UNIVERSITY MEETS ENTERPRISE

MAJOR UNIVERSITIES AROUND THE WORLD ARE TEACHING STUDENTS ABOUT GIS. BUT IS IT READYING THEM FOR THE REAL-WORLD? MICHAEL GOULD LOOKS AT HOW SYLLABUSES ARE ADAPTING TO MEET BUSINESSES' CHANGING REQUIREMENTS

Having visited about 200 universities around the world over the past decade, I can safely assert that almost all major universities are teaching and using GIS – some, such as where I studied (Buffalo), since the 1970s, while others are just getting starting. What they have in common is that students on the verge of graduation want to know where they might find opportunities, either as postgraduate researchers or as GIS practitioners. And what many have in common is a rather narrow view of GIS: a classroom of students analysing thematic layers to discover patterns, relationships and processes.

Learning how to operate desktop GIS software to solve problems by analysing these thematic layers is an important and necessary practice for students specialising in GIS as well as for those applying GIS to a cognate field. It is difficult to find GIS courses that do not talk about buffers and overlay. Alas, many students get just a brief taste of the 'layercake', maybe just a semester, and are pushed off to other coursework and then out into the working world. That world is advancing rapidly, in part due to innovations in technology and business practices.

Institutions are increasingly connected, providing real-time access to important data, anytime anywhere. Building the infrastructure – what some call enterprise GIS – to make that possible is not a trivial exercise. In many cases the institution no longer relies on a few 'GIS people in the basement' to do all the analysis and produce mapped results. The norm is now mobile apps and *in situ* sensors feeding data into multiuser databases in the cloud, which is where geoprocessing also happens. Final decisions are also made on mobile devices or on the web from remote locations. In the messy middle, the GIS is often integrated with other complex business systems (think SAP).

While some people talk of the final days of GIS, I'd say that GIS has morphed in accordance with technology trends. People are still asking spatial questions and getting answers, only the box on the desk often is not where this all happens. And GIS is now much better plugged-into the inner workings of the business or government agency.

One way to easily distinguish enterprise GIS is 'beyond basic desktop workflows'. This is certainly not to claim that desktop GIS is irrelevant, only to underscore its specific role as a specialised node in the wider enterprise constellation. Many top universities around the world now have access to mobile, server and online GIS software, and are moving beyond basic desktop GIS and innovating in the enterprise GIS space. Doing so not only provides solutions to clients and partners – researchers, NGOs and other user communities – but also helps prepare GIS learners for the world of enterprise computing.

See 'Real-world' GIS on page 41 for just a few examples of real-world GIS education taken from the set of university groups designated as Esri Development Centers.

Gradually, we are seeing a shift from student projects based on single-user desktop GIS analysis, to distributed systems and geoprocessing. In many cases desktop GIS performs the heavy lifting of geoprocessing and then publishes results as webmaps, crafted to maximise comprehension by the public or politicians. GIS instruction built around these enterprise projects allows students to work in small competitive teams, hackathon-style. The GIS classroom is evolving.

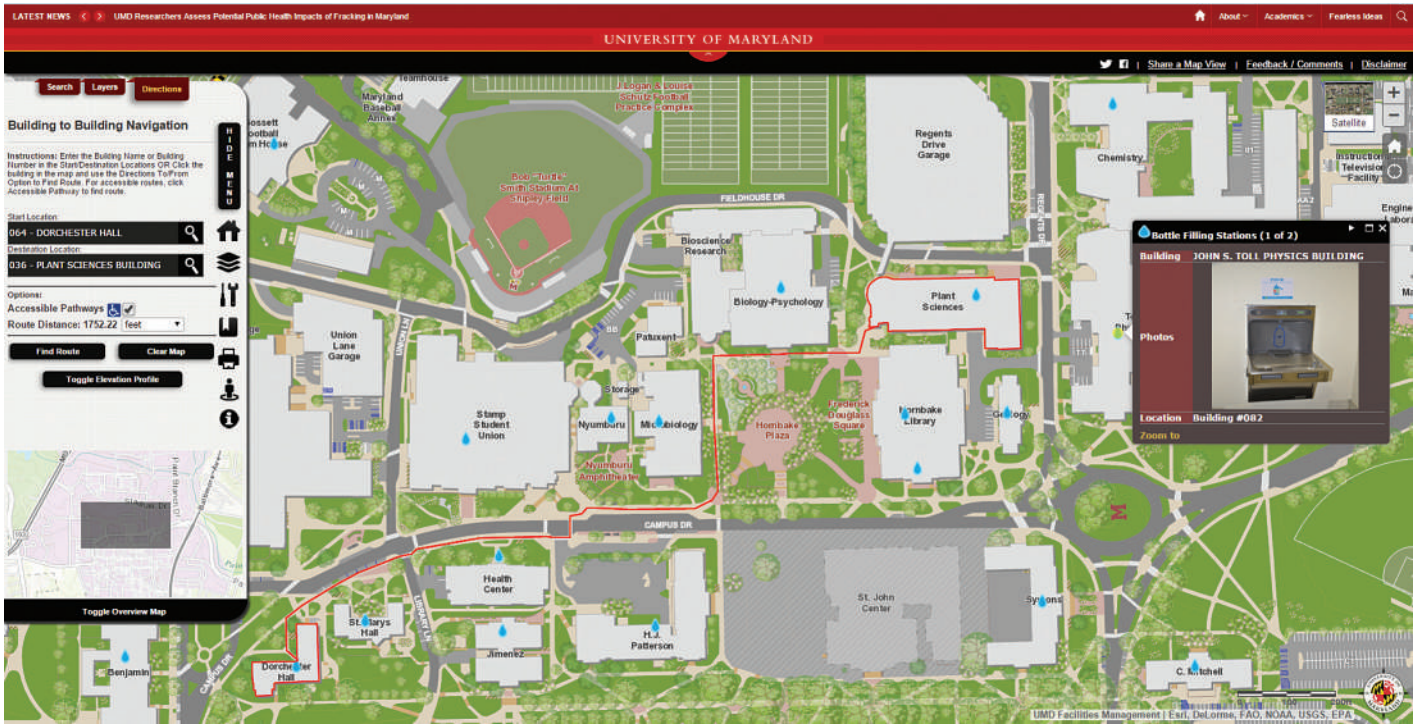

Figure 1. University of Maryland GIS-driven campus maps applications

Outside in

We have seen examples of how enterprise GIS thinking helps to get actionable information into the hands of more people, in an inside-out fashion. Another trend is the application of enterprise GIS thinking inside the administrative working of the university. Administrators are recognising that the same GIS software used for research and teaching can also be applied to their internal campus business.

A growing number of higher education campuses around the world are leveraging their enterprise GIS licenses for very specific, mission-critical activities such as planning indoor space use and optimisation, managing campus infrastructure and assets, and keeping people and property safe. Higher education institutions exemplifying this rising trend include Curtin University in Australia, Kuwait University, the University of Calgary in Canada, and US universities the University of Kentucky, the University of Massachusetts-Amherst, and the University of Washington.

The list is growing and the uses are becoming commonplace and available to multiple stakeholders such as the singular campus map in use at the University of Maryland in the US (http://maps.umd.edu/map/) (see Figure 1). The GIS staff within campus facilities have created a public campus basemap, obtained executive support, involved multiple departments adding many operational layers, and are institutionalising and democratising mapping for activities ranging from disability routing, to landscape inventories, to campus construction projects, and to locating bottle filling stations, bike racks, dining services, and emergency phones.

These campus enterprise GIS projects provide a unique opportunity for students and research groups to test their methodologies and technology, infuse spatial thinking across the university, and make a name for themselves on campus and beyond.

Now when you ask students about what they learned in GIS class, don't expect them to sit down at their desktop to show you. Expect them to stand up and show their mobile app calling web services.

REAL-WORLD GIS

At the 2015 Association of Geographic Information Labs in Europe (AGILE) conference, Technical University Dresden (Germany) researchers presented a Geoprocessing Appstore (GA) providing access to and testing of specialised algorithms via the Esri Geoportal Server (and Geoportal Facets), both freely available on github (https://github.com/GeoinformationSystems/GeoprocessingAppstore-1).

The University College London ExCiteS (Extreme Citizen Science) research group developed and tested unique mobile app user interfaces for non-literate users in the Amazon and Congo basins (see *GeoConnexion International* February). They went beyond the mobile app and created the GeoKey web API to connect user-generated data to the ArcGIS Online platform to make it accessible around the world.

Researchers at ETH-Zurich are creating a platform for location-based mobile learning, called Omleth, which integrates mobile devices, learning management systems, and cloud geoservices (www.omleth.ch).

Computer scientists at Rochester Institute of Technology (New York State) have built Iwacu, an Android platform serious game for spatial thinking that was tested in Rwanda and is now available on Google Play. Although the mobile game appears simple for users, the team built a sophisticated backend including ArcGIS for Server and several open source components in order to keep the game running (https://play.google.com/store/apps/details?id=gis.iwacu_new.rit.edu.main&hl=en).

The Georgia Coastal and Marine Planner (GCAMP) was developed by the Center for GIS and the Strategic Energy Institute at Georgia Institute of Technology (Atlanta), and includes an online data catalogue feeding specialised apps on coastal planning, shipping, and energy (http://geospatial.gatech.edu/GCAMP/).

EXPECT THEM TO STAND UP AND SHOW THEIR MOBILE APP CALLING WEB SERVICES

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