



Exploring Common Ground: The Educational Promise of GIS

Effective use of geographic information systems (GIS) involves more than just clicking buttons to create a map. In a school setting it means engaging in active learning, with significant thinking required. GIS can mean more to education than just "having a source of maps." GIS can affect the whole educational experience, for students, teachers, and the community. This summary describes some of the broader requirements, possibilities, and implications.

I. GIS can play a role in educational reform.

- A. GIS can be an effective tool to promote change and growth for students, teachers, skill development, classroom organization, instructional methodology, curricular content, and community participation, all at the same time
- B. The software and the data do not contain or present "the" answer. People define answers according to the questions they ask and the parameters they establish. GIS provides methods with which to explore alternative responses for specific problems and situations. Users still need to define what constitutes a satisfactory answer to their question. Critical thinking plays a primary role in using GIS effectively. Explorations thus involve profound challenge for learners.
- C. Students and teachers can both be active learners at the same time. By developing new skills and exploring new understandings of a variety of topics, teachers can model for students the process and value of lifelong learning.
- D. Because the computer is a powerful tool for exploring similar content through divergent paths, students engaged in GIS can progress in varied ways, in a style and at a pace more appropriate for their individual interests, strengths, and needs. Active exploration with GIS can more easily match the multiple modes of information access which different students need, while still affording each the chance to contribute to group activities and providing each a powerful opportunity for constructing individual visions of the world.
- E. Assessment of student progress, achievement, or development can be accomplished in multiple fashions, in ways that are appropriate to the students' interests, the school curriculum, and the community needs.
- F. Using GIS can help students and teachers become more involved as local community participants and global citizens. Partnering with other GIS users from the community enacts the "community as classroom" concept. Students, schools, and the community all benefit as each pays closer attention to the needs of the others.

II. GIS is a vocational tool

- A. GIS helps develop basic computer literacy.
- B. Effective use of GIS provides integrated training in the process of research, including data gathering and preparation, storage, analysis, and presentation.
- C. Long-term partnering including student internships may be available through GIS- using operations in the local community.
- D. GIS activities provide actual training for many careers. GIS is a tool for the 21st century.

III. GIS engages and exercises multiple capacities and intelligences

- A. Critical thinking (ability to analyze, synthesize, and evaluate)
- B. Logical-mathematical intelligence
 - 1. Numeracy (ability to interpret and use numbers and numeric skills)
 - 2. Technological capacity (ability to understand and use tools which facilitate acquisition, processing, and transferal of information)
- C. Linguistic intelligence
 - 1. Literacy (ability to interpret and present information in word form)
 - 2. Graphicacy (ability to read and use visible symbols)
- D. Spatial intelligence
 - 1. Map literacy (ability to transform real life into a mental or visual picture, or vice versa, at multiple scales)
- E. Interpersonal intelligence
 - 1. Communication (ability to transfer effectively to others through multiple modes of representation the information and knowledge gleaned through the investigative process)

IV. GIS relies on and fosters a mindset of exploration

- A. Effective users have a disposition for discovery learning.
- B. Effective users look for new possibilities.
- C. Effective users explore multiple views of a single issue or set of information.
- D. Effective users recognize that there is rarely a "right answer" to a given question or problem.
- E. Effective users make mental leaps, involving both direct iterations (multiple slight variations on a single theme) and "inspired explorations" (divergent, creative thinking).
- F. In effective situations, the teacher is a facilitator who models lifelong learning, rather than simply being a deliverer of information. Students and teachers can collaborate in their explorations.

V. GIS relies on and promotes finding information and knowing what to do with it

- A. Effective users are able to identify appropriate types and sources of information needed to solve a problem.
- B. Effective users integrate information from multiple sources and of multiple types.
- C. Effective users recognize that appropriate use of any given data includes understanding the nature and quality of the data. Effective users can identify factors which affect the quality of data and know how to match data and task appropriately.

VI. GIS relies on and promotes spatial awareness

- A. Effective users see patterns in actual landscapes and symbolic representations.
- B. Effective users ask iterative questions to describe and explain spatial patterns.
- C. Effective users explore patterns identifiable across a range of data sources and different types of representations.
- D. Effective users integrate data at multiple scales and identify patterns and processes at and across a range from macro to micro.

VII. GIS relies on and promotes computer literacy

- A. File management (critical skill)
- B. Database manipulation (critical skill)
- C. Spreadsheet operation
- D. Graphics tool use
- E. Using remotely sensed data such as satellite imagery and aerial photos
- F. Accessing the Internet for data
- G. Using presentation software
- H. Producing multimedia projects
- I. Integrating additional technologies such as Global Positioning Systems

VIII. Using GIS effectively requires knowing how to make the GIS software perform particular tasks.

- A. Effective users learn, over time, how to make the software do what they want.
- B. Effective users take advantage of different levels of software capacity. Some needs and tasks are more complex than others; some tools are more broadly applicable than others. Effective users learn to employ fundamental tools early, and add to their tool-using skills over time.

SUMMARY

What this all means is that GIS can be a powerful ally in the effort to enhance education. Students and teachers can work together to build a coherent framework for information about the world. The community can share in the process of providing educational experiences, and can gain from intelligence provided by the students. The focus on collaboration between students, teachers, school, and community can provide significant long-term benefit for all.

Individually, students can benefit from increased attention to their strengths and weaknesses. The potential to relate schoolwork with explorations from everyday life can add powerful connections for students constructing their own views of the world. Engaging GIS in multiple grade levels and disciplines can yield an uncommon synergy in a setting too often fractured.

This is the vision and expectation built from early explorations of GIS in the K-12 classrooms. Because of the speed with which this technology has burst on the scene, these descriptions are not supported by exhaustive studies. Similarly, because of the complexity involved, it has not been proven beyond all doubt that students and teachers who engage GIS develop the desirable traits noted above where such traits did not exist before. Rather, this is the view of individuals who have gained sufficient background with both the technology and the challenges of elementary and secondary education. As with much of education, the results may not be clear for years. But, given the current anecdotal evidence, there is strong reason to believe these positive statements are true for all students.

Finally, as technology brings us all ever closer to each other, it seems only too obvious that there is a need to understand more fully the changing relationships between people and places around the planet. We share many parts of our existence, and need to explore our common ground.

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