Moving Mountains: Using Interactive Graphics to Teach Geography

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This presentation explores the Science Museum of Minnesota's approach to informal science learning by focusing on how its classroom students and visitors to one of its Web sites, The Greatest Places Online, are developing interactive simulations to learn geography and sciences related to geography. The Greatest Places Online is an educational resource that complements the Science Museum's latest large-format film on geography for Omni-theaters, entitled The Greatest Places. The film, which debuted in February of 1998, features seven diverse geographical locations: the Amazon Basin, Greenland, Iguazu Falls in Argentina, Madagascar, the Okavango Delta in Botswana, and the Chang Tang plateau of Tibet.

In Moving Mountains, attendees have the opportunity to view several examples of multimedia projects created by students and educators from the museum for The Greatest Places Online. Many of these projects are based on construction kits whose geographical settings come from the seven places featured in the Greatest Places film. They are created using the award-winning and innovative authoring software for kids, MicroWorlds (from LCSI), where graphics, video, and sound can be brought together interactively through a simplified version of the LOGO programming language. Completed projects can be viewed through a free player that can be downloaded from the Greatest Places Web site; there is also a beta version plug-in available to view games directly from the Internet.

We believe the interactive graphics approach demonstrated through The Greatest Places Online could prove effective in classroom and home settings as well. For example, to help students understand weather systems, a geography teacher might want to teach iceberg formation as a tie-in to the Greatest Places film. After visiting the Greatest Places Online, this teacher, whose institution already owns MicroWorlds, might suggest class interactivity to help in understanding how an iceberg is formed. Students could download a basic MicroWorlds kit from the Web site, which includes a background and several "costumes" that can be attached to moveable turtles (sprites) on the screen. A variable slider that changes temperature or snowfall directly affects whether an iceberg separates from the larger ice mass. Once the iceberg separates, the movement is animated. Several icebergs can be calved and moving on the screen at the same time. When they hit each other, they bounce away. Time might also be a variable, where the iceberg slowly melts. This process can also be animated.

The educational benefit of this experience is broad. Students learn more about a geographical process. They use logic to create the variables and artistic ability to create the graphical elements. And because of the time it takes to create the project, they are more likely to let the concepts sink in and share their understanding with others.

There are plans to have an educator from the museum travel to schools and museums to assist educators in using these resources. A collaboration is already underway between the Science Museum of Minnesota and the Carnegie Science Center in Pittsburgh.

The Learning Technologies Center (formerly the Youth Computer Center) at the Science Museum has been teaching informal science classes incorporating interactive graphics since 1994. For the past four years, children and teenagers aged eight through 18 have been developing their own interactive programs as a way to learn concepts and skills in both science and art in our computer classrooms. In this process, students are asked to assemble flowcharts, storyboards, and sketches to prepare for coordination of graphics, sound, and programming. Students are trusted to come up with their own plots and puzzles, with themes given only for inspiration.

We have found that students are excited to come up with an original idea and map out how to complete it. We have also found that immersion in programming gets them beyond the desire to passively surf the Internet and engrosses them in a constructive computer activity that helps them understand logic, as well as design composition, in a fun environment. They are often enthusiastic about offering their own interactive games and animations for public viewing and for distribution to friends and family.

This process is a rich intellectual challenge and whole-brain experience, as students are stimulated to use both logic and creativity. Students come away with both a sense of accomplishment and a concrete example of their individual approach to problem solving. Encouragement to develop creative solutions that do not include violence, unless it is an expression of personal experience, has given birth to some insight and innovation in students as well.

Finally, the finished projects, being digital, have been copied and distributed via a Web plug-in, or via a player that does not require owning the program. This allows students to express their experiences and share their knowledge, which often prompts them to devote more time and attention to their projects.

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We believe our approach has been successful for these reasons: students are eager to return to class, often reluctant to leave at the end of day; parents report that students are talking about their projects enthusiastically at home; parents ask how to purchase the software used. MicroWorlds, used in this demonstration, is perhaps the most widely requested software in our four years of classroom teaching.

Visitors to this presentation are welcome to discuss our museum's experiences with such topics as helping students to become self-motivating and self-organizing, techniques in programming logic, and final distribution alternatives. Participants are also welcome to share their own experiences with programming and graphics in an educational setting and discuss what the future may hold for interactivity in their classrooms.

Participants will hopefully come away with a greater understanding of, or renewed enthusiasm for, the possibilities and rewards of empowering students with the vocabulary of interactive graphics, as well as some additional knowledge of how to make this a reality in their own classrooms and homes.

The Greatest Places Online:
www.greatestplaces.org

The Science Museum of Minnesota:
www.smm.org

Science Museum of Minnesota's Learning Technologies Center:
www.smm.org/lt