Chandra Benevento  
NRS 509  
August/Yang  
December 2012  

Reflection Paper – GIS in K-12 Education  

Initially, I was just planning to review and read about the ways GIS has been or can be used in K-12 classrooms. But ultimately, what I found equally interesting were the concerns and issues surrounding its slow incorporation into the curricula, teacher training effectiveness, and constraints in bringing the technology to the K-12 classrooms. I’m glad I chose articles that gave me a more holistic look at GIS in K-12 classrooms from the prospective of many stakeholders. Although my magnifying lens ended up being more zoomed out than I had initially expected, I was able to see more of the terrain associated with GIS in K-12 education and its implementation and incorporation in school curricula.  

I was surprised at the varied responses and results from actual research conducted about students’ gains in knowledge and skills after work with GIS software. While newer (1994) national Geography standards embrace GIS as a teaching tool, there are no requirements with respect to its use in Environmental or Geography education. There are concerns as to whether GIS is simply a flashy technology and may motivate students, or if it is a means to increase problem-solving skills, spatial reasoning and thinking, and understanding of geographic principles. It was quite interesting, although not that surprising, that research supported both: some found students’ scored better than counterparts without GIS exposure while other studies demonstrated that students skill level did not increase due to work with GIS as a learning tool. I think that some of the study designs were questionable, however, and did not give a full picture of students’ prior knowledge or motivation. Without a pretest, it is difficult to pinpoint the nature of the success. One study that stands out asked students to create pre and post GIS sketch maps and found that students were able to convey numerous viewpoints and draw transportation systems better after GIS exposure, but their growth in success with legends and use of color followed a hill and valley gain graph. More of this kind of research would certainly be interesting.  

But, what really stands out is the idea that there are major drawbacks and concerns about bringing GIS to classrooms. As with any tool, if it is used incorrectly, or not in a very meaningful way, the tool itself ends up being relatively useless. Teachers need to be trained in not only using the software, but also on how to incorporate it into lesson design. Time to learn both of those skills as well as time to teach the basics of the software to their students and then ask them to use it for learning is a lot on a plate. Teachers did not feel adequately prepared to use GIS and use it well. Even teaching training programs at higher education institutions were not using GIS in preservice teacher training. And so it becomes almost worthless if teachers don’t have time in their lessons, space in their curriculum, and time to learn it and make it meaningful. If
teacher aren’t comfortable and adept with GIS and lesson planning, then districts will end of spending money on technology that is barely used.

In reading that students found it motivating and interesting, but that some studies found students spatial thinking skills didn’t really improve because of a GIS component to their class, I seriously question how it can be better implemented and embraced in K-12 education. Are we just teaching kids how to make computer-generated maps or are we able to really teach teachers how to use it to improve problem solving, critical thinking, and spatial relationship skills? This is a giant issue and there are so many ways to tackle it, but it first must be included in not only environmental science and geography teacher training programs but in all disciplines as it can be used in history, math and even language and literature classrooms. As a high school English teacher, the interdisciplinary lessons using GIS swirling around my brain make their own lovely images. It was be great to help teach about setting(s) and background information in many novels that students would read.

But, it ultimately comes back to teacher comfort with and preparedness to use GIS in their classrooms. There is a lot of training that needs to go into it and I don’t know if the cases for its use are strong enough to warrant that work. I think it could be a great help, as the students themselves remarked, in increasing interest and motivation. And I think GIS can be a great tool for increasing gains in skills and knowledge, but there are many classrooms with GIS access in which it has never been used, or may not have used it to made learning meaningful or transferable.

Overall, I am thrilled with the path my research took. In looking at examples of classrooms GIS projects, student and teacher responses to GIS use and even reading about the lack of real GIS teacher training programs and models, I see more facets of the implementation and incorporation process. I loved reading about the pros and cons to GIS in K-12 classrooms and have a much better handle on how it could be included in meaningful ways that actually increase student learning.

Patterson et al designed a GIS project for advanced placement Geography students to determine whether exposure to GIS would help them in learning geographic principles. Thirty students completed a semester long GIS project that included field work in which they had to collect ground truthing absolute locations using GPS units and then classify them into land cover categories. Students then created maps and used GIS technologies to complete the project requirements. The paper discusses the results of test scores of the AP students, at the end of the semester, compared with those of college level geography students without GIS exposure. The common assessment’s purpose was to determine whether GIS played a significant role in the AP students understanding of geographic principles. The article was well written and easy to follow, however the project itself raises questions regarding the prior knowledge of the AP and college students since no pretest was included in the experiment design.


In this article, Doering and Veletsianos hypothesized that the use of authentic data and geospatial technology would result in increased student motivation to use the data to learn about geography. A total of sixty-five middle school students from three different classrooms in the Midwest participated in lessons involving GPS data and map layers to make decisions about oil exploration impacts on caribou migrating patterns. Students also used data and technology for projects involving satellite imagery of their hometown. After completing the projects, students were interviewed in focus groups to answer questions about their experiences using the data and technology. Results from the students’ responses are presented. The article is well organized and detailed except in the authors’ explanation on the focus group sessions. More information could be included detailing these sessions and would enhance the article’s completeness.


Bednarz’s article reviews issues associated with the use of GIS in K-12 education and goes on to include ideas for improving the GIS classroom pedagogy. Since there
are concerns over whether GIS implementation has a positive effect on students’ gains in spatial thinking and reasoning, Bednarz questions its role as more than just new technology and increased motivation. She discusses arguments for and against its inclusion in k-12 curricula. This article does a good job of presenting issues surrounding the technology and adopting it into K-12 classrooms. History of GIS use in education as well as previous research findings are presented in the article. Bednarz also reviews a GIS teacher training 2-week program and how that impacted the teachers’ use of and comfort with GIS in their classrooms following the training session. This article provides a thorough review of the pros and cons to GIS in K-12 education.


In this article, Shin discusses the results of a GIS module and instructional learning unit implemented in a fourth grade classroom as a mean of increasing elementary students geography content knowledge. The module was a four-unit lesson that focused on population and transportation change and growth. Categories of map view, boundary and accuracy were used to analyze the students’ pre and post sketch maps to find patterns of progression in understanding that could be attributed to GIS technology exposure. The article also included sections on challenges from the students’ view and from the teachers’ view in working with the technology. The study did conclude that GIS helped the students learn geography but added important factors to consider in lesson design and implementation. This article adequately detailed the lesson design, results and conclusions of a GIS module used to help fourth graders learn geography.


Meyer et al examine two qualitative case studies involving GIS use in K-12 Education. The first is the response from teachers after completing a GIS training program. Teachers were asked follow-up questions about their comfort with and ability to include GIS in their classrooms and whether they found the software beneficial to their lessons. The second case study involved seventh graders working on a GIS project about water quality. Results of both case studies are presented and discussed in the article. While the article itself is a little outdated, the inclusion of a teacher and student case study helps the reader see the benefits and drawbacks to both populations’ use of GIS in the classroom. Overall, this article is well organized and presents a diverse set of issues and factors surrounding GIS in K-12 education.

In this article the authors examine the state of GIS in preservice teacher training. In order to get a sense nationally of whether and how GIS is incorporated in teacher training programs, three means of data collection were used. The authors generated a Listserv discussion about GIS training and classroom use among national organizations supporting teachers. They also completed a mail survey sent to 736 members of the Association of American Colleges of Teacher Education and then followed up with interviews with folks who were named in the mail survey responses as those responsible for GIS teacher training. The results from the three modes of data collection were detailed in the article in a thought-provoking and stimulating manner. The article addresses the results that a very small percentage of national teacher preparation programs have or are planning to include GIS in the training curricula. This article discussed a very real issue that the other articles only briefly mentioned; its unique topic, that teacher-training programs must include GIS for the technology to be successfully implemented in K-12 education, made it an interesting read.


Baker’s article discusses the barriers to including GIS in K-12 classrooms and includes methods to overcome these barriers. GIS, while emphasized in national geography standards in 1994 as a way to enhance students understanding of geographic principles, has not been implemented in classrooms as quickly as many GIS proponents wished. There are real issues surrounding its practical use in K-12 educational and this article presents those and includes possible solutions or at least thoughts about overcoming such challenges. The article itself is a bit dry and could include more examples to emphasize problems and or solutions to GIS becoming a technological tool used in many classrooms around the nation to support K-12 learning.