The Educational Double Whammy

Why the GIS community has two, not one, educational crises on its hands
Most of us are aware that GIS has now permeated all of the fields of surveying and mapping. This is true from the surveyor in the field, to the GIS user, to the field scientist, to the cartographer using the resultant data. This is because the native inherent power of geographical location is no longer a mere professional curiosity, but a valuable and productive way to organize and query information—all information, not just that on maps. The last decades have seen an impressive institutional response to the science and technology of GIS, ranging from the National Center for Geographic Information and Analysis to the Open GIS Consortium. A fledgling industry has turned into a mature one, with even players among the greats of Information Technology at last, belatedly, finding their way into a market when innovation has thrived. The future of GIS as a technology looks bright. The value of GIS to national security, public health, economic profit, and to the functioning of basic democracy is assured. Even an uninterested reader of the professional and technical press can gain this much knowledge with a brief perusal of the latest news. What they cannot see, however, are two lingering crises. The crises are invisible because they impact not the blossoming present of GIS, but its future. These are the lingering crises of education. In my native England, the loss of human intelligence to the United States is often called the Brain Drain. For GIS, we might call this the Brain Gap.

There are two crises, we must keep in mind, not one. The first is the crisis of magnitude. One often hears that the next great thing for GIS is the advent of location-based services. I have been telling students for the last couple of years that location-based services will amplify GIS by about a factor of ten. Yet it goes beyond this, for we are also witnessing a technological convergence.

In the curriculum at my own institution, we offer classes in GIS, remote sensing, cartography, visualization, geostatistics, spatial analysis, and geographical modeling. Yet every year, more and more the content of these classes overlaps. One example will suffice, that of high-resolution remote sensing, from instruments such as IKONOS. Once the pure domain of remote sensing, IKONOS data find uses not only in urban geography, planning, transportation analysis and cartography, but also beyond the mapping-based disciplines in economics, archeology and sociology. In short, the multiplier effect is kicking in, and geographical location is central to all of this expanded range of applications and disciplines.

The outcome is a massive demand for basic GIS and even basic mapping science education, such that basic classes in these areas, even operating at capacity, cannot keep up with demand. This is in the short term. When the generation of kids currently in elementary and high school, who have grown up with GIS highly integrated into the K-12 curriculum, reach college and the workforce, they will find the material in the basic GIS classes trivial. The problem of capacity is real. If we add up all of the seats available nationally for education (and even

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training) in GIS, we come sorrowfully short. And the USA leads the world in this field! We simply need to start thinking bigger as far as GIS education is concerned. The brain gap will probably require a response similar to that following the 1957 "shock" of the success of Russia’s SPUTNIK. The institutional seeds are present, but not yet the national will. And yet this is only the first side of the problem.

The double whammy is this. By the time we can gear up GIS education to meet the raw numbers, we will face the full impact of the next paradigm shift in geographic information technologies. The seeds of this change are everywhere. They challenge just about every assumption that we currently make about GIS and spatial information use: data capture, storage, management, analysis, retrieval, and display. Even the familiar desktop metaphor, a constant for those under 30 as far as computing is concerned, is clearly headed for the dustbin of history. Vector, raster, consistent rectification, address matching, uncertainty handling, visualization? All of these will pass from research enterprises to “locked in” solutions. Once one knows the basics of the internal combustion engine, one rarely looks under the hood, and concern with better driving (even navigation!) becomes primary. So too will it be with GIS. Where does this take us? Perhaps into better human computer interaction and integration of knowledge into human decision-making? We do not really know. We do know, however, that our mechanistic modes of thinking about contemporary GIS will have to change.

We currently are very good at the measurement, analysis, and display components of GIS. Accurate and timely data capture is becoming easier, to the extent that we talk about having too much data and needing to sort and prioritize first. Clearly, the next generation will excel at these skills, sifting and reducing, rather than measuring and storing. Methods of spatial analysis and modeling are becoming increasingly sophisticated, and the merging of cartography and scientific data exploration has been highly productive.

Nevertheless, there are two entire parts of the educational domain where we are relative novices. These are (1) problem formulation and (2) intervention. Planners have covered these areas all along yet, even in planning, their integration with computer-based methods has lagged. We need to learn how to teach students how to think, how to structure and pose questions and problems so that their solutions are possible with the vast arsenal of technical solutions that we now possess. And the flip side of this educational challenge is that we need to stop thinking of the delivery of a fi-
See pages 9 to 1 of this issue for information about educational opportunities for surveyors and cartographers.

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Rent direct from manufacturer, the publication of a peer-reviewed journal article, or the graduation of another student, as the end product of our work. We know the power of GIS tools and methods. By using and mastering them, we are also taking on an obligation to ensure their effective use to ensure a better world. No set of disciplines is closer to our everyday lives than those that work with geographic reality and spatial relations and interactions. No set of individuals, therefore, is better able to ensure the correct and effective use of these means. Given enough effort, few problems will be beyond our means of solution.

So where does ACSM come in? As a professional organization representing the body of people in the thick of spatially based technologies, one vital role is that of education. Obviously ACSM is not a university or college. It is, however, in an excellent position to advocate, influence, guide, and inform. I am no supporter of GIS certification programs, yet ACSM is the ideal place for an open discussion of their possible impact. ACSM can act as a bridge for elected officials, informing them of the educational crises and prompting them to act against them. It can inventory and rank our educational programs in GIS and mapping science. Where, for
example, can a young person go to find out about the quality and nature of educational programs in the United States? ACSM can recognize and promote the convergence in the mapping sciences, even among its own member organizations. ACSM can provide information, such as the current career guides, to allow high-school counselors, teachers, and students to gain knowledge about our field. And AGSM can point out exemplars, programs that work or which anticipate and plan for the second part of the double whammy that is just down the road.

The nice thing about time is that the future comes along, whether we like it or not. AGSM can guide and steer the GIS community towards the next generation, or it can sit by the wayside and watch this future unfold. Given a choice, I prefer the former.

Photos by Susan Baumgart, Geography Department, University of California Santa Barbara