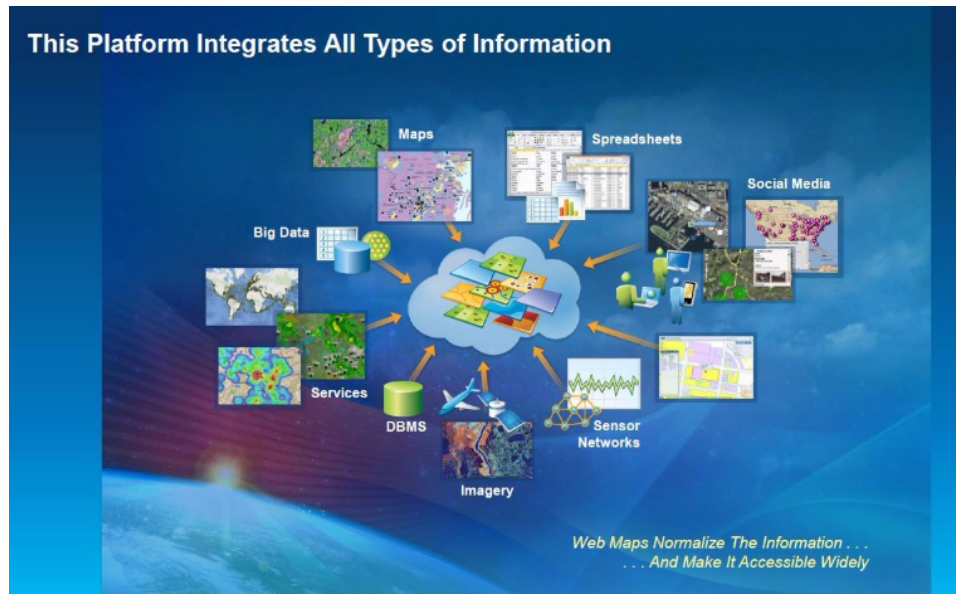


GIS is no longer a "niche" technology but embedded in mainstream IT.



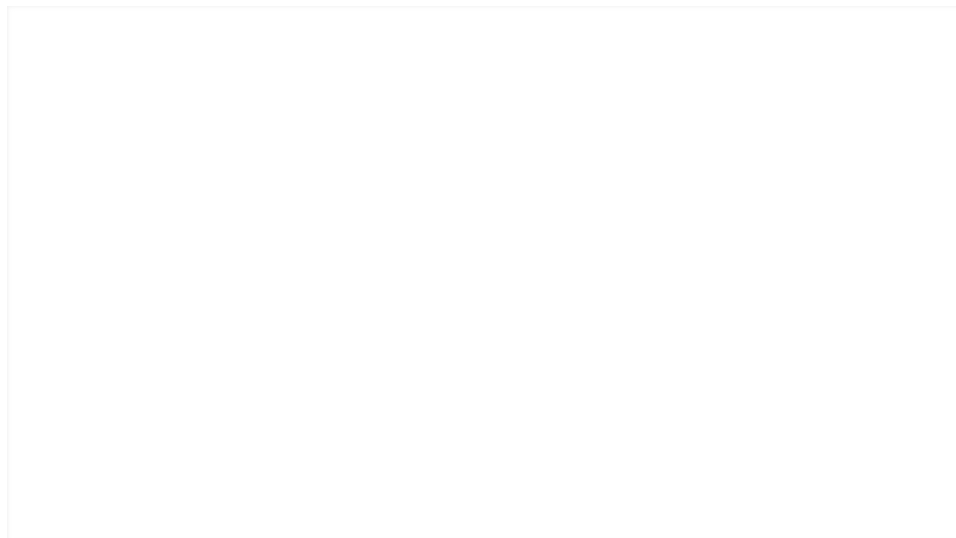
Analytics as a Service provides spatial analysis tools for an increasing number of disciplines.

GIS has moved from a system of RECORDS to a system of ENGAGEMENT.

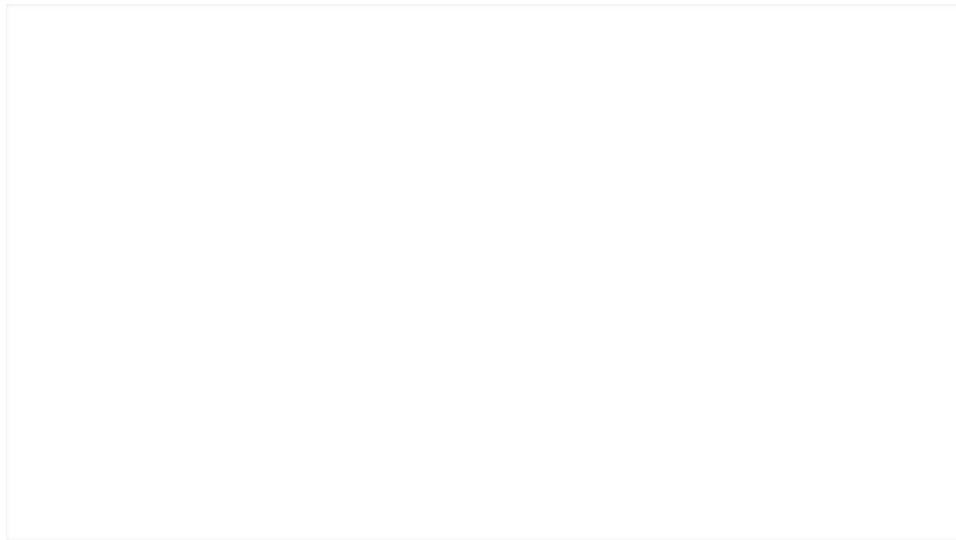


The GIS platform integrates all types of information.

As GIS has become a platform that integrates all types of information, maps are becoming the language of science--the language of the planet.



Current weather--11 variables for every airport weather station and many ocean buoys around the world--nearly 5,000 stations, updated hourly.



Sea surface temperature over space and time.

7. GIS fosters place-based education and field work

Teaching and research must include immersion in places and fieldwork: Collect data in the field but also: Observe. And foster a love for the planet.

Place-based learning: A framework for incorporating cultural standards and related practices as the framework for integrating indigenous knowledge and physical environment into Western education systems (Emekauwa 2004).



Guess where?

Include Community Service in Field Work:

Wildcat stated that “community service ought to be expected, and I can think of no better services than holistic learning experiences” (2001).

8. Practical Ways to Start.

Ask questions, investigate, solve problems, use GIS and other investigative tools in your investigations.

Ways to teach with GIS:

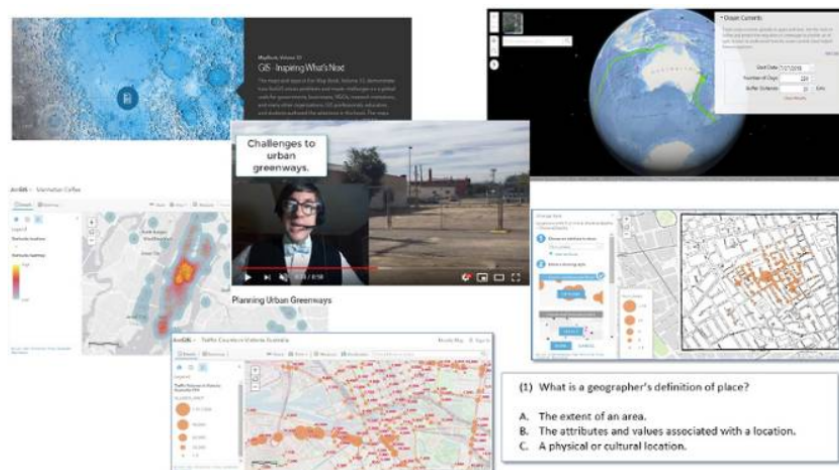
1. Use existing activities tied to interactive web maps.
2. Dig deeper into data tied to existing lessons or other data.
3. Create your own activities based on your own course objectives.
4. Gather, map, and analyse data in your own community.
5. Create and give oral and written presentations with story maps.

using...

1. One projector, one computer – everyone engaged.
2. Multiple computers in BYOD mode.
3. In the field using Survey123, clipboards, and other apps.

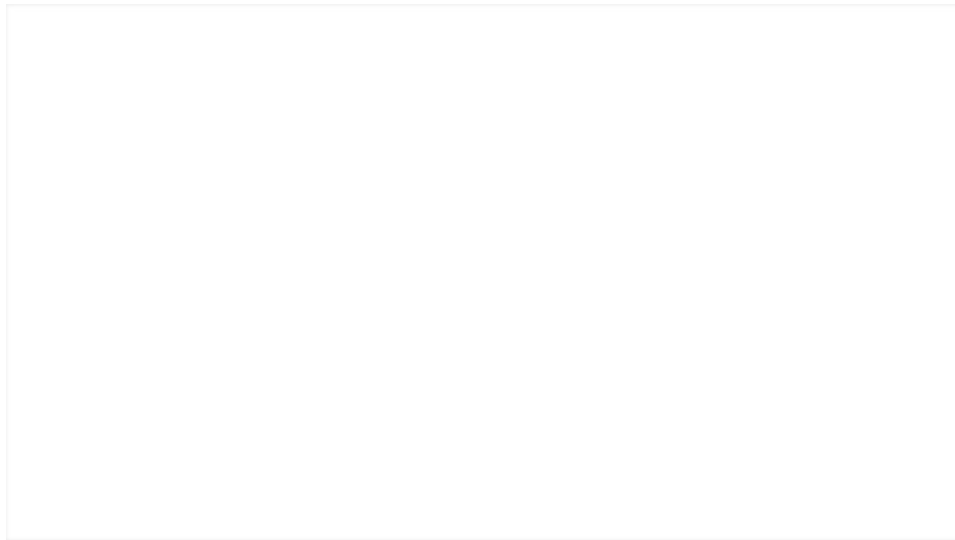
Advice on teaching with GIS:

1. Examine which activities you are teaching could be enhanced through GIS.
2. Teaching with rapidly evolving technology requires you to learn along with students.
3. Have a Plan B (when a layer does not pull up, the web is slow, etc.)
4. GIS is a system, an entire discipline (GIScience). Give yourself time for the journey. Start with something doable and achievable. But the key is to **start**.
5. The Mapping Hour: 60 minute videos and resources on building core skills.
6. Don't go it alone: Network with colleagues to share ideas and best practices.



Selection of course quizzes, hands-on work, readings, and videos.

GIS courses for educators.



Story map of trees of Australia.

9. Ten Key Skills

If you develop these 10 fundamental GIS skills, you can do anything!

A multi-scale demographic investigation.

If you grasp these 10 skills, you can do **anything** with GIS.

- (1) Opening, saving, and sharing maps.
- (2) Changing scale & selecting map layers.
- (3) Measuring & bookmarking.
- (4) Changing symbology & classification.
- (5) Working with tables and filtering data.
- (6) Collecting and mapping field data.
- (7) Configuring popups & map notes.
- (8) Saving & sharing maps.

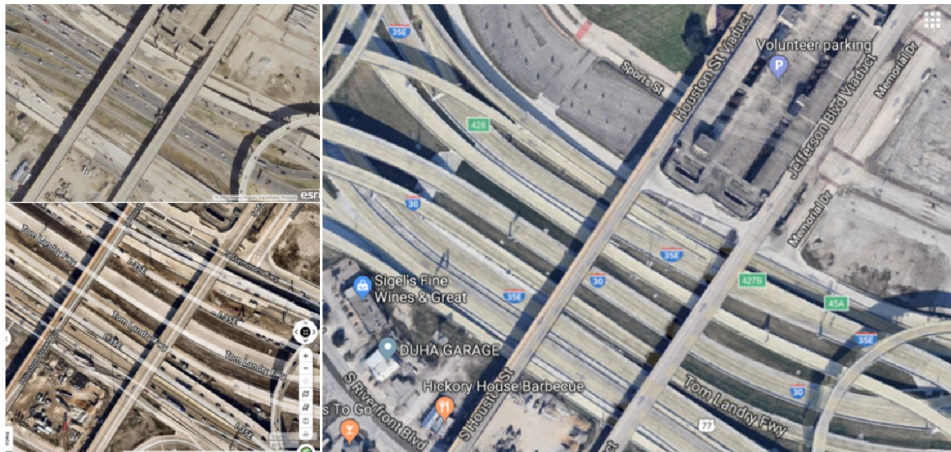
(9) Creating web mapping applications such as story maps and operations dashboards.

(10) Performing analysis: Proximity, summarize, routing, spatial statistics.

Help students think critically about data--including spatial data.

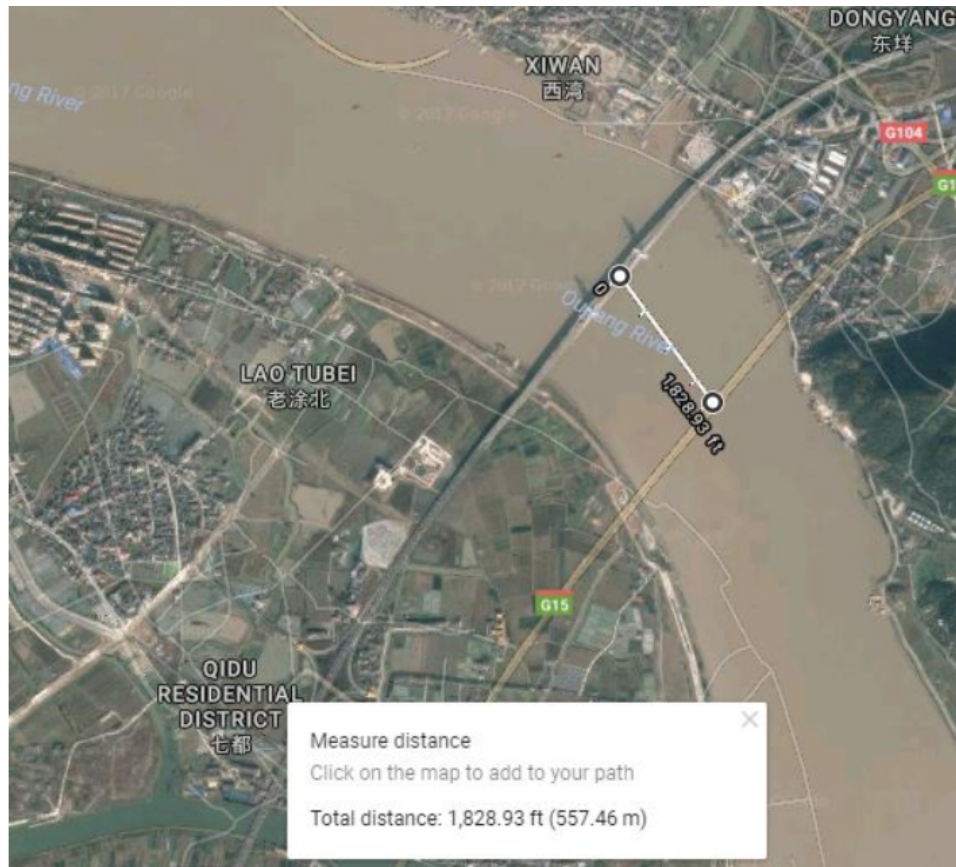
The [Spatial Reserves data book and blog](#).

Example: [Imagery: It is what it is. Well, not really.](#)

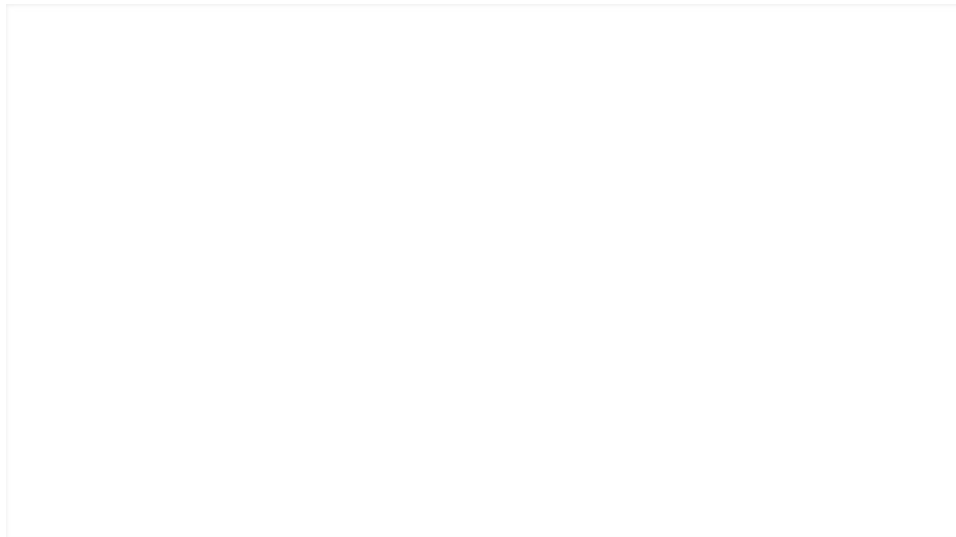


What is noticeably absent on the satellite image on the right?

Example: [Imagery on live web maps](#).

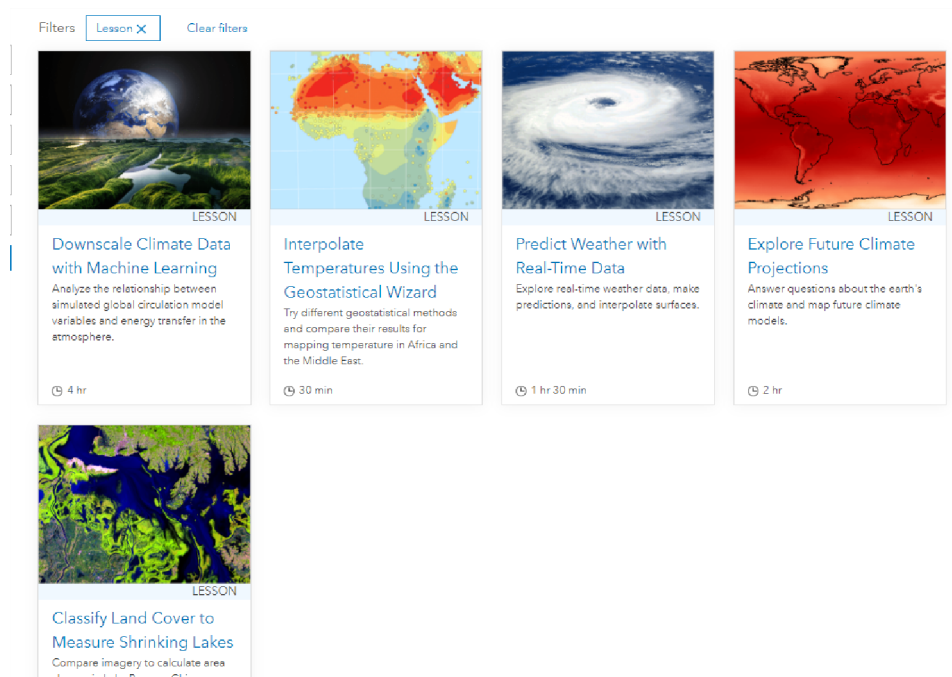


Images and vector street data are offset in China on Google Maps--which is in the correct position? Most sources say "neither".



Ecological Marine Units Explorer.

Teach with selected web GIS maps and apps.



Selected hands-on climate lessons.

Use existing and CREATE YOUR OWN web mapping applications.

The Urban Observatory:

<http://www.urbanobservatory.org/compare/index.html>

Visualizing and understanding migration over space and time.

IoT: Water Balance App: <https://livingatlas.arcgis.com/waterbalance/>

Multimedia interactive

storymaps: <https://storymaps.arcgis.com>

The Esri Living Atlas of the World:

<https://livingatlas.arcgis.com> A curated, authoritative library of hundreds of data sets from government, industry, and nonprofit data contributors from all over the world.

Wayback

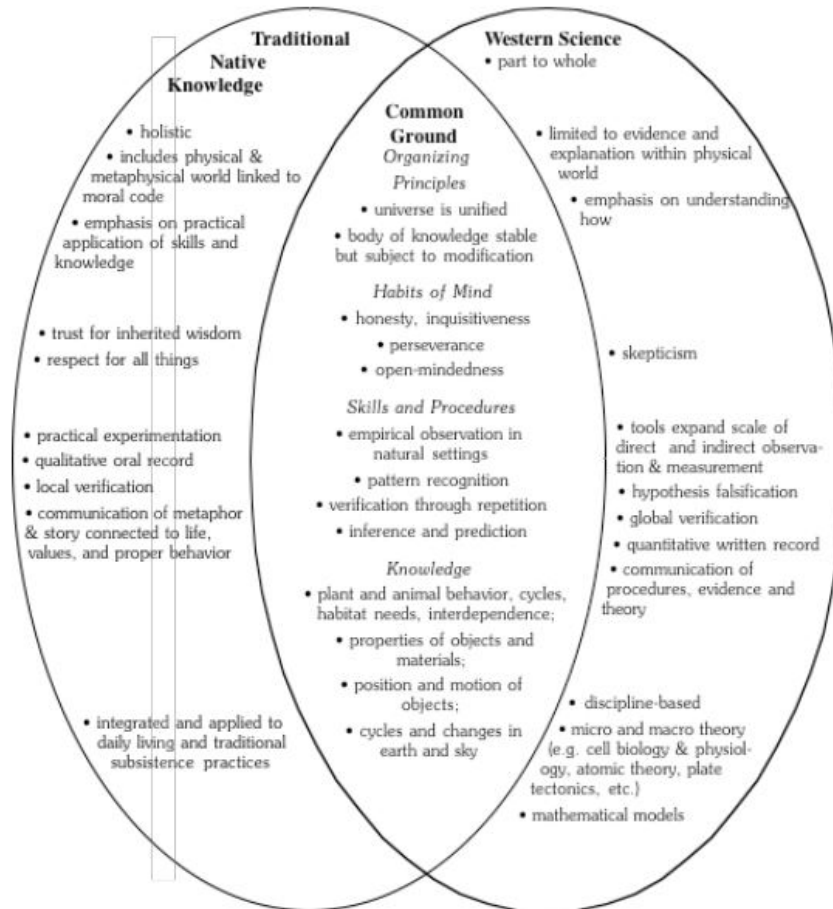
imagery: <https://livingatlas.arcgis.com/wayback/> Examine

change over space and time with high-resolution imagery for the entire planet. New in November 2020: Swipe tool to compare imagery!



Historical imagery in ArcGIS Online.

Change: Indigenous knowledge is not static, an unchanging artifact of a former lifeway. It has been adapting to the contemporary world since contact with “others” began, and it will continue to change. (Bielawski 1990).



Stephens (2000): Qualities associated with traditional knowledge and western science.

10. Use the tools in combination -- they are all part of a web GIS platform. Example: Field survey, map, story map, and dashboard.

Walkability

Harness the power of maps to tell stories that matter. ArcGIS StoryMaps has everything you need...

<https://storymaps.arcgis.com/stories/1e4847f78ec94fd89e960adfabb5ac5c>

**The evolution of geography, GIS, and our planet,
can and SHOULD change instructional practice.**

You are teaching with a SYSTEM | There is no single pathway.
What strategies exist?



There is no 1 single pathway when teaching with GIS -- that is the appeal, and also the challenge.



Selected Esri Press books.

Tools most commonly used in schools and universities:
ArcGIS Online, ArcGIS Pro, ArcGIS Business Analyst Web,
Survey123, web mapping applications (story maps, instant
apps, dashboards). ArcGIS Hub.



Don't get too tied to the tools. What is the best tool to use?

To continue your geo-education journey: (1) [Learn ArcGIS library of lessons](#), (2) [GeoInquiries](#), (3) [Teach with GIS](#).

Curricular approaches

Traditional knowledge enables us to see our place and our responsibility

within the movement of history as it is experienced by the community.

Formal American education, on the other hand, helps us to understand

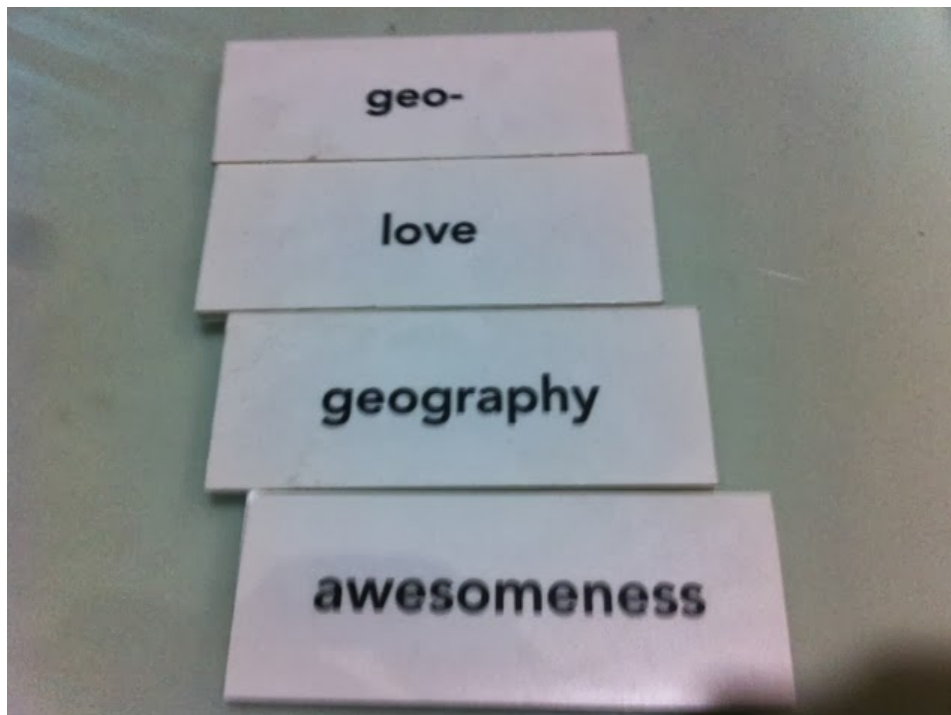
how things work, and knowing how things work and being able to

make them work are the marks of a professional person in this society.

(2001)

In the classroom, GIS fosters collaboration. Examples: Field work, communicating research results.

We have visionary, skilled, energetic people, powerful tools, data, and perspectives. We can build a better educational environment and society. As an educator, tribal professional, student, or other you have a critical role in shaping the future!



Images and text

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