The Georgia Geoscience Online Project

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THE GEORGIA GEOSCIENCE ONLINE PROJECT is a technology-supported, freshman-level geology course sequence at DeKalb College, which uses the World-Wide Web to enhance distance learning. Course notes and assignments are provided for students on the Web, and projected in the classroom using a networked multimedia computer. The class is taught in a distance learning room which is part of the Georgia Statewide Academic and Medical System (GSAMS). The project was funded by a grant from the Board of Regents of the University System of Georgia, Connecting Teachers and Technology, Course Development Program.

Primary objectives of the project include using the Web to teach students how to obtain a variety of types of geologic information, to expose students to the most current information in the geosciences using the latest computer technology, to deliver course notes on-line, and to demonstrate laboratory specimens and field localities. Secondary objectives include getting students to preview course materials before coming to lecture, getting students to listen and think in class by removing the necessity of writing down every word, assisting international students, at-risk students, and disabled students with note-taking, enhancing communication outside of class through the use of e-mail, and increasing computer competency among the student population.

DeKalb College is a multicampus, two-year unit of the University System of Georgia, serving 16,000 students. Full-time geology faculty are present at two of the College's five locations. Using GSAMS, we are able to offer a geology course simultaneously on two (or more) campuses, allowing us to reach students in under-served locations. At present, the Georgia Geoscience On-line Project connects the Central (Clarkston) and Gwinnett (Lawrenceville) Campuses. The instructor alternates between sites, and lab is offered on the day the instructor is on-site. Alternatively, labs may be taught by a part-time instructor, working in coordination with the full-time faculty member. In the future, labs may also be offered over GSAMS.

Students print out course notes from the Web before class. Bringing printouts of lecture notes to class has resulted in more listening and thinking, and less "frantic" writing in class. This has been found to be especially helpful for non-native speakers of English (DeKalb College has the largest international student population in Georgia), disabled students (including those with learning disabilities), at-risk students, many of whom are minorities (DeKalb College had a 42% minority enrollment in Fall 1996), and students who are absent or lose their notes.

Students use the Web to obtain current geological data, such as maps and seismograms of recent earthquakes, real-time flood stage data, information and images of currently erupting volcanoes, and images from satellites and the Hubble Space Telescope. They use data from seismographs around the world to locate earthquake epicenters. As part of their course work, students examine geological specimens in museums around the world (such as dinosaur skeletons), and take "virtual field trips" to remote localities (such as erupting volcanoes). As a final project, students research a geological topic and prepare a multimedia web page written in hypertext markup language (HTML), which they submit on-disk, instead of a term paper. Student projects are posted on the Georgia Geoscience On-line website. Visit Georgia Geoscience On-line at thttp://www.dc.peachnet.edu/~pgore/gore.htm

Pamela Gore is a Regents' Connecting Teachers and Technology Faculty Development Workshop award recipient.

Teaching Calculus I via GSAMS Using the TI-92 and CBL

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THE PRIMARY OBJECTIVE OF THIS PROJECT was to utilize the GSAMS network to offer Introductory Calculus as a Post Secondary Options/Joint Enrollment course to high school and college students. In order to enhance student learning and involvement, the course was designed to include daily use of the new TI-92 computer/calcula-

tor in conjunction with frequent use of a CBL (Computer Based Laboratory). Since the calculator had been on the market for only a few months, development of course materials was a large factor.

The TI-92 computer/calculator was used for several reasons. It aids in the presentation of course materials which would otherwise be restricted due to delivery over a distance learning network. With the TI-92, topics can be presented from a holistic point of view by relating symbolic, numerical, and graphical representations of a problem. This enables students to visualize and further understand the abstract concepts of calculus rather than just the mechanics. In conjunction with the CBL, "real-world" data can be gathered and cumbersome calculations easily managed, enabling students to experience solving problems relevant in today's world. Finally, the calculator can be taken home, allowing more time for individual exploration and experimentation.

Through this project we were able to meet the needs of not only our college population, but of the high school students as well. The high school students targeted for this project were those who attend public schools that are unable to provide advanced courses in mathematics (particularly AP Calculus) as a part of their college preparatory tract. Since many of these schools have limited computer/calculator resources available for the study of mathematics, requiring the use of the TI-92 gives them the opportunity to become familiar with the use of this technology. At the initial offering of this course Fall Quarter 1996, we were able to leave six TI-92 calculators and one calculator view screen on permanent loan to the high school who served as our remote site. This gives them equipment not only for use in the Calculus PSO course offered in subsequent years but also for use in other mathematics courses taught in their school.

The TI-92 helped to greatly increase the interaction between the remote and local sites, one of the challenges of teaching a course over the GSAMS network. Unlike other graphing calculators, any TI-92 can be connected to a view screen (which projects the contents of the calculator's screen onto the television screen). This enables any student to transmit the information from their calculator to any site being used at the session, which is especially helpful in student interaction as well as trouble-shooting.

A topic of continuing concern among mathematics educators is that calculus be taught with more of a "concept-driven" and not "formula-driven" approach. Using DERIVE software, the TI-92 calculator is capable of symbolic manipulation, interactive geometry, and text editing. Daily use of this calculator enables students to visualize and understand concepts rather than simply memorize unconnected bits of information.

In a world that is powered by the use of continually evolving technology, educators in the sciences and mathematics are also challenged to investigate "real-world" problems in the classroom. With the CBL to gather the data and the TI-92 to translate that data into mathematical relations or functions and handle the computations, it is now possible for students to investigate relevant applications of these mathematical concepts. Under the traditional approach, these calculations would be too time-consuming to present in a class period.

There were many outcomes of the project as well. Instructional materials including detailed lesson plans, a TI-92 tutorial, and laboratory projects for both the CBL and TI-92 were written specifically for delivery of this course over an interactive distance learning network. These materials can be easily adapted, however, to any Calculus I course taught with the TI-92.

The students gained a better conceptual understanding of the covered topics, which was evident when their knowledge of certain fundamental concepts in the course was compared to that of students taking the traditional course without the hand-held technology. Evaluation of this observed event is on-going. Tests and assignments used for evaluation are still being refined and will be used to collect data during the Spring Quarter offering of this course.

Even though some students at the local college site were resistant to both GSAMS and the calculator technology, we felt the use of the technology increased most students' interest in the course material. The TI-92 did prove to aid in increasing interaction between sites. We have also been able to facilitate faculty training and development at both secondary and post-secondary levels.

Much was learned by not only the students, but the designers and instructors of this course as well! We found it important to ensure that each student knows about the technology (both GSAMS and calculator) before they register for the course. Because the course was added late, our college students thought they were signing up for a traditional section of Calculus I. Therefore they knew nothing of the GSAMS or calculator use until they arrived for class. For some, this created a negative effect on their attitude towards the acceptance of the technology.

Although the calculator is very user-friendly, we found that the capabilities of the TI-92 can be overwhelming. It is much better to introduce the different features of the calculator as they are needed in the course work rather than attempt a "comprehensive" tutorial at the beginning of the course. Since the TI-92 was brand new technology, the calculus textbooks did not have any homework problems specifically designed for calculator use. We discovered that more homework assignments specifically designed to provide practice on using the TI-92 in particular should be regularly incorporated into the course work.

The projects that involved cooperative learning were very successful, especially those requiring the students to be creative. We plan to design more of these group

activities into the course. One of the goals in the design of the new projects will be to encourage group activities that can be shared between local and remote sites, yielding even more interaction between sites. We found the CBL to be a good tool for collecting data for use in student projects but also found that a person familiar in its operation needs to be present at both the local and remote sites. The initial offering of this course was team taught, so this did not create a problem. Since subsequent offerings will be taught by only one instructor, appropriate use of the CBL will have to be evaluated.

The scope of this project lends itself to many logical extensions. More data concerning the effectiveness of the technology needs to be collected in order to effectively evaluate the project. Faculty development must also continue, with possibilities of workshops in how to deliver a course in mathematics using hand-held technology via GSAMS, how to use the new TI-92 calculator, how to integrate the TI-92 into a calculus course, etc. We would also like to develop a web-site where course materials from this project could be accessed for the purpose of faculty development, student class materials and tutorials, or general interest.

Additional time is needed to work on instructional materials so that they can be easily adapted by other calculus instructors in the university system who wish to teach a similar course via GSAMS. These materials should be textbook independent. When the state university system converts to the semester system in Fall 1998, the Calculus I course will cover a third more material than it presently covers. Since we foresee this to remain a popular PSO course, time must be spent to re-structure the course and develop new instructional materials. We would also like to add a course in Trigonometry to the Algebra and Calculus courses already being taught as PSO courses over GSAMS by Georgia Southern University.

Cindy Gonzalez and Susan McKinnon are Regents' Connecting Teachers and Technology Faculty Development Workshop award recipients.

Comparing Achievement in Required Health Education Classes: Between Traditional Delivery and Distance Learning

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USING TECHNOLOGY AS A MEANS OF REACHING students who cannot take classes in the traditional way has been a growing trend in the 1990s. A question that has yet to be answered satisfactorily concerns student achievement. Do students learn effectively via distance delivery? After several years of facilitating a college by cassette course, I began to sense distance students were not learning the material as well as traditional students. I decided to investigate my data to determine if this was indeed the case.

Health education courses using college by cassette delivery began in fall 1993. The *Living with Health* telecourse was chosen to be used and licensed through PBS. Instructional support includes video tapes, text, student study guide, and an instructor-produced student handbook. The students are required to meet with the instructor three times per quarter for testing and to turn in class work. Enrollment for the first year was 86. Since that time, the course is offered twice a quarter with an average enrollment of 30 students in each section. In 1994, FCTV (Floyd College Television, serving Rome and Floyd County) began cable casting. Using production software to augment the instruction, I developed this health course for live delivery. The students watch the live sessions or tape the class and watch it as their schedules permit. Instructional support includes text and an instructor-produced interactive study guide. The class meets with the instructor two times a quarter for testing and to turn in class work. Enrollment averages 20 students per class. In 1995, this health course was developed to fit GSAMS (Georgia Statewide Academic and Medical System of two-way audio/video teleconferencing classrooms). Students must attend either the live or remote classroom site. Instructional support again includes text and an instructor-produced interactive study guide. Presentation software is used