successful partners shared classroom and planning responsibilities in ways that utilized the strengths of each partner. This promoted greater exchange of scientific and pedagogical knowledge and experience between the partners and made the scientist and teacher feel as though their respective contributions were important. When both partners felt welcomed, invited, and appreciated, investment in the partnership remained high. Because it takes time and negotiation to build trust and commitment, forming partnerships is an iterative process.

ED21B MCC: Level 2 Tuesday 0830h

Polar Attraction: Linking Polar Science With Education and Outreach II Posters *(joint with C)*

Presiding: **S L Pfirman,** Barnard College, Columbia University**; R E Bell,** Lamont-Doherty Earth Observatory

ED21B-1207 0830h POSTER

From Pole to Pole: Educating Tomorrow's Leaders

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The high northern and southern latitudes of the earth share an extreme climate, but are vastly different in their histories, ecological systems and human cultures. Polar regions are increasingly under threat from climate change, resource extraction, and the collapse of large-scale marine ecosystems. These systems are important indicators of human influence on global scale processes (ozone depletion, global warming) and are valued for their biodiversity and uniquely adapted cultures. Unfortunately, the polar regions are often poorly understood by our citizens. Dartmouth College offers a liberal arts undergraduate education that trains tomorrow's leaders in politics, humanities, science and medicine. Through the Dickey Institute of Arctic Studies at Dartmouth College, we designed and taught an undergraduate interdisciplinary course to introduce the major physical, ecological and human systems of high latitudes, including the circumpolar northern Arctic regions and the continent of Antarctic and its southern oceans. Using an interdisciplinary approach we examined the science, societies, politics and policies that shape our viewpoint of cold regions. The connections of the polar regions to global processes and international issues were emphasized. In this paper we will describe our use of differing viewpoints to examine varying topics of importance in the polar regions. Starting the course as a tourist, we proceeded as traveler, explorer, scientist, resident, and politician to reach our final goal as informed voter at the end of the semester. A variety of invited speakers enhanced the course. Hoping before the course to attract twenty students, the fifty students enrolled in the course gave us high ratings. .

ED21B-1208 0830h POSTER

Exploring Science Through Polar Exploration

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Exploring the Poles is a First Year Seminar course taught at Barnard College, Columbia University. First Year Seminars are required of incoming students and are designed to encourage critical analysis in a small class setting with focused discussion. The class links historical polar exploration with current research in order to: introduce non-scientists to the value of environmental science through polar literature; discuss issues related to venturing into the unknown that are of relevance to any discipline: self-reliance, leadership, preparation, decisions under uncertainty; show students the human face of science; change attitudes about science and scientists; use data to engage students in exploring/understanding the environment and help them learn to draw conclusions from data; integrate research and education. These goals are met by bringing analysis of early exploration efforts together with a modern understanding of the polar environment. To date to class has followed the efforts of Nansen in the Fram, Scott and Amundsen in their race to the pole, and Shackleton's Endurance. As students read turn-of-the-century expedition journals, expedition progress is progressively revealed on an interactive map showing the environmental context. To bring the exploration process to life, students are assigned to expedition teams for specific years and the fates of the student "expeditions" are based on their own decisions. For example, in the Arctic, they navigate coastal sea ice and become frozen into the ice north of Siberia, recreating Nansen's polar drift. Fates of the teams varied tremendously: some safely emerged at Fram Strait in 4 years, while others nearly became hopelessly lost in the Beaufort Gyre. Students thus learn about variability in the current polar environment through first hand experience, enabling them to appreciate the experiences, decisions, and, in some cases, the luck, of polar explorers. Evaluation by the Columbia Center for New Media, Teaching and Learning shows that combining historical texts with current data/simulations is an extremely powerful way of engaging non-scientists in science, and explaining the role of science and the environment in decision-making.

ED21B-1209 0830h POSTER

Polar Meteorology: An Interactive Educational Web Module

Peter S. Guest (831-656-2451; pguest@nps.navy.mil)

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The author has created a public web module that explores topics related to polar meteorology and climatology. Currently, the module contains sections on vessel icing, polar climates, climate change and web resources. The key feature of the web module is interactivity; each section has an exercise that requires the student to actively participate in his/her education rather than just absorb information. The climate section features active maps of the Arctic and Antarctic regions; when the user clicks on a region, a plot of the annual temperature cycle is displayed. The exercise requires the user to analyze factors that control climate by comparing regions and analyzing the differences in the temperature patterns. The climate change section features a global energy balance model that can be run online in less than two minutes. An easy-to-use online form is used to provide inputs such as surface albedo, horizontal advection, solar input and several other geophysical parameters into the model. The associated exercise examines how changes in these inputs affect global temperatures as a function of time of year and latitude, sea ice extent and sea ice thickness. All the exercises feature multiple choice questions with instant feedback after each question is answered. The module can and has been used in a stand alone fashion and in conjunction with other educational materials and media. This presentation will showcase the module in an online environment. You may examine the module for yourself by following the link below.

URL: http://www.weather.nps.navy.mil/~psguest/polarmet/

ED21B-1210 0830h POSTER

A New Antarctic Field Course for Undergraduates at Michigan State University

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Field courses in remote and extreme environments immerse students in new and unfamiliar cultural and environmental settings where the impact from learning is high and the conventional wisdom, mindsets, and life skills of students are challenged. Through the Office of Study Abroad at Michigan State University (MSU), a new field course for undergraduates entitled Studies in Antarctic System Science' embraces these principles. The three week, 6 credit course will be convened for the first time during the 2003-04 austral summer and will feature field based activities and classroom sessions beginning in Ushuaia, Tierra Del Fuego, Argentina. The defining experience of the program will be a cruise of the Antarctic Peninsula on a tourist ship partnered to the International Association of Antarctic Tour Operators (IAATO). This cruise will include landings on a daily basis at various sites of interest and international research stations en route. In 2003-04, the course will comprise 20 students and three faculty members from MSU. The non-major course curriculum has been compiled from materials based on original research by program faculty, relevant literature, information obtained directly from the international research community, and the Antarctic tourist industry. Subject areas will span multiple disciplines including palaeohistory and ecology, oceanography, climatology, geology and glaciology, marine, terrestrial and aerobiology, early exploration, policy and management, and the potential impacts from climate change and humans. It is intended that the course be repeated on an annual basis and that the curriculum be expanded to include greater coverage of ongoing research activities, especially NSF funded research. We welcome contact and feedback from educators and scientists interested in this endeavor, especially those who would like to broaden the impact of their own education interests or research by offering materials that could enhance the curriculum of the course and/or create opportunities for collaboration.

URL: http://www.cevl.msu.edu/ael/projects/antarctica.html

ED21B-1211 0830h POSTER

Edge of the Arctic Shelf: an Online Education Expedition

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The Edge of the Arctic Shelf website communicates scientific results and the beauty of the Arctic Ocean to a broad audience (junior high to PhD). The website supports the physical oceanographic component of the Western Arctic Shelf-Basin Interactions Experiment (SBI), an extensive three-year field program in the Chukchi and Beaufort Seas. The website features four main segments: expedition overview, daily updates, images and facts, and science highlights. Starting this year (2003), I enlisted ten junior high classrooms to participate "virtually" in the cruise. While at sea, I received questions from the students via email. My daily updates incorporated answers to these questions, plus observations and digital photos of the science activities and environment. I then created the html and transmitted the pages to our server. In this fashion, students, scientists, and the general public interacted with our cruise in "near-real-time." This presentation will focus on highlights from the website and lessons learned.

URL: http://www.whoi.edu/arcticedge

ED21B-1212 0830h POSTER

A Friend Acting Strangely: an Exhibition on Climate Change in the Arctic

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The Arctic: A Friend Acting Strangely is a new exhibit being developed at the Smithsonian Institution's National Museum of Natural History (NMNH) as a part of the museum's *Forces of Change* exhibit series on global change issues. The exhibit will open to the public in Summer 2004 and is the third component of the series. The other two components are about El Niño (*El Niño's Powerful Reach*) and atmospheric chemistry (*Change is in the Air*). The Arctic exhibit's underlying theme is that current global change is causing such rapid shifts in Arctic weather and the polar environment that it has become strange,' - or unpredictable - to its residents. The speed of change in Arctic ice and climate patterns, ocean and terrestrial ecosystems, and wildlife creates a great challenge for polar scientists; but it also advances beyond the experience and memory of northern indigenous people, who know it so well. The key issues the NMNH team faces in preparing the new exhibit are: how to document and display the forces and consequences of rapid change; how to make complex scientific processes and research comprehensible to visitors; and how to engage the general public in the on-going discussion. Because current shifts in the Arctic environment have been observed and recorded in much detail by scientists and Native residents alike, this topic offers unique opportunities beyond the museum presentation, including outreach through public programs and the Internet. The exhibit is being developed jointly by the NMNH Arctic Studies Center and Office of the Exhibits, and in close collaboration with NOAA' Office of Arctic Research, NSF' new Study of Environmental Arctic Change (SEARCH) initiative, and NASA's Earth Science Enterprise. Exhibit components will include objects, text, graphic panels, video, and a computer interactive. Special efforts will be made to present the voices and opinions of Arctic indigenous people who experience new challenges to their traditional subsistence activities and face new risks in their daily life. Specimens, artifacts, and photographs from the NMNH and other museum collections will be used to interpret the biological and cultural adaptations required to understand the once friendly' Arctic that is now behaving strangely.'

ED21B-1213 0830h POSTER

Secrets of the Ice: Interactive Outreach as part of the International Trans Antarctic Scientific Expedition

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A multi-institutional group of US researchers recently completed four field seasons of overland scientific traverses in West Antarctica as part of the International Trans Antarctic Scientific Expedition (ITASE). During the four field seasons, numerous glaciological experiments were conducted with the broad aim of understanding the past 200 years of Antarctic climate and environmental history. The culmination of four expeditions and more than 5,000 km of travel was our arrival at South Pole in January 2003. Outreach activities, including teacher workshops and school visits, have been a central part of the US ITASE program from the very beginning. At the heart of our outreach program is a collaboration with the Boston Museum of Science and their expedition website (http://www.secretsoftheice.org). Besides providing the usual background scientific information and educational resources to non-specialist audiences, the website allowed us to interact with groups directly from the field with the aid of modern telecommunications. Our ability to interact daily and provide updates on our science programs and expedition life were key to sustaining widespread interest among school students and other groups.

ED21B-1214 0830h POSTER

Weaving Arctic Networks of Support and Engaged Accountability

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This presentation will provide a preview of a new project which explores the potential of applying emerging educational research in conjunction with the latest polar research through a multifaceted approach designed to weave networks of support and engaged accountability between Arctic researchers, teachers, and learners. This presentation will outline how Sunwood's (2002) WoSEA educational model might be utilized to facilitate and study methods of engaging and supporting teachers and scientists in collaborative Arctic research and pedagogy. The model we are proposing employs action research methodology to provide educators and scientists the opportunity to engage in reflection on their own practice, and enhancement of their own practice through extensive connection and collaboration between education and scientific professionals, thus contributing to the cumulative development of a lifelong learning continuum. Our Weaving the Arctic project will amplify and enhance the voice, knowledge and expertise of Arctic researchers and teachers as each participant explores, shares, and showcases their experience, knowledge, and the products of their practice. Weaving thus holds great promise for addressing science education needs, particularly the critical needs surrounding enhancement and retention of STEM teachers in K-12 (especially rural) schools. This presentation will share the promise of our Weaving model.

URL: http://www.arcus.org

ED21B-1215 0830h POSTER

Live from the Arctic

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For reasons of geography and geophysics, the poles of our planet, the Arctic and Antarctica, are places where climate change appears first: they are global canaries in the mine shaft. But while Antarctica (its penguins and ozone hole, for example) has been relatively well-documented in recent books, TV programs and journalism, the far North has received somewhat less attention. This project builds on and advances what has been done to date to share the people, places, and stories of the North with all Americans through multiple media, over several years.
In a collaborative project between the Arctic Research Consortium of the United States (ARCUS) and PASSPORT TO KNOWLEDGE, Live from the Arctic will bring the Arctic environment to the public through a series of primetime broadcasts, live and taped programming, interactive virtual field trips, and webcasts. The five-year project will culminate during the 2007-2008 International Polar Year (IPY). Live from the Arctic will:
A. Promote global understanding about the value and world -wide significance of the Arctic,
B. Bring cutting-edge research to both non-formal and formal education communities,
C. Provide opportunities for collaboration between arctic scientists, arctic communities, and the general public.
Content will focus on the following four themes.
1. Pan-Arctic Changes and Impacts on Land (i.e. snow cover; permafrost; glaciers; hydrology; species composition, distribution, and abundance; subsistence harvesting)
2. Pan-Arctic Changes and Impacts in the Sea (i.e. salinity, temperature, currents, nutrients, sea ice, marine ecosystems (including people, marine mammals and fisheries)
3. Pan-Arctic Changes and Impacts in the Atmosphere (i.e. precipitation and evaporation; effects on humans and their communities)
4. Global Perspectives (i.e. effects on humans and communities, impacts to rest of the world)
In The Earth is Faster Now, a recent collection of comments by members of indigenous arctic peoples, arctic residents speak in eloquent terms of the changes they see around them, manifested in new patterns of vegetation, the melting of permafrost and the absence of game species that used to be abundant. Meanwhile, new satellites and more sophisticated sensors on the ground and in the ice, add scientific testimony that seems to support and even extend native perceptions. Live from the Arctic will unify both perspectives, and use todays most powerful and effective communications media to connect young people and general audiences all across America to researchers and communities living and working in the Arctic. During IPY there will be a level of interest in the Polar regions unprecedented in a generation. Live from the Arctic offers unique resources to satisfy that curiosity, and encourage active participation and engagement in understanding some of Earths most significant peoples, places and rapidly changing conditions.

URL: http://www.arcus.org

ED21B-1216 0830h POSTER

Arctic Connections, an Interactive CD-ROM Program for Middle School Science

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In this project we developed an interactive CD-ROM program for middle school students, accompanied by an interactive web site. The project was sponsored by a grant from the NSF ESIE Instructional Materials Development program. One of the major goals of this project was to involve middle school students in inquiry-based science education, using topics that are of interest to students in Arctic communities. Native Alaskan students have traditionally done poorly in science at the secondary level, and few have gone on to major in the sciences in college or to pursue scientific careers. Part of the problem is a perceived dichotomy between science and traditional Native ways of knowing about the natural world. Hence some students reject the scientific method as being foreign to their native culture. Our goal was to help bridge this cultural barrier, and to demonstrate to native students that the scientific method is not antithetical to their traditional way of life. The program uses story modules that discuss both scientific and Native ways of understanding, through the use of action-adventure stories and brief learning modules. The aim was to show students the relevance of science to their daily lives, and to convince them that scientific methods are a vital tool in solving major problems in arctic communities. Each action-adventure story contains a series of problems that the program user must solve through interactive participation, in order for the story to progress. The interactive elements include answering quiz questions correctly, measuring pH by comparing litmus paper colors, measuring archaeological artifact dimensions, finding the location of fossil bones in a photograph, and correctly identifying photographs of whale species, arctic plants, and fish. The stories contain a mixture of live-action film sequences and voice-over sketch art story boards. The ten modules include such topics as arctic flora and fauna (including terrestrial and sea mammals), arctic solar phenomena, the archaeology and ice-age history of Alaska, water quality, sea ice, permafrost, and climatology. The topics are designed to show connections between the past, present, and future of the Arctic, highlighting problems that can be addressed by scientific inquiry. The accompanying teacher's guide contains a series of hands-on experiments and additional learning materials for each module. The scientific information contained in the modules was refereed by a team of experts who have also volunteered to respond to student questions via e-mail. During the last three years, the program has been field tested in middle schools in Barrow, Kotzebue, Fairbanks, and Anchorage, Alaska. These tests have brought many suggestions for improvements from both teachers and students. The program is in its final evaluation phase, and will be available to schools early in 2004.

URL: http://arctic.rhul.ac.uk/

ED21B-1217 0830h POSTER

Web-based Tools for Educators: Outreach Activities of the Polar Radar for Ice Sheet Measurements (PRISM) Project

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The Radar Systems and Remote Sensing Laboratory at the University of Kansas (KU) has implemented extensive outreach activities focusing on Polar Regions as part of the Polar Radar for Ice Sheet Measurements (PRISM) project. The PRISM project is developing advanced intelligent remote sensing technology that involves radar systems, an autonomous rover, and communications systems to measure detailed ice sheet characteristics, and to determine bed conditions (frozen or wet) below active ice sheets in both Greenland and Antarctica. These measurements will provide a better understanding of the response of polar ice sheets to global climate change and the resulting impact the ice sheets will have on sea level rise. Many of the research and technological development aspects of the PRISM project, such as robotics, radar systems, climate change and exploration of harsh environments, can kindle an excitement and interest in students about science and technology. These topics form the core of our K-12 education and training outreach initiatives, which are designed to capture the imagination of young students, and prompt them to consider an educational path that will lead them to scientific or engineering

careers. The K-12 PRISM outreach initiatives are being developed and implemented in a collaboration with the Advanced Learning Technology Program (ALTec) of the High Plains Regional Technology in Education Consortium (HPR*TEC). ALTec is associated with the KU School of Education, and is a well-established educational research center that develops and hosts web tools to enable teachers nationwide to network, collaborate, and share resources with other teachers. An example of an innovative and successful web interface developed by ALTec is called TrackStar. Teachers can use TrackStar over the Web to develop interactive, resource-based lessons (called tracks) on-line for their students. Once developed, tracks are added to the TrackStar database and can be accessed and modified (if necessary) by teachers everywhere. The PRISM project has added a search engine for polar related tracks, and has developed numerous new tracks on robotics, polar exploration, and climate change under the guidance of a K-12 teacher advisory group. The PRISM project is also developing and hosting several other web-based lesson design tools and resources for K-12 educators and students on the PRISM project web page (http://www.ku-prism.org). These tools and resources include: i) "Polar Scientists and Explorers, Past and Present" covering the travels and/or unknown fate of polar explorers and scientists; ii) "Polar News" providing links to current news articles related to polar regions; iii) "Letter of Global Concern", which is a tool to help students draft a letter to a politician, government official, or business leader; iv) "Graphic Sleuth", which is an online utility that allows teachers to make lessons for student use; v) "Bears on Ice" for students in grades K - 6 that can follow the adventures of two stuffed bears that travel with scientists into polar regions; and vi) "K-12 Polar Resources," which provides teachers with images, information, TrackStar lessons, and a search engine designed to identify polar related lessons. In our presentation, we will describe and show examples of these tools and resources, and provide an assessment of their popularity with teachers nationwide.

URL: http://www.ku-prism.org

ED21B-1218 0830h POSTER

Integrating research and education in a study of Arctic frost-boil ecosystems

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We have integrated the field course Arctic Field Ecology with an interdisciplinary research project investigating the interactions of climate, vegetation, and permafrost in the study Biocomplexity of Arctic Frost-boil Ecosystems. Arctic Field Ecology is designed to introduce undergraduate and graduate students to field studies in the Arctic to gain an understanding of the structure and function of arctic ecosystems and the current state of Arctic research. The integration of the field course and research is designed to 1. Give students sufficient background in regional ecology and ecological issues to place the Biocomplexity project within the context of current directions in science, 2. Introduce students to the project objectives, methods, and personnel, 3. Provide for interaction with all the participating scientists, including discussion and field experience, 4. Encourage students to develop questions and hypotheses for future research, and 5. Give students the opportunity to interact with indigenous people with interests in Traditional Ecological Knowledge. Arctic Field Ecology is offered by the University of Minnesota. Formal and informal seminars are provided by the course leaders, project scientists, and native speakers. Students are involved in field sampling activities and discussions associated with the biocomplexity project goals. Each student develops and presents a research proposal based on their interests and understanding of the current trends in ecological research in the region. A major philosophy of the course is that the natural arctic environment is a key source of ideas and inspiration, guided and augmented by the interaction with instructors, project scientists and native people.

ED21C MCC: Level 2 Tuesday 0830h

Assessment of Geoscience Education Tools and Approaches I Posters *(joint with C)*

Presiding: **C Gautier,** University of California, Santa Barbara**; D Schweizer,** NASA Headquarters

ED21C-1219 0830h POSTER

Analyzing Student Perceptions of Geological Time Through the Use of Graphic Timelines

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Students' understanding of geological concepts has been studied through drawings but work with regard to geological timelines is lacking. Approximately 80 semi-structured interviews were conducted with introductory and non-science major college students at a large Midwestern university. Students were asked to make drawings of a variety of topics involving the Earth system; drawings included the Earth's interior, and features of the Earth's surface such as mountains or volcanoes. Additionally, the students were asked to mark and date major events in the earth's past on a timeline. Analyses of the student generated timelines indicate the lack of understanding of the true timescale of the geological history of the earth. Furthermore, the data revealed a lack of knowledge of the accepted dates of the major events in the earth's past. Uncovering this lack of understanding has significant implications for both teachers of earth science and teacher education programs.

ED21C-1220 0830h POSTER

The Field-tested Learning Assessment Guide (FLAG): A Community Repository of Proven Alternative Assessment Instruments for STEM Education

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FLAG, the Field-tested Learning Assessment Guide (http://www.flaguide.org/) is a NSF funded website that offers broadly-applicable, self-contained modular classroom assessment techniques (CATs) and discipline-specific tools for STEM instructors creating new approaches to evaluate student learning, attitudes and performance. In particular, the FLAG contains proven techniques for alterative assessments—those needed for reformed, innovative STEM courses. Each tool has been developed, tested and refined in real classrooms at colleges and universities. The FLAG also contains an assessment primer, a section to help you select the most appropriate assessment technique(s) for your course goals, and other resources. In addition to references on instrument development and field-tested instruments on attitudes towards science, the FLAG also includes discipline-specific tools in Physics, Astronomy, Biology, and Mathematics. Building of the Geoscience collection is currently under way with the development of an instrument for detecting misconceptions of incoming freshmen on Space Science, which is being developed with the help of the Committee on Space Science and Astronomy of the American Association of Physics Teachers. Additional field-tested resources from the Geosciences are solicited from the community. Contributions should be sent to Michael Zeilik, zeilik@la.unm.edu. This work has been supported in part by NSF grant DUE 99-81155.

ED21C-1221 0830h POSTER

Interpretation of Assessment Results in General Education Sciences Laboratories: the TA Effect

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A significant part of student learning relates to the way the student is taught. Assessment of class goals with multiple sections needs to take into account complexity introduced by having several teaching assistants (TAs). The TAs bring different levels of expertise in the subject matter, in pedagogy, and self confidence, creating highly variable experiences for the students in the classroom. It was observed that assessment results for a general education sciences laboratory are skew by the novice TAs in two ways. First, the inexperienced TA may cover material superficially, where the students are not given the tools to reason at higher orders of thinking. For example, students may be able to recall information, but they will not be able to thoroughly evaluate a given situation using the material learned in the lab. Second, the novice TA may teach to a question. Thus, the students in her/his section will have disproportional high scores in the assessment. To minimize the effects that novice TAs may have on assessment, it is very important to properly screen and train the TAs on the subject matter and on pedagogical issues. These steps will minimize the effects that novice TAs may have on the assessment results, but will not eliminate them. Thus, it is important to design the assessment tool to be as transparent to TA shortcomings as possible and try to get to the student understanding. Common assessment tools used for laboratory settings with large number of students include lab work and exams. Results of assessment of lab work are easier to compare when there is a clear rubric for students and TAs. Furthermore, the effect of the novice TA may be minimized because in the laboratory setting, students are encouraged to work together and to answer each other questions. Thus, allowing for more self-guiding by the students. For exams to be meaningful assessment tools, the TAs must have input on designing the exams. However, consensus must be reached on the wording of the questions so that students in all sections will be asked the same question. Ideally, the assessment questions will be prepared after the lab has been taught so the less experience TAs do not teach to the question. Regardless of the assessment tool used, it is important to take more than one sample per section (e.g. three samples per section) to draw meaningful conclusion on whether or not the assessment results are biased by inexperience TAs.

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Educational Testing of an Auditory Display of Mars Gamma Ray Spectrometer Data

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A unique, alternative educational and public outreach product was created to investigate the use and effectiveness of auditory displays in science education. The product, which allows students to both visualize and hear seasonal variations in data detected by the Gamma Ray Spectrometer (GRS) aboard the Mars Odyssey spacecraft, consists of an animation of false-color maps of hydrogen concentrations on Mars along with a musical presentation, or sonification, of the same data. Learners can access this data using the visual false-color animation, the auditory false-pitch sonification, or both. Central to the development of this product is the question of its educational effectiveness and implementation. During the spring 2003 semester, three sections of an introductory astronomy course, each with ∼100 non-science undergraduates, were presented with one of three different exposures to GRS hydrogen data: one auditory, one visual, and one both auditory and visual. Student achievement data was collected through use of multiple-choice and open-ended surveys administered before, immediately following, and three and six weeks following the experiment. It was found that the three student groups performed equally well in their ability to perceive and interpret the data presented. Additionally, student groups exposed to the auditory display reported a higher interest and engagement level than the student group exposed to the visual data alone. Based upon this preliminary