September 2013

# ArcGIS Online in Education

## Success Stories from Early Adopters

esri

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# Introduction

## Joseph J. Kerski, Esri Education Manager

These stories serve as powerful testimony for how learning with ArcGIS Online supports critical thinking, global awareness, information competency, communication, and collaboration. The stories describe innovative efforts of early adopters of ArcGIS Online in higher education to empower their students to learn in new ways. As Erich Fromm observed, "Creativity requires the courage to let go of certainties." These educators let go of established practices to embrace the benefits of web GIS and engage students from a wide variety of backgrounds in mapping and spatial thinking.

These stories illustrate the diversity of learning with ArcGIS Online by the variety of courses and programs they include. ArcGIS Online supports Southwestern College's earth science curriculum, the University of Oregon's new geography course, Murray State University's marketing and business curriculum, and the University of South Carolina's geography undergraduate senior seminar. These stories further illustrate the diversity of the students served by these institutions. As Ken Yanow explains, Southwestern College's student body is 81 percent ethnic minorities. Christopher Bone's students are just beginning their university career, while Sarah Battersby's students are finishing theirs. Fred Miller's students are not geography students at all but rather in business marketing.

These stories demonstrate that ArcGIS Online serves a variety of education objectives. Yanow's goals were to embed critical and holistic thinking and geotechnologies into earth science. Battersby's goals were to enable students to showcase their capstone projects and communicate the results to community partners. For Bone, ArcGIS Online was the perfect toolkit to enable students in his Our Digital Earth class to use geotechnologies effectively and easily. It enabled students from disciplines as diverse as music, psychology, and journalism to create maps and web applications. Miller's students saw GIS as another set of tools necessary in site selection and analyzing business locations, consumer preferences, and advertising campaigns.

These stories also illustrate that ArcGIS Online supports an amazing variety of projects: comparing winemaking in San Diego County, California, with Tuscany, Italy; examining food deserts in Oregon; analyzing market segments and business locations in Ohio; studying the Gills Creek Watershed in South Carolina;

and simulating a cholera outbreak on the University of Oregon campus.

Finally, these stories illustrate Edwin Land's statement that "the essential part of creativity is not being afraid to fail." Bone's cholera simulation could have fallen flat, for example. Yet these educators forged ahead and succeeded. They not only used new methods but created new courses and programs, which in itself requires much tenacity in higher education. And they built bridges between disciplines and encouraged students to study issues from multiple perspectives.

As Bone indicates, ArcGIS Online is "fostering new pathways." Key to these pathways are innovative educators and their students who are unafraid to blaze new paths.

# Introducing Geospatial Concepts to General Education Students

## Earth Science Now More Engaging with ArcGIS Explorer Online

### By Ken Yanow, Professor of Geographical Sciences, Southwestern College

Southwestern College (SWC) in Chula Vista, California, is so named because it is located in the southwestern corner of the continental United States—12 miles south of the city of San Diego and 8 miles north of the US-Mexico international border. The college serves approximately 400,000 residents within the district, which encompasses the communities of the southern urban section of San Diego County. The total annual enrollment at SWC is around 30,000 students, and the average student is 25 years old. Eighty-one percent of all SWC students are ethnic minorities, with Hispanics comprising 56 percent of the student body. SWC is listed as a Hispanic Serving Institution.


Locations of vineyards around the world (ArcGIS Explorer Online).

In 2012, the college was selected as an Esri ArcGIS Online for Education grant winner. As a result of the grant, two new ArcGIS Online projects have been created and are now incorporated into all the college's earth science general education courses, including Physical Geography, Geography of California, Cultural Geography, World Regional Geography, Weather and Climate, and Introduction to Earth Science. These are the college's most popular general education courses, with nearly 2,000 students enrolled annually.

Although the popularity of SWC's earth science courses can be attributed to a number of reasons, perhaps the most important part of their success is that earth science coursework is contextual and relevant in today's geospatially connected world. With the advent of online mapping and location-specific computer applications, geospatial technologies and geography itself are more familiar to the general public, while geospatial disciplines are becoming more and more popular among college students. With this in mind, the new ArcGIS Online assignments are a perfect fit for SWC's earth science courses, providing an easy-to-

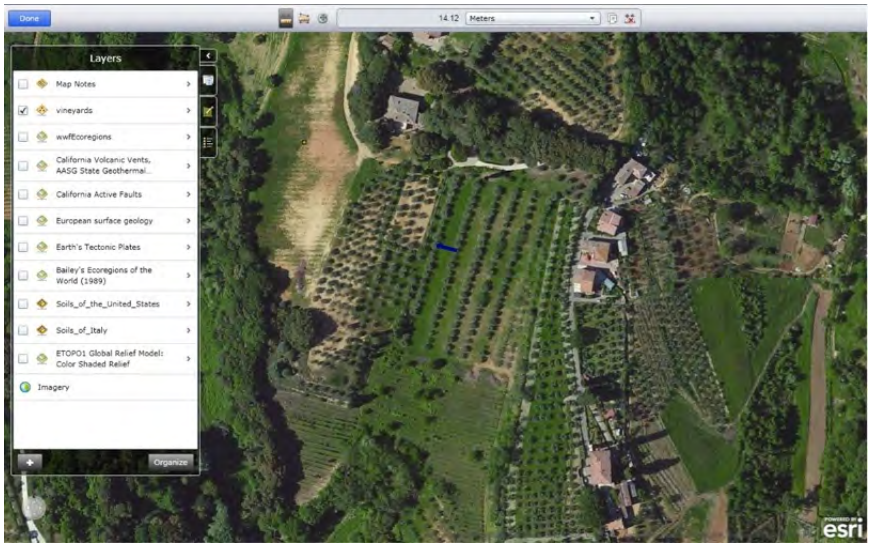
use, robust tool for students not only to learn earth science but also to develop and strengthen their geographic awareness and spatial thinking skills.

The projects were developed with the following educational objectives in mind:

- Critical thinking and spatial reasoning skill set development
- Information competency enhancement (that is, how information technology is used in environmental and social issues)
- Expanded global awareness (how the world is similar/dissimilar in culture, politics, and environment)
- Comprehension of fundamental GIS concepts

Each project is self-contained and includes step-by-step instructions to help the students explore the related data and perform a series of exercises. Beyond ArcGIS Explorer Online and the layers of data that can be directly added to maps from the ArcGIS Online data warehouse, no additional software or data is required. The projects take two to four hours to complete.

**Visualizing the SWC Student Community—**Examining address and demographic data with ArcGIS Explorer Online, students gain fundamental insight into the economic and sociological characteristics of their college. Using the standard postal code data from the United States Postal Service and the SWC student admissions data, a database was created of the locations where SWC students lived from 2007 to 2011. This included another data layer containing demographic information with the socioeconomic breakdown and ethnicities for each postal code. Exercises include statistical analyses of student residence locations, the examination of income levels and ethnicity, proximity to fault zones, location/climate characteristics, and the location of local transportation corridors.




Example of vine spacing, density measurement (ArcGIS Explorer Online).

**Comparing and Contrasting Wine-Making Regions in Tuscany and San Diego County—**In this module, students explore the variables of wine making, paying special attention to soil, climate,

and topographic characteristics. A shapefile map was created that includes the majority of vineyards in the world. By clicking the dot representing a vineyard, information about it is displayed. Students map the location of vineyards in Tuscany, Italy, and San Diego County and overlay those locations with climate, soil, and geologic data. Then, the two wine-making regions are compared. Students not only analyze environmental data but also use ArcGIS Explorer Online to discern more specialized information, such as the measurement of vine density.

During the fall 2012 semester, the projects were beta tested by approximately 200 students enrolled in selected Physical Geography and Introduction to Earth Science classes. Both projects were extremely well received. Typical responses included, "Wow, I didn't know that!" and "Oh, that makes sense."

Anecdotally, beta testers did better on those portions of the class exams that included geospatial technologies, demographic analysis, and natural vegetation topics by about 5 percentage points over other members in their respective classes. Although there are other variables to consider, it is a reasonable conclusion that the ArcGIS Explorer Online projects aided in student success. Ultimately, those are the desired outcomes—students becoming engaged in a project, enjoying the learning process, and actually learning.

Both these projects are included in spring 2013 SWC earth science classes. In addition, the projects were sent to all SWC instructors so that they could incorporate them into their own disciplines, where possible. Presently, requests are coming in from instructors across a variety of disciplines to help build additional learning modules. With that in mind, the following projects are currently being worked on: Erik the Red and the Norse Greenland Tragedy—What Happened and Why? and The Spread of Humans Around the World, based on part I of the book *Guns, Germs, and Steel* by Jared Diamond. ArcGIS Online across the campus of Southwestern College is helping to promote interactive learning, geographic awareness, and spatial thinking to thousands of general education students each year.

## About the Author

Ken Yanow, professor of geographical sciences at Southwestern College in Chula Vista, California, has master's degrees in both geography and astronomy. He leads the GeoTech Center's efforts to promote minority and female recruitment in geospatial technology programs nationwide.

(This article originally appeared in the Summer 2013 issue of *ArcNews Online*.)

# Fostering New Pathways to GIS with ArcGIS Online

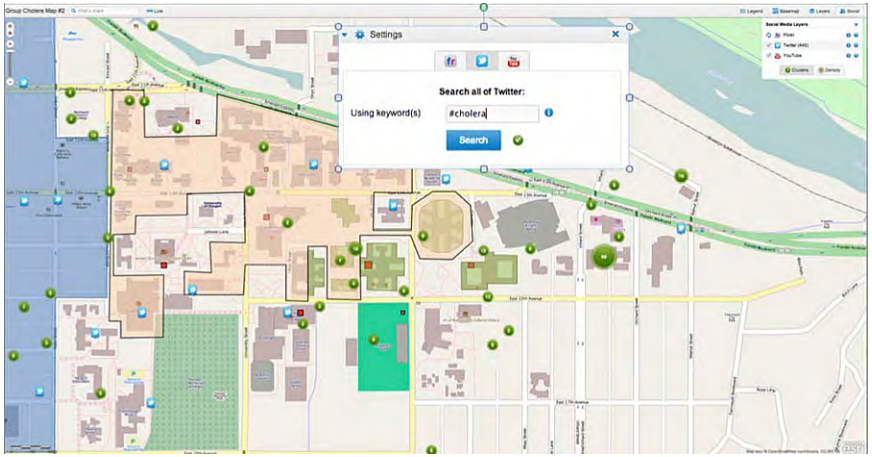
By Christopher Bone, Assistant Professor, Department of Geography, University of Oregon

In the summer of 1854, the Soho neighborhood in the city of London, England, was gripped by a cholera outbreak that was killing an increasing number of Londoners each day. By the end of the outbreak, 616 people had died. However, this number could have been much higher if it were not for the insight and actions of Dr. John Snow, who utilized spatial analysis with a simple map to determine that a single water pump was the source of the outbreak. Snow eventually became known as the "father" of modern-day epidemiology, and the world was introduced to the power of spatial analysis. While this was a watershed moment in many ways, we have to wonder how this outbreak would be different if it were to occur today. One thing for certain is that web-based mapping and social media would play a significant role in helping minimize the impacts of this crisis.

How?

That question was answered in the fall of 2012 in the Department of Geography at the University of Oregon in a course called Our Digital Earth, and ArcGIS Online was the core resource that made it all possible.

Our Digital Earth is a new freshman course that was awarded Esri's ArcGIS Online for Educators grant for developing a course




Campus map demonstrating the location of Tweets that were posted by course staff who were simulating students infected with cholera.

that uses ArcGIS Online in a way that facilitates an introduction to the world of geospatial data and technology for non-GIS students. Over the course of 10 weeks, students received the following message:

*Every day of your life, you make several decisions that are based on geography. Using your smartphone, you inquire where is the best place to have lunch with friends and how is the best way to get to the restaurant. On your laptop, you roam the earth to see where your relatives live and observe photos of those locations*

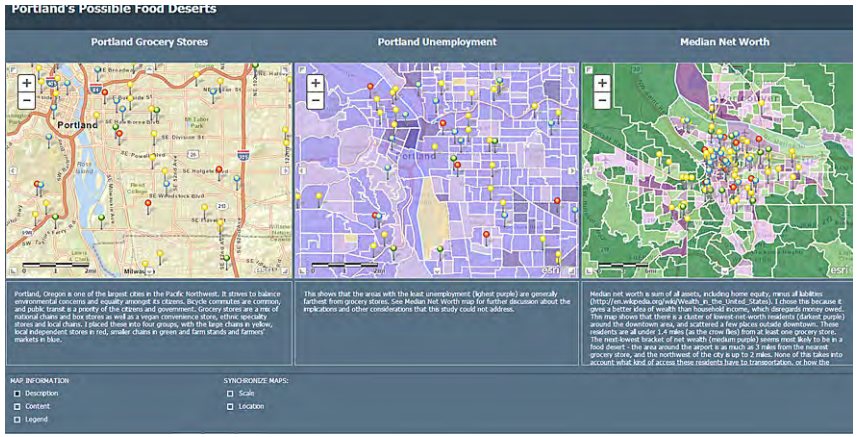
*that others have taken. You receive texts from people you don't know who are explaining where a social event is happening tonight. Every day of your life, you are interacting with geospatial data and technologies but are perhaps unaware of how important they are in our world.*

Unlike typical GIS classes that are offered as upper-division courses to students with some formal geography or computational training, the goal of Our Digital Earth is to invite students across all disciplines to examine how geospatial data is collected and used, how geospatial technologies have transformed the way we think and make decisions, and the important societal issues that result. ArcGIS Online provides us with an opportunity to have a broad range of students learn how to develop web-based mapping applications by integrating satellite imagery with their own data they collected in the field or from the web. The mapping applications are created as part of a set of assignments that include everything from mapping students' routes to campus with spatial features and social media to creating web-based applications that shed light on socioeconomic inequalities in major cities. Of these assignments, the one that students were most excited with this term was learning how to engage in a crowdsourcing activity to respond to disasters, such as a cholera outbreak.

Over two weeks in November, our class set out to simulate a modern-day version of the 1854 Soho cholera outbreak on the campus of the University of Oregon. However, instead of sketching out cholera deaths on a paper map, students utilized e-mail alerts, posts on a dedicated Facebook page, and Twitter messages that collectively provided information on the types of individuals who were infected each day; their daily activity patterns, including walking paths and courses in which they were enrolled; the locations of water sources around campus; and the status of water testing at potentially infected sites. In small groups, students were responsible for assigning individual tasks among themselves to efficiently map out the diverse range of information that they received on a daily basis. Students created maps in ArcGIS Online, shared the maps among group members, collectively mapped out the cholera-related information, and performed a visualization of all the data to determine where the cholera outbreak originated.

Most impressive in this assignment was that students could easily map Tweets by utilizing one of the ArcGIS Online social media mapping applications. Students simply entered in keywords, and the Tweets posted by the teaching staff were placed on the map in the location from where the Tweet was posted. For example, if I were to Tweet from outside a residence on campus that I had been infected with cholera, a student could search the keyword cholera and a feature would be placed in the location from where I posted the message. The response from this assignment was unanimously enthusiastic, and ArcGIS Online made it all possible.

As someone who teaches multiple GIS-related courses, I was impressed at how students from all disciplines (e.g., geography,




Web-based mapping application demonstrating location of major grocery stores in Portland, Oregon (left) in relationship to unemployment (center) and net worth (right).

music, psychology, journalism) could easily create not just maps but web-based mapping applications. One example was a mapping application that demonstrated the potential presence of food deserts in Portland, Oregon. Students with little to no GIS experience were able to create an application in which three separate maps representing socioeconomic data and grocery store locations zoom and pan in unison, which were accompanied by text describing the relationship between quality of life and access to major grocery stores.

From an administrative perspective, ArcGIS Online provided a means for students to store data and projects without having them rely on desktop software in a lab. That means that students can access their work from anywhere in the world! Also, having students be able to share their projects with the public provided an added sense of pride in their work and was extremely helpful in advertising the course to the university community and beyond.

As Our Digital Earth wraps up this term, we are very excited about future offerings of this course and the role in which ArcGIS Online will help it grow into an integral part of the geography curriculum. Without a doubt, we have already engaged a new group of GIS professionals that would have likely not discovered this discipline through traditional means. Dr. John Snow would surely be impressed!

## About the Author

Christopher Bone, assistant professor in the Department of Geography at the University of Oregon, received his PhD from Simon Fraser University in Canada. His work is focused on modeling coupled human-natural systems, with specific attention paid to large-scale forest disturbances.

(This article originally appeared in the Spring 2013 issue of *ArcNews Online*.)

# Murray State University's Training Modules Apply ArcGIS Online to Business

## RacerGISOnline Is Based on Esri Press SpatiaLABS

By Fred L. Miller, PhD, Murray State University, Kentucky

GIS has proved its value in the analysis and solution of business problems over and over, especially in marketing analyses. However, the adoption and dissemination of GIS tools among executives and marketing managers has been painstakingly slow because a lack of knowledge about its capabilities. So too has been the integration of GIS tools into the curricula of business schools, where instruction in this technology lags far behind its potential contribution to the business decision-making process.

To date, this is largely the result of the steep resource curve of GIS systems (hardware, software, faculty training, and so on) that are generally not included in business school budgets. In addition, the traditional GIS lab model requires a significant commitment of institutional and personal resources to develop GIS learning activities that must be subsequently crammed into an already tightly packed course.

### Business GIS Training Modules

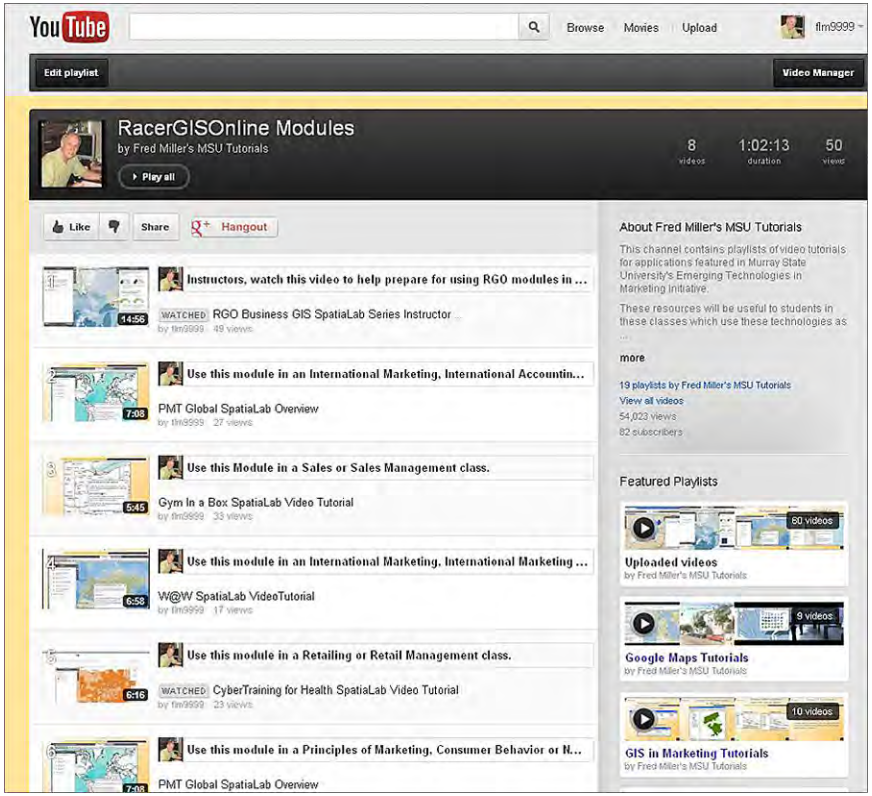
Easy-to-understand, structured, online GIS instruction can minimize equipment, training, and administrative cost, while supporting classroom instruction. At Kentucky's Murray State University (MSU), a project team of nine marketing and one accounting faculty members developed RacerGISOnline, a series of online business GIS training modules. RacerGISOnline.org, Murray State University's funded project in the Esri ArcGIS Online for Education grant program, can be taught by faculty with relatively little GIS background.


RacerGISOnline home page.

The program provides enhanced training for seven lab courses from the business section of SpatiaLABS, available from Esri Press. SpatiaLABS are computer-based exercises that supplement college curriculum and present students with a variety of real-world problems that they solve using GIS technology. The MSU program allows students to work through the designated SpatiaLABS exercises using ArcGIS Online, which is seamlessly accessed through RacerGISOnline. A video supplements each exercise, providing additional support without the need for classroom instruction. The video tutorials for these exercises are collected in a YouTube playlist for ease of discovery and access by interested students and faculty. That playlist also includes a general overview tutorial to help students and faculty learn basic functions of ArcGIS Online. The description for each tutorial provides instructions on how to access the relevant map and written instructions in the corresponding exercises in SpatiaLABS.

Each module in the series can be finished in 75 minutes or less and used as in-class activities or independent exercises. They may be completed as individual assignments or in teams of two students working on two computers, one computer displaying a SpatiaLABS activity and its instructions and the other computer with the map and its resources. As all exercises are web-based, no computer lab facilities are required.

At the conclusion of each module, students are directed to an online survey so that they can evaluate the exercise and its technical components. They also discuss the value of the exercise

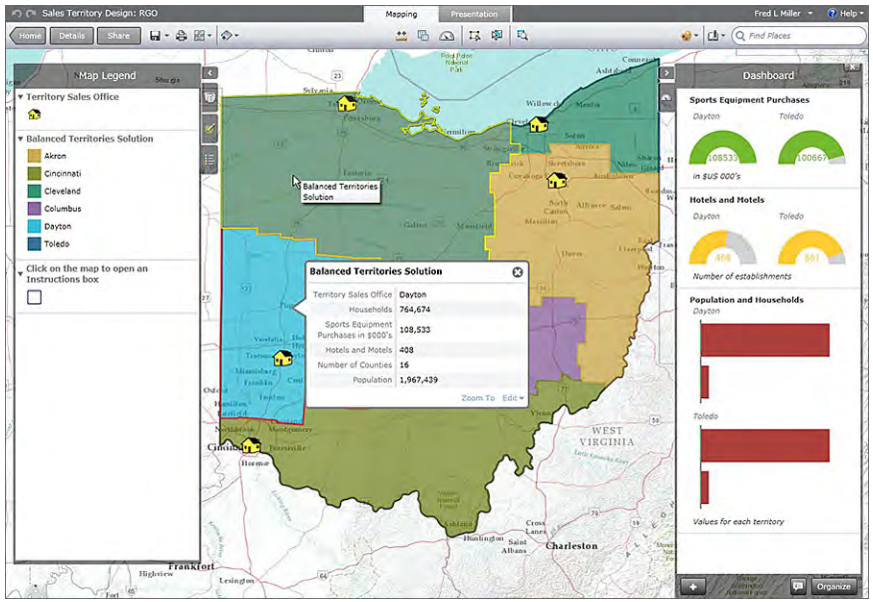



RacerGISOnline modules YouTube playlist.

in class, as well as their level of interest in completing additional modules or taking a business GIS course. More than 50 percent of business students who complete a RacerGISOnline module have expressed interest in taking a dedicated business GIS course.

These modules fill different roles in the MSU geography, marketing, and accounting curricula. As they are illustrative

applications, geography students will not necessarily expand their GIS skills, but they will see how those skills may be applied to the analysis of business problems. For marketing and accounting students, these modules will often be their first hands-on experience with GIS tools and the application of geospatial thinking to business problems. Because marketing students at MSU have the opportunity to work with geospatial tools in several different courses in their curriculum, the completion of RacerGISOnline modules provide them with a good introduction to the GIS tools they may encounter in other classes. They also become prime candidates for a dedicated business GIS course offered either by the MSU business school or the geography department.




Sample business GIS module map.

Following accreditation trends, most business schools and their faculty are seeking opportunities to integrate technology-based, innovative, interactive, hands-on learning activities into business courses. Many of them are high enrollment courses with relatively little opportunity for large scale lab activities. These modules are very useful in that setting, particularly in marketing courses. In addition, by introducing their marketing colleagues to RacerGISOnline business GIS modules and providing support for course integration, geography faculty can build demand for their own business geography courses.

Further expansion of the system and its learning resources will include the involvement of faculty in other MSU colleges and schools.

## About the Author

Fred L. Miller is Thomas Hutchens Distinguished Professor of Marketing and Business GIS in the Department of Management, Marketing and Business Administration at Murray State University, Murray, Kentucky. He is also director of MSU's Regensburg Exchange Programs. His teaching and research interests are in the fields of business GIS, e-commerce, emerging technologies in marketing and global marketing management. Miller authored the books *GIS Tutorial for Marketing* (Esri Press, 2007) and

*Getting to Know Esri Business Analyst* (Esri Press, 2011), and is a contributing author to SpatiaLABS.

(This article originally appeared in the Spring 2013 issue of *ArcNews Online*.)

# Story Maps in the Classroom

By Sarah E. Battersby and Kevin C. Remington, University of South Carolina

Incorporating Esri's story maps into the geography undergraduate senior seminar at the University of South Carolina helped students communicate results from their semester-long projects. The authors discuss the successes they had and the challenges they faced to help other instructors recognize the possibilities—and minimize the limitations—of using story maps in their own classrooms.

The story map concept allowed students with varying levels of GIS and mapping experience (from none to substantial) to clearly express the spatial story attached to their projects. Story maps let educators introduce students to the concepts and techniques involved with creating a dynamic, geocentric web application. Story maps can be created using basic prepared templates that are designed entirely using the ArcGIS Online web application tools or from downloadable template files that can be easily configured and customized by editing a few simple HTML or comma-separated value (CSV) files. While the incorporation of story maps was an overall success, it was a learning experience with technical challenges for students, the instructor, and the technical staff supporting the class.

## About the Class and Projects

As part of graduation requirements, geography majors at the University of South Carolina must complete a semester-long, capstone project. Students, who enroll in a seminar class during their last year in the major, enter that class with varied backgrounds in geography that typically emphasize GIScience, human, or physical geography. Consequently, students are encouraged to tackle projects that use multidisciplinary approaches. In addition, no common level of experience in mapping or the use of geospatial technologies can be assumed.

The class is typically structured to partner a group of students (from a few students to the entire class) with local community agencies that have interesting spatial problems. Efforts are made to match agency work with students' expertise across major and other university coursework.

Given these constraints, Esri's story maps and ArcGIS Online were chosen to enable all students to feel comfortable preparing attractive, informative maps and spatially referenced media to communicate their results and meet the objectives of their partner organization.

For the fall 2012 semester, six groups of students were working on projects with three local agencies: the Gills Creek Watershed Association, Lexington County GIS, and Sustainable Midlands. Prior to the start of the semester, potential projects and how a story map or set of story maps developed as part of the class projects might be of benefit to the agencies were discussed. The agencies expressed interest in story maps as student-generated deliverables for projects. The story map format was viewed as an innovative, web-based way to help agencies explore their data, use it for internal organizational purposes, and communicate to the public about issues of interest.

## Implementation Process

While all students in the class were seniors in their last year of coursework for the geography major, only about a third of them had worked with Esri's desktop or online GIS products. Most had no experience in map design. Because the class focus was on the projects and content, there was limited time to dedicate to learning geospatial technologies and cartographic practices.

To get the students familiar with ArcGIS Online and story maps, one of the authors, Kevin Remington, the campus GIS coordinator, presented a lecture on the basics of ArcGIS Online. The other author, course instructor Sarah Battersby, presented two additional follow-up lectures on customizing the HTML-based templates and creating maps using the ArcGIS Online hosted templates. In total, approximately four hours of class lecture time was dedicated to introducing the basics of story mapping. Throughout the remainder of the semester, the instructor and two GIS staff members assisted students in collecting and analyzing content and preparing data to make their story maps. To aid them in building and displaying their maps, students were given department-hosted web accounts, and each student created an ArcGIS Online account.

Five of the six project groups presented their project results using story maps. The group that did not create a story map used data that could not be distributed publicly due to privacy concerns from the partner agency.

## Student Responses

Four of the 19 students enrolled in the course were interviewed about their experiences with story maps. These students were from different project groups and had varied backgrounds (i.e., not all GIS-focused).

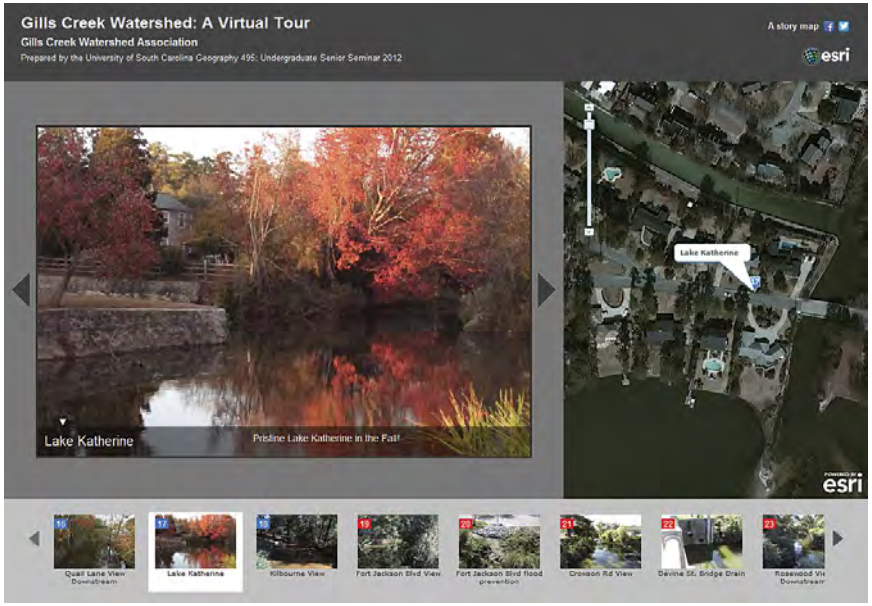
Overall, their responses to the use of story maps for communicating their final project results were positive. They found story map templates easy to use, enabling them to design more exciting, interactive web-based maps than would have been possible with other technologies available to them. Students easily designed custom pop-ups with tables, photographs, and charts. The students also emphasized that

ArcGIS Online and story maps were accessible to everyone in the class.

While the more experienced students had an initial advantage, most students quickly grasped the concepts and discovered that they didn't need to have that background to make a great map. This allowed for greater division of labor across the groups and emphasized that mapping "isn't just for the GIScience majors."

The partner agencies seemed to agree the projects were successful. A class-developed virtual tour of the Gills Creek Watershed was posted on the Gills Creek Watershed Alliance website, and additional maps are being posted by Lexington County to show the physical, cultural, and historical landmarks of the Riverwalk, part of the Three Rivers Greenway network of trails and parks.

While the students incorporated several different types of story maps into their projects, the Storytelling Map Tour template was the most popular. This template combines an interactive map, a photo panel with customizable descriptive text, and a carousel of photo thumbnails. The map template includes two different colors of map markers and is customized by simply editing the CSV file that lists the location where markers should be placed on the map that correspond to photos of each location. Additional customization of the basemap, level of zoom, and title can be done by editing a simple HTML file.




The Storytelling Map Tour template, an interactive map and a photo panel with customizable descriptive text, was the most popular.

## Challenges

The free Esri story map customizable templates and complementary hosting service using ArcGIS Online alleviate a number of instructional, IT, and administrative considerations. However, implementing these tools created some new challenges.

Students could supplement story maps data they produced as part of their project with map and feature services already published by Esri and hosted on ArcGIS Online. Often, students needed datasets that were specific to the class project. These students had to create their own services. While the students'

personal ArcGIS Online accounts were sufficient in many instances, projects that required working with larger datasets quickly exceeded the ArcGIS Online personal account limit for importing files of 1,000 features or 250 geocoded addresses. To work around this, large layers were broken into many smaller layers and then symbolized individually—a challenge without manual classification options in ArcGIS Online. Alternatively, access to the data was made possible via map or feature services hosted on site at the university as an ArcGIS for Server instance.

While working with the story map templates and ArcGIS Online, the authors began exploring the ArcGIS Online for Organizations account that had just been provided to the university through its site license agreement. With this additional functionality, student-authored maps and feature services could be hosted on Esri's cloud. These resources then become simple for the students to consume in their story maps. While the ArcGIS Online cloud provided a number of exciting new opportunities for helping the students present more complex datasets, it also introduced some general considerations for its successful employment in an academic environment.

One concern was the ArcGIS Online credits expended by the use of this cloud-based technology in the classroom. The site license agreement provided an initial allotment of credits. The authors assessed the feasibility of using institutional credits to host datasets for class projects to determine how far credits might go given expected use. Credits are generally spent for bandwidth, computation, and storage. With many class projects, the bandwidth usage cost is of little concern because the audience is often just the students in the classroom and the instructors.

Of greater concern, however, is the expenditure of credits for computation and storage. Although many student-built applications consume fairly small proof-of-concept datasets, this is not always the case for class projects when partnering with state- or county-level public organizations to address problems and provide real-world applications. For these projects, a student might build an application that exposes a large number of spatially discrete geographic units such as parcel and building footprint data. In this scenario, the project would require many gigabytes of data storage in the ArcGIS Online cloud and consume a large number of credits.

In one class project, a student could consume approximately 800 credits to publish and store a feature service that exposed approximately 1 GB of data. This scenario meant that, for a class of 15 to 25 students, the entire university allotment of credits could be expended in a single lab session.

Of course, storing feature data in the ArcGIS Online cloud and exposing it through feature services is more costly than storing data as a tiled map service. A tiled service provides a good alternative when much of the data that a student needs to expose can be utilized as view-only data. However, even this approach can be costly if the student needs to expose large

areas of high-resolution imagery and raster data that may require tiling at many different scales for optimal performance. This approach can become costly because organizations are charged credits for the computation involved in generating the tiles on ArcGIS Online and for their storage.

The authors' experience indicates that using story maps requires active administration of an ArcGIS Online site. The site should be routinely cleaned to remove redundant or orphaned services and applications that are no longer needed. IT staff need to evaluate which approach (feature service or tile cache-based service) is best, in the long run, for distributing the data.

Other administrative concerns include the necessity of associating each student's Esri Global Account with the university's ArcGIS Online group. While this is a fairly straightforward process, care needs to be taken when assigning rights to a group member and ensuring membership is terminated when the class ends or the student leaves the university.

## Conclusion

Even with these challenges, working with ArcGIS Online and story maps provided great opportunities to introduce students to web-based mapping and multimedia technologies. The story map concept enabled students with all levels of GIS experience to create professional-looking dynamic web map applications to support and present the research from their class projects. There were definite learning moments for everyone involved in these projects. Creativity was needed to work around the limitations of ArcGIS Online (which can't be expected to have the functionality of ArcGIS for Desktop). However, ArcGIS Online and story maps made high-quality mapping accessible to all students.

## About the Authors

Sarah E. Battersby, PhD, is an assistant professor in the geography department at the University of South Carolina. Her research interests include cognitive issues in GIScience and geography education. She currently serves on the board of directors for the Cartography and Geographic Information Society (CaGIS) and the University Consortium for Geographic Information Science (UCGIS).

Kevin C. Remington, GISP, has been the campus GIS coordinator at the University of South Carolina for the last 15 years. His interdisciplinary role keeps him involved in many of the university's research, teaching, and outreach activities that have a GIScience component. When not immersed in the world of GIS and academia, he can be found homesteading, enjoying the outdoors, traveling, tasting craft beers, playing music, and building yurts.

(This article originally appeared in the Spring 2013 issue of *ArcUser*.)

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