Bruce, Bertram C.; Jacobson, Michael; Osborne, Margery; Levin, James L.; Waugh, Michael; & Weller, Martha (1994. September). Research on the use of technology in the classroom. Change & diversity: Challenges for education, 75th Anniversary Symposium, College of Education, University of Illinois at Urbana-Champaign.

Research on the Use of Technology in the Classroom

Time: 9:30-11:00 a.m.
Date: September 25, 1994
Place: Room 10, Education Building, UIUC
Professors Bertram Bruce, Michael Jacobson, Jim Levin, Margery Osborne, Michael Waugh, & Martha Weller

This session involved brief presentations followed by active use of computers and various technology programs by participants and presenters. Approximately thirty participants attended and had opportunities to experiment with a variety of programs and multimedia products and to interact with others while doing so.

Computer-Based Training Programs for Beginning Aviation Students

Martha Weller

Dr. Martha Weller demonstrated computer-based training programs that she has developed for use with beginning aviation students enrolled at the University's Institute of Aviation. These programs use a variety of media elements (e.g., graphics, audio) to assist students in acquiring specific skills. Dr. Weller has made these programs available, along with many others, to her students in C&I 355 (Introduction to Computer-Assisted Instruction) as samples for evaluation and critique. Dr. Weller is also interested in using the programs that she has developed as a test bed for exploring various design and learning issues related to the effective use of multimedia for instruction.

Use of Networks for Science Teacher Education

Margery Osborne

At the University of Illinois in science education in elementary science methods classes, there has been a long history of involving students with real hands-on science activities and helping them to think about how to teach children science in a similar manner. Often, we have found that a stumbling block for these preservice teachers is a lack of science knowledge and knowledge of places to go to get the resources that will enable them to teach science well. Recently, we have begun experimenting with helping these students access the growing science and teaching resources available on the Internet. We have structured this process so that the students pass through stages of learning to use electronic mail and the internet, participating in "treasure hunts" to find

existing science resources on particular topics, starting to think about how they might use Internet resources for teaching, and finally, constructing science curriculum.

Teaching Teleapprenticeships: Innovative Models for Using Technology for Improving Teacher Education

Jim Levin & Michael Waugh

We have developed a framework for improving teacher education called Teaching Teleapprenticeships. Within this framework, teacher education students and practicing teachers learn about teaching and learning by participating in electronic network based activities with K-12 students, teachers and administrators and university-based teacher educators.

The National Science Foundation has provided funds to implement and evaluate the Teaching Teleapprenticeships model as one means of improving the preparation of science and mathematics teachers. To support this model, student teachers and practicing classroom teachers have access to Macintosh computers and advanced communication software for widely diverse K-12 science and mathematics settings.

The Teaching Teleapprenticeships model extends the face-to-face apprenticeships traditionally used in student teacher settings by making electronic networks available to provide a more powerful context for learning in preservice and inservice education. Additionally, this model helps to establish stronger links between teacher education programs and classroom teaching practice.

Our objectives are to:

- examine the ways in which Teaching Teleapprenticeships provide a diverse set of real instructional experiences, not just invented examples, for learning content and instructional methods;
- study the kinds of skills which students will need to operate effectively as teachers in such interactions on educational networks in the future;
- examine the ways in which Teaching Teleapprenticeships can provide additional support for student teachers, as mediators between the post secondary and the K-12 settings;
- investigate the roles of practicing science and mathematics teachers in Teaching Teleapprenticeships, as they integrate the interactions into their teaching and continue their own education;
- explore ways to integrate content area experts, both from higher education and from outside the educational system, into this model;
- examine the impact of state-of-the-art communication tools and resource servers on Teaching Teleapprenticeship interactions; and
- explore ways to involve student teachers as mediators of network-learning frameworks and develop and support the diverse set of distributed mediators necessary for a large scale use of networks for

learning.

Hypermedia Learning Environments, Conceptual Change, and Learning Complex Biological Knowledge

Michael J. Jacobson

This presentation described ongoing research into the use of advanced technologies to help promote the learning of complex biological knowledge. An important focus of this research is exploring the process of conceptual change that occurs as students learn a complex topic that is critical to understanding contemporary biological science: evolution and natural selection. Recent research is beginning to identify the naive models students have about evolution and the serious misunderstandings they frequently have with this topic even after instruction. This naive model of evolution is quite similar to older scientific views about the mechanisms of evolution that challenged the Darwinian theory of evolution through natural selection up until the beginning of the twentieth century. Based on this research, we have developed a computer-based "conceptual simulation" of a naive model of evolution that is used to help reify naive student models about evolution. The program then uses a general history of science perspective which deals with the limitations and inadequacies of the older scientific model (and the commonly held naive model) with respect to real biological phenomena. A conceptual simulation of the expert view of evolution is then used to make salient the important aspect of this difficulty to learn aspects of modern biology. These conceptual simulations have been integrated into a case-based, conceptually indexed hypermedia learning environment, the Thematic Investigator, dealing with evolutionary biology. This program includes a variety of computer-based materials (simulations, hypertext, figures, and digital video) to illustrate how the expert evolutionary conceptual model applies to a variety of rich case examples of evolution.

Overall, the Thematic Investigator is intended to function as a learning environment in which students can first reify their often tacit models about evolution, confront limitations in the commonly found naive evolutionary model, and then explore the applicability of the expert model of evolution across a wide variety of different cases using the hypertext conceptual indexing. Our research group is currently investigating the use of different versions of this conceptual model/case-based hypermedia program to help student transform their naive models into a more expert model of evolution and natural selection. This presentation will provide a summary of the literature related to naive models and misconceptions associated with evolution, discuss the theoretical and research framework for the design features of the experimental hypermedia learning environment, present the preliminary results of the ongoing research, and consider the implications of this research for understanding how advances in hypermedia technologies can be used to promote conceptual change in a complex biological domain.

Creating an Environment for Learning with Interactive Multimedia Technology
Discoveries: In the Desert

Bertram C. Bruce

As John Dewey identified long ago, the natural impulses to inquire, or to find out things, to use language, to build, and to express oneself are our students' greatest educational resources. The educational challenge is to nurture these impulses for lifelong learning. Therefore, the ideal learning environment should not satisfy children's curiosity, but instead, present them with new things to be curious about. It should engage children in exploring, thinking, reading, writing, researching, inventing, problem-solving, and experiencing the world.

Interactive, multimedia technology provides a new way to draw upon students' natural impulses. These new tools offer an abundance of materials including text, voice, music, graphics, photos, animation, and video. But they provide more than abundance. Bringing all these media together means that we can vastly expand the range of learning experiences for children, opening up the social and natural worlds in far-off places and times. We can also highlight the relations among ideas, so that students can make connections in their learning. Perhaps more importantly, these new tools are interactive, and conducive to active, engaged learning. Students can choose what to see and do, and they have tools to record and extend what they learn. Learning is driven by the individual needs and interests of the learner.

Imagine that you wanted to learn about life in a far-off place. Books alone might give only a limited idea of the sights and sounds there, and travel might be impractical. What if you could enter that world through a virtual reality, without leaving your home or classroom? Interactive multimedia makes it possible to experience that virtual reality. When you choose to enter that world, you discover full-color images that come alive with video or animation. There are voices, music, and the sounds of the natural world. You can move about in this world, change the time of day, and follow up on interesting happenings. It's as if you took a field trip and were able to experience that distant world with the help of a knowledgeable guide.

While on your field trip, your initial interest would likely grow as you encountered the people who live there, the art and music, the flora and fauna, and the natural scenery. You would probably want to explore some topics in depth. Interactive multimedia can provide an abundance of resources to expand and deepen understanding. These resources include texts, but also images, video, and animations. As you browse in a multimedia library you may become intrigued to learn more, and so return to explore the virtual world.

In a classroom, or computer lab, these resources can support integrated learning, in which students see the connections across traditional subject areas, and between formal, typically more verbal, learning and their informal experiences. They can focus on specific problems or activities emphasizing areas such as nature, social studies, language arts, or mathematics, or they may work on larger projects that both draw upon and stimulate their desire to learn.

Moving about in this virtual world, students are actively in charge of their learning. They can make choices about where to go, what to see, and what ideas to

study in greater depth. In this way, learning is individualized to students' own backgrounds and needs. Moreover, the computer provides tools for writing and for supporting work on projects involving collaboration and communication with others. It extends students' own capabilities as it engages them in learning. The Discoveries CD-ROM takes advantage of all of these features of interactive multimedia to provide an exciting and rich learning environment for students.

This presentation demonstrated how the world of the desert can be brought right into the classroom. With Discoveries: In the Desert, students are transported into a realistic, 360 degree Sonoran Desert environment where they may engage in independent exploration and investigation of the natural world without leaving the classroom.

The following is summarized from a teacher's guide that accompanies Discoveries: In the Desert and describes some of the important features of the disc.

The Journal

With an emphasis on writing and recording, this tool allows students to note their ideas as they investigate the desert environment. Students can take notes with the Journal's word-processing feature about what they see and hear and then can write stories, poems, or reports. A camera feature in the Journal enables students to take photos of any image they find on the disc.

The Panorama

A 360 degree Sonoran Desert Panorama on CD-ROM allows students the opportunity to explore by clicking on any of the "hot spots" in the Panorama which triggers an animation of a particular plant or animal, complete with a QuickTime video. They can also test their knowledge by answering a trivia question about that plant or animal. A click of the mouse will take students from the heat of a desert day to the chill of its night.

The Visitors' Center

The Visitors' Center, in the form of an adobe house, is a resource for in-depth inquiry into the desert giving students a range of educational experiences. The Visitors' Center Library contains a rich assortment of interactive books, providing students with interesting information to add greater depth to what they learn in the Panorama. Through these books, they might meet a real storyteller, a Native American potter, or other interesting people. They may read and listen to stories, poems, and information about every plant and animal in the Panorama. The Library also contains an animated World Map, where students can learn facts about other major deserts around the world. Other areas in the Visitors' Center include a Communications Center, where students will find ideas for activities, and a Studio, where they will find a Can You Guess? desert trivia game, as well as some surprises.

The *Discoveries: In the Desert* CD-ROM is a resource for engaging students of varying abilities and interests in the activity of learning. It provides students opportunities to explore, investigate, gather, and process information. These

experiences may help students improve skills, gain confidence in themselves as learners, and have fun while doing so.