The Role of Online Services in Teaching Geospatial Intelligence (GEOINT)

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Abstract. As data and maps move to the cloud, tools such as Map Services and Online Mapping resources (such as ArcGIS online) become more important in the tradecraft such as Geospatial Intelligence. This paper focuses on how Geospatial Intelligence (GEOINT) teaching is changing at the undergraduate level due to the advent of these new tools. Fayetteville State University, a small Historically Black College/University (HBCU) in the United States recently created an undergraduate certificate in GEOINT. The program initially focused on mapping, cartography, programming, scripting, and intelligence. The program is undergoing modifications to include additional geospatial and cartographic content, most of which will be delivered through cloud based applications. Students will use SaaS to create and disseminate cartographic products that focus on the delivery of information or results of certain analysis.

Keywords: SaaS, cloud, GEOINT

1. Introduction

Over the past few years, the increased offering of online courses, degrees, and the proliferation of Massive Open Online Courses (MOOCs) has changed the education landscape in the United States. At the professional and graduate school levels, the focus is gradually shifting from face to face education to a more remote non-contact model. All this is being made possible by the increased availability of content (literature, instructions, and software) online. Whether it is a YouTube 'how to about mapping' or a mathematics exercise sheet for a fourth grade student, most types of content that augment learning can be searched and found online. This online information explosion is also impacting in-class teaching, particularly in 'hands-on' disciplines such as mapping and cartography. This paper focuses on the inclusion of open source and closed source (Grimes 2009) 'proprietary' cloud based 'software as a service' (SaaS) and 'platform as a ser-

vice' (PaaS) such as ArcGIS Online in the classroom that make application learning independent of location i.e. the learner does not physically have to be present in the laboratory to complete a cartographic assignment. These technological advances along with access to mapping applications such as google maps, open maps, etc. are changing how many or our students learn and apply cartographic principles in their mapping applications.

2. Fayetteville State University

Fayetteville State University, which is located in Fayetteville, North Carolina is one of the smaller constituent universities of the University of North Carolina University System. Located in the southeastern region of North Carolina, it is among the most diverse campus communities in the state and the nation, with 70% of its student population of 5,781 in 2010 being African Americans, 17% Caucasians and 4% Hispanics. The university is a Historically Black College or University (HBCU) that has been building expertise in geospatial technologies for several years. One of the reasons was that FSU is in close proximity to Fort Bragg, one of the largest military installations in the United States, and it makes it the perfect place to educate geospatial intelligence analysts. In 2010, the university made a strong commitment to Fort Bragg and the Department of Homeland Security (DHS) by launching the Center for Defense and Homeland Security (CDHS) to focus on education, research and commercialization of scientific technologies with, industry partners, institutions of higher education, the Department of Defense, DHS, and other government entities. In 2014, FSU became the first HBCU and the tenth university in the nation to offer the USGIF accredited GEOINT Certificate at the undergraduate level (Mitchell 2014).

2.1. Online instruction and student diversity

Student at FSU come from diverse backgrounds but can be generally subdivided into two disparate groups. One group mainly comprises of the military students or their spouses who are stationed at the Fort Bragg military base. While they are interested in furthering their education by completing an undergraduate degree, the transient nature of their job draws them to online courses and degree programs. The other group is mainly underrepresented minorities who may come from a non-privileged background and are often the first in their family to attend college and to eventually receive a Bachelor's degree. In between there is also a mix of other students such as student who attend two early college high schools located on campus and students who transfer from either the nearby Fayetteville Technical Community College (FTCC) or from other regional community

colleges to focus on a field of study, such a GIS and cartography, that may not be taught at these community institutions.

For the university, it is important to cater to both these populations and also to students who may not fall into one of these categories. The aim at FSU is to provide the best education possible that will help the student attain lifelong goals, including employment. Faculty members at FSU are also keenly aware of the stereotypes that hamper progress for both women and minorities (Leslie et al. 2015). While the paper cited here is Science Technology Engineering and Mathematics (STEM) disciplines, this bias is also prevalent in for geography and GEOINT as these disciplines, including the subfield of cartography are considered to reside at the intersection of science and art. Therefore faculty associated with the GEOINT program pay particular attention to draw students into the challenges. The students' familiarity with online tools such as google maps and location based applications that proliferate present day cell phones are used in this context. However, given these challenges, the online revolution is both a blessing and a bane at a small diverse campus such as Fayetteville State University. While some students instantly take on to the internet based learning, others require a greater level of 'hand holding'.

This paper focuses on the role of specific tools such as mapping services that deliver online content, software as a service (SaaS) such as ArcGIS online, and online modules that help students learn the basics of cartography and mapping. While open source geospatial tools are increasingly available, the university has supported the GEOINT and geography programs and the mapping and cartography classes by paying for the annual license fees for Esri's ArcGIS site of software and services. This includes student access to ArcGIS software and extensions, online instructional modules and exercises, and online credit based access to ArcGIS online. This trio of software applications is used in courses such as "Cartography" and "Introduction to GIS" as well as technical courses such as "Programming for GIS" to support in class instruction.

All these online advances, as well as other online options such as online help and videos contribute to student learning outside the class room. However, the key to gaining the most from online courses or from modules that are assigned to be completed outside of the classroom is commitment to the learning that can be lacking in students who are not familiar or comfortable with independent learning. While this model works great for students who come from the military background where they often have to 'figure things out', it can be disheartening for students who have a harder time learning and acquiring new concepts. Therefore, faculty members teaching these 'applied' courses have to strike a balance between independ-

ent learning and hands on instructions. The rest of the paper addresses some of these balances that support cartographic learning and map making at FSU.

3. Striking a Balance

One of the key things that the authors have learned while using online tools in an undergraduate setting is that even in this day and age of cell phones and social media, not everyone is computer savvy. It is one thing to be able to use everyday applications such as Microsoft Office, Google, Facebook, and even Twitter, but experience with these does not generally translate into proficiency with cartographic and mapping applications. As instructors, we have to be prepared to teach basic computing fundamentals such as file storage and software installation, or require courses in these topics as pre-requisites. Not doing so can create problems down the road as the semester progresses and more complicated issues are addressed. Therefore, spatial and contextual learning in courses such as 'Introduction to GIS' and 'Applied Computer Cartography' have to be complimentary. In more advanced courses, the focus can shift more towards spatial learning.

3.1. Teaching and Learning

From a teaching perspective, it is easy to assume that once an assignment has been given that includes independent work such as installing software or following instructions to complete an exercise, students will follow through. However, at an undergraduate level, this assumption can lead to a breakdown in communication and create problems that amplify as the semester progresses. Therefore, the first few lecturers should focus on instructional technology and guide students through the initial stages of software installation. This builds confidence and helps the learning process down the road. Such hand holding is particularly important for online modules, such as the ones provided by Esri for their software. It is beneficial to walk through some of the steps in installing the software. Also useful is using the instructions as lecture material. These tweaks to hybrid courses that rely heavily on technology and student initiative help students, particularly undergraduate students and the ones with limited exposure to technology by providing them with easily achievable short term goals. This step by step approach helps students and prevents them from being overwhelmed by the focus on independent study.

The other side of the coin is learning and it helps to set goals and expectations right at the very beginning of the class. While various methods can be

used to achieve this, one faculty member used a full class session (the second session of the semester) to lay out the ground rules for the class. This included a review of the technology as well as a closing statement from each student where they agreed to spend a substantial amount of effort outside of the class room. Learning with technology is also supported by providing access to this technology. For example the Esri site license that is currently used at Fayetteville State University provides all students the software and license to install the full version of the software on their computers. This eliminates the requirement that students have to be in the laboratory to learn. They can be anywhere and work on their assignments. This is further extended by ArcGIS online and other SaaS services. This transition from in class learning towards technology assisted learning will continue, particularly with the advent of MOOCs. These courses are particularly suited to independent learners who set their sights high. However, regardless of technology, student motivation plays an important role in their success in geospatial classes that are heavily laden with software and techniques. In a short span of 30 years, cartography has transitioned from pen and paper to digits and bytes. This transition has opened up the discipline to users with minimal experience in cartographic principles and this leads to unintentional errors (Obermeyer 1998, Monmonier 2004). Such errors of omission and commission are only going to increase as a greater percentage of the general public dabbles in maps.

4. Conclusion

The internet and web based innovations are not only changing cartography as a discipline but are also changing how it is taught in the classroom. Overall the changes are positive and are brining cartography as a discipline closer to a greater number of people, especially the ones who are using crowd sourced mapping (Newcomb 2014). However, these changes to the discipline also bring challenges, challenges for the learners as well as challenges for the instructors. This is particularly true for undergraduate instruction where students may not be as motivated to follow independent instructions outside of the classroom setting. Instructors have to find ways to make technology an integral part of learning both inside and outside the classroom.

Working with internet based technologies also makes students ready for the real world where tools such as map services and ArcGIS online are widely used. In addition to being ready for graduate studies and the professional environment, one of the main advantages of teaching through the self-taught medium such as online tutorials is the confidence that the students

derive from completing these tasks on their own. Once they have overcome the learning barrier, students can continue to acquire new skills through MOOCs and other services. It is the initial hump, however, that is the greatest impediment to including these tools in undergraduate education.

References

Grimes S (2009) The Opposite of Open Source. Information Week. http://www.informationweek.com/software/information-management/the-opposite-of-open-source/d/d-id/1082345. Accessed 21 March 2015

Leslie, S J, Cimpian, A, Meyer, M, & Freeland, E (2015) Expectations of brilliance underlie gender distributions across academic disciplines. Science, 347(6219), 262-265.

Mitchell L T (2014) Expanding Horizons. Trajectory Magazine. 2014(4):12-13.

Monmonier, M (2014). How to lie with maps. University of Chicago Press.

Newcomb, D (2014) Crowd-Sourced Mapping: The Next Weapon in Navigation. PC Magazine. http://www.pcmag.com/article2/0,2817,2458392,00.asp. Accessed 29 March, 2015.

Obermeyer, N J (1998). The evolution of public participation GIS. Cartography and Geographic Information Systems, 25(2), 65-66.