What Curriculum Means, and Could Mean, for CyberGIS

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The Curriculum Workshop’s goal is to envision guidelines that lead to adoption of CyberGIS teaching and learning in undergraduate and graduate courses. One challenge confronting this task is the fact that “curriculum” is a polysemous concept with multiple related meanings. Here I briefly consider some of those meanings and their implications for efforts to achieve the stated goal.

In general, “curriculum” denotes a designed and guided experience or series of experiences that result in learning. In particular, however, curricula in higher education occur across a spectrum of scales as well as a hierarchy of levels (graduate, undergraduate, professional development, middle college high school, etc.). At the macro-scale, “core” or “general education” curricula span entire institutions. Articulation agreements also make inter-institutional curricula possible. At a micro-scale, discrete educational resources like articles, presentations, demonstrations, exercises, quizzes, and sometimes even games shape learners’ experiences. In between, academic departments offer degree and certificate programs with prescribed sequences of “courses” or “modules” and individual educators or small teams develop and conduct courses/modules made up of sequences of topics and activities.

Macro-scale curricula are longer in duration (sometimes requiring years to complete), have the broadest scope, involve the most stakeholders, and are therefore the most challenging to develop, maintain, and transfer to other settings. Micro-scale curricula, by contrast, are relatively brief experiences that tend to be narrow in scope, reflecting the efforts of fewer authors. They are relatively easy to create and update. And because they can be adopted by others with a minimum of disruption to their own curricula, they tend to be easier to transfer to other settings. If transferability is a key design objective for CyberGIS education, then thinking small may make more sense than thinking big.

If we array the various scales at which curricula occur into a spectrum ranging from most extensive (macro-scale) to most focused (micro-scale), and if we then situate the projects of the CyberGIS Fellows within that spectrum, a concentration of projects at the intermediate scale of courses/modules becomes apparent. The educational experiences engineered at this scale are likely to span weeks or months, involve a small number of individual author/educators, and impact dozens, or at most hundreds of students (cumulatively). The resources are likely to be moderately difficult to develop, maintain, and transfer to other settings (i.e., graduate and undergraduate programs at other institutions). The position I wish to advance is that a broader range of educational resources is likely to increase the chances of achieving the workshop’s goal.

One example of a “micro-scale” resource is Esri’s “GeoInquiries.” GeoInquiries are short, standards-based inquiry activities for teaching map-based concepts found in the most commonly used K-12 textbooks. Each GeoInquiry consists of a one-page (front and back) PDF document that explains the activity and guides the inquiry, and a corresponding ArcGIS Online web map that teachers and students can access freely, without even logging in to the cloud-based GIS. The activities are technology agnostic and can be delivered in a K-12 classroom with as little as a tablet and a projector. They can be mastered in minutes, and can be added to existing curricula for U.S. History, Earth Science, AP Human Geography, and other subjects with little disruption (Baker 2015).
Extending this “micro-scale” approach to CyberGIS, one can imagine a set of learning objects that prompt students’ inquiry into fundamental concepts that make web maps possible. Although the term “learning object” is variously defined, one of the most clearly articulated definitions is “the smallest independent instructional experience that contains an objective, a learning activity, and an assessment” (L’Allier 1997, cited in Polsani 2003). Polsani stresses that learning objects are “…predisposed to reuse in multiple instructional contexts.” Concise learning objects that are narrowly focused on concepts like services architecture, APIs, and cloud computing could be readily added to any number of existing GIS and GIScience courses at many institutions. The approach has proven effective in other disciplines. For example, educators who sought to infuse ethics education in engineering curricula successfully employed a similar approach, which they called “micro-insertions” (Davis 2006). Concept mapping has been used effectively to design and organize reusable learning objects (DiBiase and Gahegan 2009).

At the intermediate scale of courses/modules, massive open online courses (MOOCs) have proven the potential to engage thousands of students in active learning with web maps. MOOCs offered at no charge, and without academic credit, are relatively easy for educators at other institutions to adopt (as extra-credit assignments, for example), and for students to join on their own. The CyberGIS Center’s host institution – the University of Illinois – is an academic partner with Coursera, the leading MOOCs platform. While designing, creating and conducting MOOCs is certainly not without costs, a concise MOOC on CyberGIS principles could expand awareness and generate interest far beyond the higher education institutions currently represented in the CyberGIS community.

“Scale” is a fundamental concept in education as well as geography and GIScience. Here I’ve suggested that more extensive “macro-scale” curricula are harder to transfer between institutions and educators than more focused “micro-scale” curricula. If true, focused educational resources – perhaps fashioned as reusable learning objects – may be best suited for initial adoptions by educators who wish to expose their students to CyberGIS, but are reluctant or unable to disrupt their established curricula. Moreover, a spectrum of curricular resources at a range of scales should help generate and support educators’ broader and deeper adoptions over time.

References:


