USING EVENTSCOPE WITH MARS MISSION DATA TO CREATE GEOSCIENCE CURRICULA.
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Introduction: EventScope, developed at the STUDIO for Creative Inquiry, Carnegie Mellon University, is a remote experience educational software package that enables students to remotely experience places they could not otherwise visit via easy-to-use computer interfaces. The primary application of the EventScope interface is for teaching geological concepts using 3D models of planetary surfaces. The development of the EventScope interface and educational programs is a multi-discipline effort that includes the fields of geology, planetary science, robotics, fine arts, K-12 education, engineering, computer science, and visual design.

Past Education and Outreach Projects: The fore-runners of EventScope are Big Signal 1998 and Big Signal Antarctica 2000. The Big Signal projects focused on a single, real time robotics experience and recently allowed 1100+ middle school students across four states to participate in the NASA Robotic Antarctic Meteorite Search live from their classrooms.

Overview: EventScope expands upon the Big Signal projects and uses newly acquired NASA mission data to create 3D models of the Martian surface as a foundation for K-12 curriculum content. EventScope currently uses Viking MDIM 2.0 and NASA Global Surveyor MOLA gridded data for developing 3D models, or “virtual worlds,” of the Martian surface. These models are then used for teaching geological and other scientific concepts, such as the scientific method, impact catering, morphologic classification, erosion, deposition, and superposition.

Using 3D models of the Martian surface, students remotely experience Mars while learning about geological processes that occur on Earth and Mars. The students are able to freely explore the Martian surface or be guided by lessons written by the EventScope Education Team or their own teachers.

Development and Testing: EventScope’s goal is to provide innovative and interactive curricula based on the recommendation of teachers and on insights gained from pilot deployments. The end product is a problem-based learning tool that immerses the students in scientific investigation.

Through the use of development workshops with local teachers, EventScope was able to create science content and exercises that fit into the existing framework of a middle-school science curriculum. Through the use of pilot deployments in Fall 2000 to three Pittsburgh area middle-schools, EventScope gained teacher and student feedback on how to improve the software and content. These improvements were tested in a Spring 2001 deployment in nine area schools.

Before EventScope is used in a classroom, there are 1-2 day teacher training workshops to explain the software and the curriculum materials. EventScope staff are also on hand during the initial deployment for technical and content assistance.

Interface and Software: The EventScope software contains two applications, an authoring tool and a navigator [Figure 1, 2]. The students primarily see only the navigator to run the lessons or to explore Martian landscapes. The authoring tool is used to design and create the lessons. Both applications allow the user to move around or “fly” over an area of Mars. There are also tools that allow the user to draw and add text. In the authoring tool, the education team (or teacher) is able create 3D models, set the view, annotate models, and provide additional text or ask questions at the top of the screen to direct student learning. Each lesson contains several pages of information in which 3D models, flat images, and text are used to teach concepts or have students show understanding of a concept by completing a mission.

Curriculum: The EventScope curriculum maybe used in a variety of ways to supplement an existing middle school science curriculum. The lessons may be used in one long sitting or in pieces as they fit in with the normal progression of a course. The education package is flexible such that students may use it effectively individually, in small groups, or in a classroom setting. The educational benefits of using EventScope go beyond the geological content. Students are engaged in active learning using the scientific method to solve problems, as well as hone their computer skills and learn how to manipulate images.

The lessons are presented in training-mission (education – application) format. Each focused lesson starts with background information, and then students are asked to apply the newly learned material in a mission type setting where they are given a problem to solve.

EventScope’s Mars education package currently has several components: Mars Exploration History, Comparisons between Earth and Mars, and feature specific lessons.
The history lesson serves to give the students an understanding of how advances in technology have allowed scientists to learn about Mars and other planets. Key discoveries made from telescope observation, orbiting spacecraft, and landers and rovers are reviewed to show the evolution of knowledge about Mars. Following the history lesson, the students are presented with an overview of Earth and Mars in a comparative manner. This foundation shows the students that Earth and Mars have similarities that allow us to use Earth as an analog for certain processes, but that the two planets are also different. These first two lessons provide the background information that the students need to complete the remaining lessons.

The first feature specific lesson focuses on impact craters. Background information regarding the process of crater formation, and a comparison of craters on the Earth, Mars, and the Moon are presented. The students are asked to notice the differences in the number and types of impacts on each planetary body and to hypothesize why this might be the case. Students are then introduced to classifying crater forms, using a general classification scheme for the preservation of Martian craters. The classifications are explained to the students, and they are presented with multiple examples of each crater type.

Once the students have been briefed on crater classification, they are presented with a practice mission to test their ability at classifying craters. They are then sent on an applied mission to study and find well preserved craters in Chryse Planitia for future use by humans on Mars. In the process, the students are asked to provide reasons for crater selections and are provided with feedback based on their choices.

Other lessons covering wind erosion and deposition, water erosion and deposition, and superposition follow a similar format. Teachers are also able to write their own lessons with the authoring tool for use with the navigator to expand on these or other topics.

Deployment: The EventScope curriculum package is currently being tested in two western Pennsylvania middle schools. In one school, each student or pair of students has access to a computer and can work through the lessons at their own pace. The other school does not have computer labs available to them. Rather they have a single computer in the classroom and are projecting the lesson on to a screen, and the class will complete the lessons together. The flexibility of the EventScope tool and curriculum make it an effective method of teaching students in both of these scenarios. Other middle and high schools and colleges in Ohio and Pennsylvania are currently evaluating the package for potential use in the classroom and with distance learning programs.

Acquiring EventScope: To acquire EventScope for use in your school – contact Ron McCloskey (ronmc@andrew.cmu.edu) or visit our web page at http://www.evetscope.org for more information.