Teaching With GIS: Reframing the Debate Bob Coulter Missouri Botanical Garden

Abstract: The past several years have seen many valiant efforts to integrate GIS into a wide variety of classrooms. Like other technology-based educational reform efforts, moving past the early adopters and particularly motivated teachers has proven to be inordinately difficult. In this session, a modest effort is made to reframe the debate away from getting GIS into schools and toward an understanding of how the teaching and learning environment can be made more hospitable to geospatial analysis. Meeting this effort half-way, suggestions are offered as to how we can frame our work to be more responsive to current classroom realities.

Each year, the ESRI Education User Conference highlights outstanding projects led by individual teachers and larger programs that are sponsored by regional organizations such as universities and non-profit organizations. As a director of one of those programs, I've been pleased to be able to share our work and contribute where we can to the greater good, and in turn learn from others' experience. Like most of us in this line of work, we've had successes and well... incomplete successes. Even with our collective gains duly noted, there remains something of a non-denominational, pre-Davinci Code "Holy Grail" that we're after: Chorus lines of mappers busily analyzing data, suddenly turned on to school, and making a difference in their community every day. As we can see in this conference and elsewhere, this does happen, but it remains far from the norm.

In many cases, our desire to spread GIS in schools often becomes like the scene in *Monty Python and the Holy Grail*, where the knights come to a castle offering the new-found grail, only to be told to go away...the people inside have already got one. Our beloved GIS seems to have trouble dislodging other grail-like icons that educators give allegiance toward. People who have been around education long enough know that these icons come and go, both in technology and in broader educational trends. If you're not sure of this, have your students do a Logo project in cooperative groups, and then present it with a HyperStudio projects to apply their higher order thinking skills.

Continuing the Monty Python analogy, perhaps a scene from *Life of Brian* is more appropriate. Brian Cohen, Jesus' next-door neighbor, is mistaken for a messiah and hounded by the masses, leading to much of the comic element of the movie. The scene relevant here is when Brian is trying to shoo everyone away, denying that he is the messiah. After a while, one of the leaders declares that Brian is in fact the messiah, and he (the leader) ought to know because he has followed enough of them! Similarly, we educators have chased our share of grails and messiahs.

Comic elements aside, perhaps it is time to put away the grail-quest, looking to GIS and GPS as something of an educational messiah. Continuing the pop-culture tour, we can borrow from Don Henley's lyrics about aliens visiting Earth: "They're not here, they're not coming, not in a million years." When we can get past that expectation, GIS and GPS might have a better chance of making a difference in schools.

Moving on to more serious considerations, three factors need much better consideration if we are

to move geospatial technologies into the mainstream: Deeper curriculum, professional development that is transformative rather than merely instrumental, and truly accessible tools and data sets. Each of these is a leg of the table; without one, the whole cannot stand.

First, curriculum needs to be much deeper. The intellectual Pop-Tarts students are fed in the name of rigor and world class standards need to be put to rest. Pre-packaged Education McNuggets don't provide nutrition for growing minds. Instead, communities need to find ways to anchor students' work in nourishing, rich investigations of meaningful concepts and issues. In our work with teachers, we have found the concept of "generative topics" advanced by the Teaching for Understanding project at Harvard Graduate School of Education (Wiske, 2005) to be particularly useful in this regard. In this framework, generative topic are ones that:

- Are connected to multiple ideas within and across subject matters
- Are authentic, accessible, and interesting to teachers
- Are fascinating and compelling for the teacher
- Can be approached through a variety of entry points and a range of available curriculum materials and technologies
- Have a "bottomless" quality that generates and rewards continuing inquiry

These generative topics allow students to develop and sustain a much deeper level of inquiry than current practice allows, over time building an intellectual character (Ritchart, 2002) that will serve them better over the long term, fostering engagement rather than disengagement.

At least two arguments can be raised here: Assessment demands and teacher capacity. The more obvious one in the current political climate is the assessment and accountability issue. Many will say that deeper curriculum would be good, but what about the tests? Simple answer: Let's stop voting for them! If we really want "accountability" and "standards" in school, we need to reclaim the language surrounding those ideas. Unfortunately, neither major political party has a credible educational plan, and local districts are too cowed by funding concerns to stand up to inane mandates and take the time to educate voters about how limiting and expensive testing really is.

Current accountability efforts are primarily focused on justifying exorbitant expenditures to a handful of companies that purport to tell us which schools are doing well and which ones aren't. Similar tools focus on doing the same at the level of the individual student. In nearly all cases, this is data that is already known, at least in strokes broad enough to know where a community should focus its efforts. Rather than blaming the schools as if they functioned in a vacuum, perhaps we should start with a two part action plan:

- 1. Part of a district's report card should include the elected representatives' scores on the high school level tests given in that jurisdiction, and
- 2. Instead of simply publishing scores and blaming the schools, we should frame the issue (and publicize it accordingly) that "The following communities failed in their support of their children."

If the tests measure skills that are essential for adult citizenship, there can clearly be no objection to the first part; the second would appropriately identify education as a community priority, not

just something for the schools to be concerned with.

While we advocate for "standards," when was the last time a child had time to think in school? Just as one possible framework for standards to consider, how often can your local school curriculum support the five learning goals used at "The Met," an alternative public high school in Providence, RI (Littky, 2004):

- Empirical Reasoning: "How do I prove it?"
- Quantitative Reasoning: "How do I measure or represent it?"
- Communication: "How do I take in and express information?"
- Social Reasoning: "What do other people have to say about this?"
- Personal Qualities: "What do I bring to this process?"

Real assessment would focus on skills that are important (Commission on Instructionally Supportive Assessment, 2001), and create a meaningful set of experiences that allow students to demonstrate their mastery. There are promising models available, such as the portfolios in use at Central Park East elementary school in Harlem (Bensman, 2000), and if we were to reallocate the amount of public welfare we now channel to corporations away from collecting data and toward developing valid measures of student understanding, we would all be better off, none more so that the students who are currently being deprived of a meaningful education.

A second concern relates to teacher quality. Can "average" teachers lead such intellectually rich investigations? The all star team – the ones presenting the outstanding projects here certainly can, but can the *average* teacher do it? Maybe, maybe not. Reframe the issue, though. What do you want for your child? We need to revisit Dewey's challenge that we "should want for every child what a good and wise parent wants for his child," even if they are poor; even if they aren't white. We allow too much mediocrity and worse in schools, particularly in the schools and districts serving those least able to fend for themselves. As social critic Jonathan Kozol (2005) so eloquently reminds us in his books and speeches, we allow things in schools serving the poor that would never be tolerated in elite schools. Tom Snyder, an early pioneer of educational software, summed it quite simply when he remarked more than a decade ago, "[T]he solution to bad teachers is good teachers." It's not in more testing to hold "Them" accountable, or in dumbing down the curriculum to nuggets that fit testing schemes.

If good teachers are to lead rich, meaningful inquiry, we need a better model of professional development. Most of what passes for professional development is really activity training, whether it involves how to use the new district curriculum, how to use activities to spice up a dull curriculum, or even ... how to operate a software program. The curriculum modules I and others have developed for GIS are a start, but not enough. In philosophy-speak, perhaps necessary, but not sufficient. Even the best curriculum modules leave teacher learning in the instrumental realm: How to do a particular task, not how to use it as a catalyst to deeper understanding.

Lets' face it: We're addicts, and we love our geo-toys. If you have ever neglected a spouse or significant other so you can use the geoprocessing wizard just a little while longer, or if your child is laughed at on the playground for still using a third generation iPod because you just

couldn't resist buying the new GPS interface for your PDA, you're an addict. Facing up to it is the first step in recovery.

Seriously, we have to work against the urge to fit in all of the "cool stuff" we can do with GIS in our workshops. Tools – electronic or physical – are just means to an end. If we don't give enough attention to changing ways of thinking about teaching and learning within our workshops, we will miss an opportunity that many teachers won't get elsewhere. As Einstein noted, "[W]e can't solve our problems with the same thinking we used when we created them." We need different models for professional evelopment. As the Mad Hatter remarked in Alice in Wonderland, "If you don't know where you are going, any road will get you there." The kind of thinking that these quotes try to counter is what has given us the endless string of transient icons in education, each to be replaced after its time in the sun.

As a starting point in thinking about the problem, I find the framework offered by Alfred Korzybski (cited by Kodish, 2005) to be compelling. If we expect different outcomes, we have to shift the assumptions behind the work. Without this shift, the transition to the desired outcomes is tenuous at best. In Korzybski's framework, only by revising assumptions (from A₁ to A₂) will the consequences resulting from our assumptions (C₁ or C₂) readily be different. Expecting to go readily from A1 to C2 is an unlikely outcome. When the assumptions are changed (I), the link from assumption to outcome is much more straightforward (II).



Truly transformative professional development that goes beyond being merely instrumental, and instead changes teachers' assumptions about learning, is essential to the long-term health of schools. Unhealthy environments are not hospitable to the kinds of rich inquiry around generative topics we need schools to embrace.

If the first two legs are established and we have substantive investigations being led by intellectually engaged teachers, we still need to consider the delivery models we use for geospatial inquiry. Just as Henry Ford was willing to sell you a car in any color you wanted as long as it was black, we are perhaps too bound to a restrictive delivery mechanism. We're happy to do GIS...as long as we have a computer lab over a 2-4 day period at least, ideally more.

While common wisdom in our field holds that ubiquitous access to ArcView allows students to engage more fully with geospatial inquiry, we may be overlooking benefits that other delivery models might offer. Two are offered here to start the discussion. First, many curriculum modules, including the ones I've developed, don't enable the comparative expertise of the

teacher as inquiry leader to come into play. Coupled with this, we need to address the need for intellectually significant geospatial resources to be accessible even when the computer lab isn't.

Regarding the first issue, we have to acknowledge the limitations of the model that has students conduct a structured inquiry, generate conclusions, and record them on data sheets for teacher grading (or "rubric-based assessment," using today's icon). Mentored discussion of a rich data set, led by a capable teacher, can draw out insights that students may not come to on their own guided by a worksheet. Even better, the dynamic interplay between a teacher and her students can generate points of view that no one had going into the process. Working alone or with a partner at a computer runs the risk of leaving assumptions unchallenged and points of view unchanged. To assume that exposure to the data, even with high powered tools, will change peoples' thinking is perhaps overly optimistic.

I'd like to propose an alternative to have in our repertoire that would address this concern and also accommodate those instances when a computer lab isn't available. People who have been around ed tech for a while may remember the "one computer classroom" that Tom Snyder Productions (Dockterman, 1998) made famous in the 80's and early 90's. Perhaps we need a new book, entitled *Great Geospatial Teaching in the One Computer Classroom*.

Joel Halvorson, the geo-guru behind Journey North, remarked in an educational technology conference I was part of nearly a decade ago something to the effect that "great teaching starts with a teacher in an empty room." Sometimes the ornaments enable, but at other times they can distract. Kids, a teacher, and a map are all that are needed for geospatial inquiry to happen in the classroom. I'd like to propose that we as a niche within the larger ed tech business consider the benefits that focused, collective inquiry on a rich data set let by a capable teacher can lead to. At the least, this focused joint attention on a screen can lead to more mentored reflective discourse (Feldman, Konold, and Coulter, 2000) happening in schools, and make geospatial inquiry more ubiquitous than if it is limited to the occasions when we can get to the computer lab to complete our curriculum modules. When a great question comes up in class, how quickly can the teacher interject a relevant data set to promote a mapematical point of view on the issue?

Schools founded on generative topics, led by teachers engaging in transformative professional development, with a range of delivery methods offers promise for better integration of geospatial inquiry. Is it easy? Of course not. The impossible takes a while. As author and evangelist Jim Wallis noted, "Hope is believing in spite of the evidence, and then watching the evidence change." For that evidence to change, though, we need to take action. In the words of the Lorax, "Unless someone like you cares a whole awful lot, Nothing is going to get better. It's not."

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