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SIT:UPSS: Exercises for the Brain

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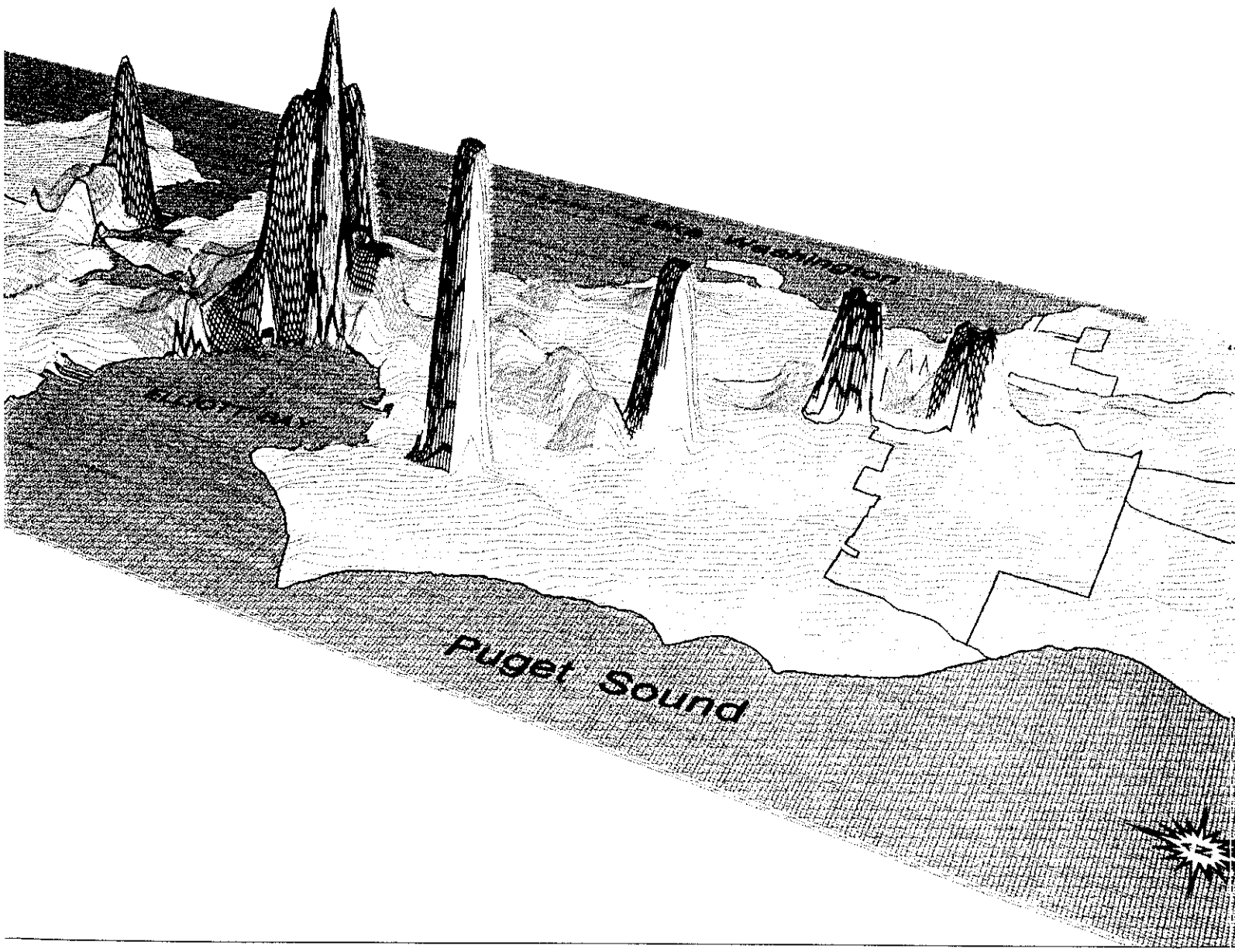

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SIT:*UPSS*—Exercises for the Brain

Richard Audet, Robert J. Lima, Marsha Alibrandi, Rheinhold Friebertshauser, William Huxhold, Kathryn Keranen and Jean Mumbleau

Debbie, a veteran 911 "telecommunicator," was working her shift at the computer-aided dispatch (CAD) console when the emergency call came in. A semi-hysterical out-of-towner exclaimed that she was witnessing a gasoline station hold-up in progress ... and, hadn't a clue of her whereabouts. All she was sure of was that a robber wearing a Big Bird mask had entered the station, and that she feared violence.

Knowing that many 911 callers were likely to be nervous and excitable, Debbie calmly and expertly fielded the most recent of the 1.7 million emergency calls that the Milwaukee Police Department receives each year. Using a skillful line of questioning, she deftly elicited information from the caller—information that could be integrated and analyzed by the CAD. Within minutes she pinpointed the exact location of the crime and confidently dispatched cruisers to the scene.

This simulated enactment of an everyday 911 scenario kicked off the "Spatialists" in Information Technology: *URISA's Program for Student Studies* (SIT:*UPSS*) program. This first-of-a-kind, two-day workshop for students in grades 5–12 was held on the weekend prior to the URISA 1994 annual conference. Thirteen students from the United States and Canada participated in a learning experience that used GIS to facilitate the development of spatially oriented problem-solving skills. Thirty-six hours after seeing Debbie create a logical framework for resolving her spatial dilemma, students were themselves able to apply a retinue of similar skills to investigate case studies in a GIS-supported environment.

To date, there are only a few instances where GIS has been employed as an educational tool in pre-college classrooms. The idea for SIT:*UPSS* stemmed from a belief that curriculum modules could be designed that would allow students to semi-independently investigate topics with GIS that focus on spatial learning. This past summer's program proved this assumption to be valid.

The initial SIT:*UPSS* activities employed traditional mapping exercises to illustrate problems and issues related to information obtained from maps. Participants discovered the value of being able to control how various data types can be displayed, the importance of pattern recognition, and why the ability to ask good questions is so critical for solving problems with a spatial component.

The SIT:*UPSS* curriculum advisory board and chair created GIS-supported case studies that served as the core of the program. Each study included a scenario describing a problem faced by a fictitious community and specific tasks for student "teams" to complete. A customized database sufficient for completing an in-depth analysis of each case study accompanied each scenario.

The "Rapid Response Team" problem required students to develop a risk-assessment strategy to deal with a ruptured gasoline tank that contaminated Mudville's aquifer. In "Away from the Raging Waters of the Ponspons," student consultants created a relocation plan for Wethersbee, an upper-midwest town whose location in a floodplain made it the subject of frequent inundation. The final study

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Robert J. Lima, AICP, is the executive director of the Boshe Institute (Hyannis, Massachusetts), an independent, non-profit research and education organization. He is also the program chair of SIT:*UPSS*, and a member of URISA's Board of Directors.

Marsha Alibrandi is an educator in social studies and geography in Cummaquid, Massachusetts, a recent teacher consultant for National Geographic, and an environmental consultant.

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William Huxhold is the chairman of the Department of Urban Planning at the University of Wisconsin in Milwaukee, and the author of texts in the field of GIS.

Kathryn Keranen is a high school instructor of geoscience in Alexandria, Virginia where she incorporates GIS into the curriculum.

Jean Mumbleau is a 5th grade coordinator of physical and social science in Alta Loma, California. She uses GIS information products to facilitate student studies.

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Peter Van Demark, *Caliper Corporation, Newton, MA*

FIGURE 1. In assessing the various alternative water supply sources for the fictitious community of Mudville, students use the GIS to explore the environmental pros and cons of building a water treatment center along the bordering river.

"Domino's Pizza Delivers," was a fast-food franchise siting and network/routing problem which was explored using streets, population and economic data.

The SIT:*UPSS* faculty consisted of a professor of urban planning and two high school teachers who currently use GIS in their curricula. During SIT:*UPSS*, they employed a cognitive apprenticeship approach to assist students in their spatial learning. Despite the lack of direct instruction with GIS, the support of the faculty and "Technological Facilitators" enabled students to rapidly become comfortable with the technology. An authentic project-based, problem-solving atmosphere emerged, and soon students were tossing about terms like open space, wetlands, topography, overlay, and routing.

During each SIT:*UPSS* learning module, students were provided with opportunities to acquire knowledge and develop skills to better comprehend space and spatial representations. During frequently scheduled periods of team presentation before the larger group of participants in the program, students demonstrated their knowledge of spatial relationships and provided rationale for the concepts, methods and strategies proposed by their team.

What we observed in SIT:*UPSS* confirms what many educators who rely extensively on technology in their teaching report. In such enhanced settings, traditional classroom roles are radically transformed. Teachers become mentors; students become workers and makers of their own meaning. The power of GIS to answer questions rapidly and to display environmental data in myriad ways gave students a degree of control over their learning that traditional classroom practices cannot provide. Nowhere was this more apparent than in the interaction between the technologi-

FIGURE 2. Students working on the Mudville problem, advance the study by using the GIS to evaluate the costs, benefits and efficiencies of drilling new wells in extraterritorial lands to the southwest of town.

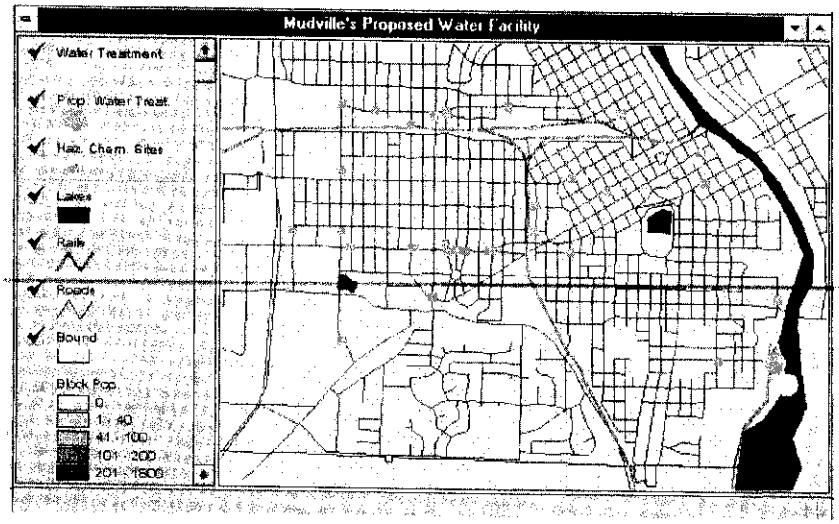
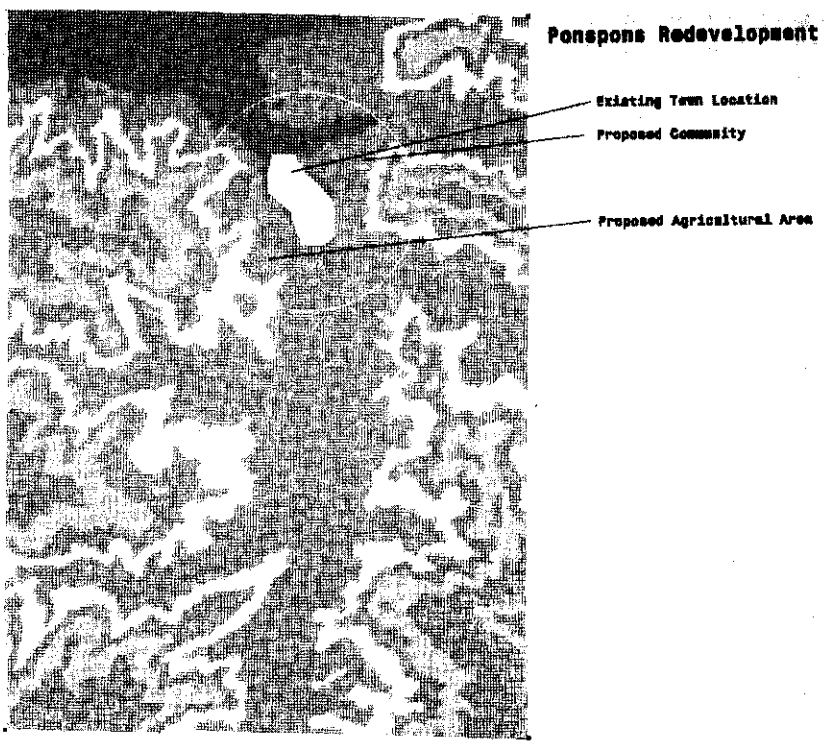


FIGURE 3. Determining appropriate areas to relocate the fictitious community of Weathersbee, and mitigate the effects of flooding from the Ponspons River, students use 2- and 3-D GIS analytical techniques to advance their studies.



URISA extends its sincerest appreciation to the corporate and government contributors who supported SIT:*UPSS* through donations of funding, technology support, human resources, and supplies. Together these efforts and resources contributed to the success of this unique learning experience for pre-college students.

Contributors to SIT:UPSS

Caliper Corporation, 1172 Beacon Street, Newton, MA 02161

Chicago Title Insurance Company, 20900 Swenson Drive, Waukesha, WI 53187

Cape Cod Commission, 3225 Main Street, Barnstable, MA 02630

Domino's Pizza Corporation, 30 Frank Lloyd Wright Drive, Ann Arbor, MI 48106

Earth Observation Satellite Company, 4300 Forbes Boulevard, Lanham, MD 20706

ESRI, Incorporated, 380 New York Avenue, Redlands, CA 92373

Intergraph Corporation, One Madison Industrial Park, Huntsville, AL 35894

Johnson Controls, Inc., 5757 North Green Bay Avenue, Milwaukee, WI 53209

MapInfo Corporation, One Global View, Troy, NY 12180

Midwest Data Resources, Inc., 15 East Wilson Street, Batavia, IL 60510

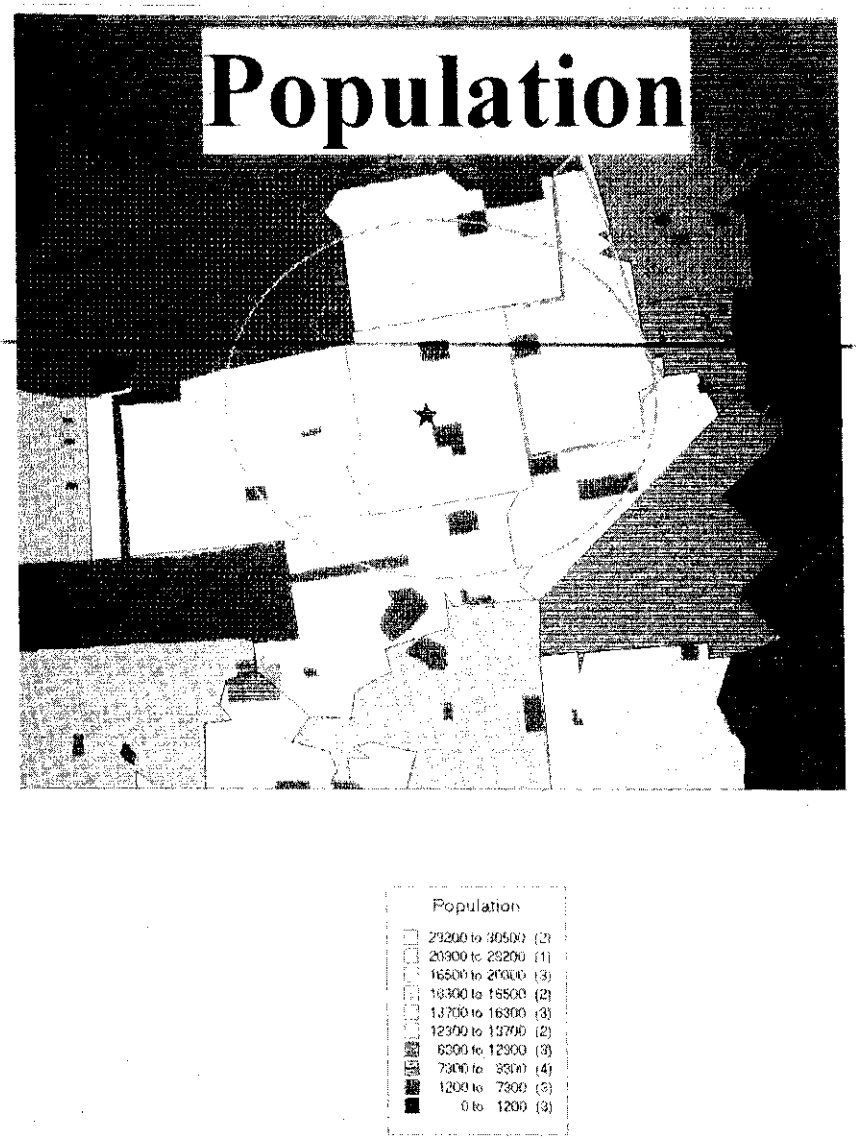
Milwaukee Police Dept., 749 West State Street, Milwaukee, WI 53233

Milwaukee Public Schools, 5225 West Vliet Street, Milwaukee, WI 53208

James W. Sewall Company, 147 Centre Street, Old Town, ME 04468

University of Wisconsin-Milwaukee, 929 North 6th Street, Milwaukee, WI 53233

FIGURE 4. **Time/distance analyses and population demographics are employed by one of the student teams to assess efficiencies and economies of locations with respect to 30-minute pizza deliveries.**



cal facilitators and students. Within a short time, they developed into working teams with a shared sense of purpose, but with students as the primary decision-makers. The GIS professionals were amazed at how rapidly students could master spatial problem-solving concepts.

Given the limitations imposed by a two-day schedule and lack of prior experience with GIS technology, the students' presentations during Project Showcase at the conference were quite remarkable and reflected well on the decision to emphasize problem-solving processes in the program. Final case-study proposals were presented in both digital and hard-copy formats, and students clearly articulated their decision-making criteria. In one notable case, a 12 year-old gave her presentation in sign language while her fifth-grade partner synchronously demonstrated their team's findings using the GIS. To find an optimum location for their fast-food franchises, public-water facilities, and community developments, student teams researched factors like population demographics, household income levels, environmental conditions, land use, traffic light impedances and travel times. Most importantly, they all did it well.

What did we learn from SIT:*UPSS*? Principally, the experience reaffirmed a belief in the potential for GIS to become an important educational technology for spatial problem-solving. GIS is a tool that even young children can use with ease; a tool that helps students ask the kinds of questions that lead to informed decision-making. GIS provides an ideal technological medium for supporting learning that is project-based and focused on problem-solving contexts that approximate the everyday life experiences of students.

At present, three essential precursors for creating effective GIS-supported learning environments are lacking. First, more teachers need training with the technology. Second, a comprehensive GIS-supported curriculum needs to be developed. Finally, a philosophy of learning needs to be clearly articulated that explains why the type of spatial learning to which GIS can contribute has a rightful place in the pre-college curriculum. Sometime in the future these preconditions will be satisfied. When this happens, the lessons of SIT:*UPSS* suggest that GIS in schools will become as commonplace as today's wordprocessing programs.

The SIT:UPSS *chair, curriculum advisory board, and faculty congratulate the student participants in the 1994 offering of* SIT:UPSS, *and encourage them to continue to explore the role that GIS and information technology can play in their spatial learn-*

ing. Students in grades 5–12, parents and/or teachers who are interested in learning more about SIT:UPSS, or in registering for the 1995 SIT:UPSS program to be convened during the URISA annual conference in San Antonio this July, should contact Bob Lima, SIT:UPSS Program Chair, c/o Boshe Institute, P. O. Box 116, Hyannis, MA 02601, tel: (508) 362-1305, fax: (508) 362-1319, or e-mail: limabob@delphi.com.

Corporations, organizations and individuals who are interested in supporting the next offering of the SIT:UPSS program (with direct funding or contributions of GIS equipment, technical facilitators, data, materials or food supplies) should also contact Mr. Lima.

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