

Title: Aligning GIS Classroom Support Materials with District Standard Curriculum
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Abstract:

Geographic Information Systems (GIS) by their nature are an integrative information technology but because of the complexities of GIS project design, the pressures put on by high stakes testing, and the exactitude of standards based education, the average classroom teacher doesn't have the time, the resources or the skills needed to develop content rich GIS curriculum. We plan to address this problem by creating GIS support materials that are adjunct to our Teaching and Learning Project (district-wide standard curricula), and by providing teachers with a multi-tiered group of teacher development opportunities.

Teacher development opportunities include two three-hour in-service trainings, summer Community Mapping courses and after school teacher support meetings. This paper will report on the progress to this point and plans for the future.

Introduction

Denver Public Schools (DPS) has an economically and ethnically diverse student population. This paper will discuss how we intend to integrate GIS into higher level district initiatives, what we have learned in the first two years of GIS in the Classroom implementation, challenges we have faced, and possible solutions in GIS in the classroom integration.

Denver Public Schools Demographics

Denver Public Schools has 69,251 kindergarten through 12th grade students. 43,623 or %63.0% are economically disadvantaged and qualified for free or reduced price lunches. The racial and ethnic makeup of the district is 20.3% White, 19.3% Black, 47.3% Hispanic, 3.8% Asian and 1.3% American Indian. 14,450 or 31.2% of our students are English language learners [speak English as a second language].

History of Competing Higher Level District Initiatives

To understand the need for GIS to fit into higher level district initiatives we need a bit of context regarding these initiatives.

In October of 2003 DPS started a districtwide initiative called the Secondary Teaching and Learning Project. Its goals include creating curriculum that is content rich, rigorous and consistent throughout the district. It also intends to create curriculum and instruction that is consistent, not only between schools, but, between grade levels as well. The project is being implemented in the core subject areas of Mathematics, Language Arts,

Science and Social Studies. Teaching teams, consisting of one Administrator and three teachers from each of these content areas, have been recruited from each DPS middle and high school. Their charge is to develop districtwide ~~curriculum~~curricula, choose common materials and create common course assessments.

Under this new framework students are expected to learn the articulated concepts, demonstrate the skills in the standards and practice the habits of thinking. Great consideration has been given to reaching poor-performing schools and closing the achievement gap. ~~Importantly, This~~ initiative is supported at the highest levels including the School Board, the Superintendent, the Chief Academic Officer and the Director of Curriculum.

Other higher level demands on teachers are the maze of state and federal regulations they must follow like the Colorado Student Assessment Program (CSAP) and the No Child Left Behind Act. CSAP and other standards based requirements effectively restrict the latitude of the teacher and necessitate adherence to tightly written lesson plans. One ~~affect~~effect that No Child Left Behind has on teachers is that they seek out professional development that satisfies the requirement that they achieve "Highly Qualified Teacher" status in their content area. Conversely, it is harder to recruit teachers for GIS professional development if the training that is offered doesn't satisfy these requirements.

History of DPS GIS in the Classroom

In the face of all of these high level demands DPS made two small commitments to GIS (1) purchasing an ESRI Higher Education District Site License and (2) accepting a \$70,000 Perkins Tech Prep grant to start up two postsecondary GIS courses for DPS students.

After purchasing the District Site License we bought a copy of *Mapping Our World: GIS Lessons for Educators* and developed a three hour teacher in-service training. This was demanded by our Department of Technology Services as a prerequisite for teacher to complete before being allowed to use GIS in a school setting. This training was only intended to teacher teachers to open and navigate pre-prepared GIS projects with students

Shortly after purchasing the site license and developing the in-service training we applied for and won a \$70,000 Perkins Tech Prep Grant to provide professional development for teachers and to start up two three-credit-hour dual credit GIS classes. The classes are called Cartography and Intro to GIS. Both of these classes are consistent with Colorado's Common Course Numbering System, so they should eventually articulate to any college that offers these classes. At present we are finalizing the Postsecondary Options Agreement with Front Range Community College as per our grant requirements. We hope to recruit enough students at two of our pilot high schools in the spring of 2006 to make two Cartography courses viable.

To prepare our GIS teacher team leaders we contracted with the IDT CMaP program (formerly the Orton Family Foundation Community Mapping Institute) to put on

~~theirethere~~ three-credit-hour training. Graduate credit is offered through the University of Colorado at Denver School of Education. CMaP is a powerful group of tools that teaches teachers to use GIS in the classroom, to design projects consistent with the ~~teacher's~~ specific standards and to manage the project so that students' time on GIS materials is commensurate with content covered. CMaP also emphasizes that industry partners should be satisfied that the time they have committed is worthwhile to them and the students.

As of August of 2005 we will have trained approximately 25 teachers in Community Mapping and about 70 teachers to use *Mapping Our World*. A second three hour in-service training designed to teach teachers to customize and localize prepared GIS materials. This training which is based on *Community Geography* was piloted to eight teachers this spring.

Challenges

The demands of higher level initiatives win out over GIS in several ways. Teachers have huge demands on their time both in the classroom and outside. Given a choice between developing new GIS based teaching materials and filing the paperwork needed to meet pay-for-performance goals, teachers invariably choose the pay. Administrators in charge of programs like our *Teaching and Learning* program can be very jealous of these resources. If GIS appears to distract from their goals they can steer resources away from projects or make it harder to garner new resources.

Many teachers are unaccustomed with working with students in a computer lab setting. Between learning to manage complex GIS files, garnering the tech support needed install GIS software, getting the read/write files set up and ready for students, and getting timeslots allocated in computer labs that are under high demand, only the most enthusiastic teacher manages to complete GIS work with students.

While project based learning engages students at a deep level it takes a great deal of time for teachers to manage projects. It takes a special teacher to be able to complete a project and still meet of their standards. The high stakes placed on standards based learning and lacks of support for project based learning by some principals also make it hard to take on GIS projects. On the other hand working with GIS professional offers guidance and mentorship for the teacher as they learn to deal with real world data.

Using pre-prepared materials helps to build self-confidence in teachers, but has built in limitations with respect to coverage of content standards. Authoring original materials removes some of the stumbling blocks and can still be engaging for students, but often involves a base GIS skill set few teacher possess. Data issues like projections, data quality problems and licenses can also stall original GIS projects.

Solutions

To address these myriad problems we are attempting to align our GIS efforts directly to the district's Teaching and Learning dictates. To accomplish this we are borrowing from a successful DPS project that is already in existence, called the Alma Project. In this project teachers are paid \$300 per fully developed lesson plan and \$700 per finished teaching unit. These are materials that teachers already have to create for their classrooms but they are paid to put the extra work into refining them enough that they can be shared with other teachers. Because all teachers who are teaching a given subject within DPS are now being asked to teach the same content areas in that given class, we hope to create GIS materials that can be shared throughout the district. These GIS materials will be attractive to teachers because they can be plugged directly into their coursework with minimal effort. These materials will foster the sense of self-confidence needed to present these materials to students. It is also hoped the curriculum content area managers will see GIS as an asset to offer to teachers, not a potential distraction.

Future plans

Three glaring deficiencies stand out at this point in this GIS implementation.

First, we are currently discussing an additional three-credit-hour course that we are informally calling the GIS Classroom Lab/Clinic. This class is intended as a follow-on to Community Mapping. In this clinic teachers would receive a little bit of additional GIS training, but the main purpose of the course would be to have teachers develop and execute a GIS project with one of their classes.

Second, because almost all of our middle schools and several of our high schools are Macintosh oriented, and because a large number of our students don't have the hardware or software capacity to do GIS work away from school, we would like to set up an ArcIMS website to deliver GIS learning materials. We have had some discussions with GIS software designers regarding applications that would allow teachers to set up student editable web pages.

Finally, we intend to continue to search for financial resources to support GIS. As the GIS Specialist for the district I have been told that my time has to be backfilled [and](#) our GIS in the Classroom will have to stand on its own. We also need money to pay teachers to develop district specific GIS materials and to set up and run the ArcIMS servers needed to deliver GIS materials directly to students.

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