

Using Computer Assisted Hypermedia In the Classroom

Michael S. DeFelice and Michael J. Monson

Computers are becoming an affordable and effective tool for assisting with classroom instruction. This article describes a pilot project that utilizes a computer-controlled hypermedia presentation system for lecture in agriculture courses. The principles involved in using computer-controlled hypermedia in the classroom are summarized. Suggestions are offered to assist faculty and administrators planning to design and implement computer-assisted classrooms.

Introduction

The availability of affordable personal computers capable of displaying multiple forms of digitized media (text, graphics, animation, photographs, sound, and full-motion video) makes it possible to use this technology to present a greater variety of information to students in the classroom and laboratory (2). Most computer applications in education have focussed on using computers to teach students about computers. However, the greatest potential for computers in education will be unleashed when they are used to enhance learning on topics unrelated to computer science (1, 5).

Recent developments in computer projection display DeFelice is an associate professor in the Department of Agronomy, and Monson is an associate professor in the Department of Agricultural Economics at the University of Missouri, Columbia, MO 65211. Contribution from the Mo. Agric. Exp. Stn. J. Ser. No. 11,902.

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term foreign experience perceived their own prior preparation for international assignments as good to excellent. The two areas where improvement was needed were language training and background information on the host country. Most respondents experienced no problem in the level of support or with personal isolation during an international assignment. The majority of respondents reported positive beneficial experience gained in cultural awareness, different farming systems, project implementation, interdisciplinary approach, and applied research.

The communication, organization, interpersonal and team research skills gained overseas should make persons returning from an overseas assignment competitive in the domestic job market. These qualifications were rated as important by people who evaluate candidates for domestic U. S. academic positions. However, criteria used in evaluating prospective candidates for a faculty position may not highlight such skills. Heavy emphasis is put on experience, references, publications and seminar. The nature of over-

technologies, and the availability of hypertext-based, graphical authoring software make it possible for the 'non-programmer' to create sophisticated, interactive multimedia lecture aids and laboratory applications (1, 2, 3). This technology allows flexibility in curriculum design, assists with curriculum organization and structure, allows multiple representations of learning concepts, and can facilitate stimulating and creative presentations of information and discussion. Computer-controlled multimedia usually allows depiction of the concepts, processes, and data in more realistic ways than do traditional chalkboard or overhead transparency presentations.

Crucial to the successful use of computers for developing learning applications is an understanding by the teacher of how to use hypertext in the creation of computer-controlled hyperdocuments. Hypertext is the creation of specific blocks of information (usually one computer screen) that are linked, cross-referenced, and accessible in different ways by the reader (1, 3, 4, 6). Hypermedia is the linking of multiple media sources (e.g. text, graphics, pictures, sound, video) to create interactive, non-linear tools for presentation and self-guided learning applications. These computer-mediated 'hyperdocuments' are the key to accessing and teaching the rapidly increasing volumes of information and ideas that are now usually stored in digital forms (1, 3, 6).

seas work may result in a candidate who is deficient in these criteria unless care is taken during the time overseas to document achievements, maintain contacts at home institutions, and keep up with scientific advances. In general, respondents to this questionnaire were positive about the benefits of an overseas assignment as a part of their professional careers.

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Objectives

The use of computer enhanced teaching and learning was implemented in two independent courses (Plant Science 209, Principles of Weed Management, and Agricultural Economics 260, Principles of Farm Management) during fall of 1992. Planning and curriculum development for the courses was initiated in the spring of 1991 using a computerized classroom display system as the primary lecture aid. This system consisted of a single computer attached to a projection system that displayed the computer output on a large screen at the front of the classroom that could be viewed by the students. The objectives of the project were to:

1. Use more interesting, stimulating, and diverse ways to present these courses to students to improve their motivation and increase learning.
2. Organize and unify teaching materials with the research, extension, and office management tasks already stored and used on office computers. We expected the technology should allow sharing information from each of these tasks across all work responsibilities.
3. Develop a base system that could be used by any instructor to create their own unique course materials for the computer without purchasing a "canned" curriculum produced somewhere else.
4. Develop an information delivery system that saves time and allows more creativity to maintain and update the courses in the future.

Observations

The first objective was the easiest to accomplish. Evaluations and comments from students made it clear they are excited and motivated by use of multimedia in these courses. In fact, this is almost a non-issue for them as current undergraduates were only about 8 years old when the Apple II was introduced. Personal computer are now a normal, and expected, part of their life.

The most difficult part of the project was creating illustrations, animations, video, audio, and reasonable speed interactivity, at a quality level high enough to meet student expectations which are set by television, motion pictures, and commercial computer software. Current software and hardware make it possible to operate within an acceptable distance of that goal. More powerful hardware and software, and greater experience, will move educational hypermedia closer to the high standards of our entertainment and marketing peers.

The teacher is still the most important 'media' in a multimedia classroom. This technology is used to enhance, not replace the instructor. The computer as a multimedia integrator is required to assemble and present the rapidly growing quantity and diversity of information that needs to be accessible in the classroom. With unique ease multimedia computing brings to the classroom complex mathematical models of economic, theoretical and physical phenomena as well as complex three-dimensional graphs, the structure of DNA, the circulation patterns of the atmosphere or

oceans, the time-lapse photography of herbicide symptoms on weeds and much, much more.

The second objective of integrating computer resources in research and extension with computer-assisted teaching was quite easy. Research data, spreadsheet models, graphics, text and software skills from other projects were easily incorporated into class materials. The computer is a marvelous tool for storing, retrieving, creating, and transmitting information. Larger volumes of information must be organized and accessed than in the past, with less office and technical assistance. Only the personal computer, connected to other information sources, allow one to keep up with all of this activity (4). Similarly the computer is the best way to synthesize and transmit this information into the classroom.

The successful use of the computer system in the classroom by two agriculture faculty with no formal computer science background indicates progress on the third objective of developing a universally accessible classroom computer system for individual course development. This project used IBM computers running Microsoft Windows. Assymetrix Toolbook authoring software was used to create most of the hypermedia material for classroom lecture support. Several other computer hardware platforms and software packages are available. These powerful, graphical-interface computers and operating systems coupled with the new "object oriented" authoring software make it much easier for "non-programmers" to create their own computer programs and multimedia resources.

Inclusion of diagrams, graphs, illustrations, photographs, and animations was relatively easy. However, skills in drawing, data presentation, interface design (typefaces, layout, use of color), photography, audio, and learning to write "hyper-linked" documents are also required to some degree. Recently introduced software provides assistance in many of these areas, but considerable training time will be required for someone new to using computers for developing presentations.

Hypermedia is flexible enough for almost any teaching style or objective in a classroom setting. It can be used simply as a blackboard replacement, a medium to encourage more student interaction with the instructor, or could be used to allow limited student access in cooperative learning classes. However, direct student use will remain extremely limited until computer facilities in form of computer-equipped laboratories of similar capability are more accessible outside of the classroom (1, 5). Ideally, students should be able to access the animations, diagrams, video, etc. outside the classroom to allow additional study, or to develop their own multimedia projects and assignments.

The fourth objective of saving time in curriculum design and maintenance may not be as readily apparent. It is impossible to *overestimate* the "up front" time required to develop multimedia course materials. Time required was three to four times higher than that spent on normal course curriculum development using traditional hand written or word processed lecture notes. However, the instructors had to evaluate and purchase hardware and software, and install and maintain the equipment. Also, time was required to

learn how to use the software and write 'hypertext' documents. Presumably, most faculty will only need to learn how to use the development software and become familiar with the hardware components required for multimedia that are already installed.

Time savings will be apparent when teaching the course again. Course revisions and enhancements are simple to design and implement compared with other forms of media such as slides or overhead transparencies. Material stored digitally in the computer is much easier to update than traditional hand written notes, slides, or overhead transparencies. Once the software is mastered, it is not uncommon to develop and complete a lecture for computer presentation in just one day (or a long evening).

Many course improvements can be made with this technology. Based on our experience and student responses, more animations and diagrams of important concepts, more interactivity and "problem solving" in the structure of the class, and development and use of digitized video to illustrate more concepts during lecture are some of the goals for the project.

Suggestions for Implementation

It is absolutely vital that faculty have the support and encouragement of their administration to adopt computer technology in the classroom. Faculty need the assurances that a) resources will be available for use in a classroom or laboratory setting, and b) that they will be rewarded for the time, enthusiasm, and commitment to teaching required for this work. Further, faculty desiring to become involved in multimedia development for teaching should be realistic about their commitment, and allow enough time to devote necessary efforts for other responsibilities (research, grant writing, committees, extension, etc.). Support programs for faculty training, short sabbaticals, etc. in this new area of hypertext development and multimedia would increase the acceptance and adoption of computers for teaching.

The classroom facility, hardware, and software must be clearly identified and provided *before* an instructor begins developing course materials. Knowledge of the exact computer platform, operating system, software, display system, its resolution, available storage retrieval systems like hard drives, CD-ROM, videodisc, the sound system, lighting control, etc., must be resolved in advance, or software and course development may not work as planned and scarce faculty preparation time would be lost.

In the pilot study, these issues had to be addressed:

1. **Administrative support.** This project would have never succeeded without the support, financial assistance, and encouragement of the college dean and our immediate administrators. Both instructors had to temporarily reduce some activities in other responsibility areas to have the time needed for this project. It helps considerably when your boss is agreeable to the disruptions.

2. **Students need to be involved in the process.** Students are the 'test subjects', and they should have input into the development of an instructors' learning on the use of multimedia. Involvement also helps to reduce student anxieties

about the change in teaching methods. Students generally have greater comfort with the technology than do many instructors, and provide excellent suggestions for new ways to use the equipment.

3. **Invest enough time learning and developing the course.** And be willing to admit mistakes. This is still relatively new territory. Many things will not work as expected. Many more will work with extremely rewarding results!

4. **Hardware and software standards:** This is a very tough and controversial topic. Several hardware and operating system standards may need to be supported. Add this to class size considerations and political boundaries in classroom ownership, and it becomes obvious that classroom scheduling and support will become more complicated. The diversity of available software is also extensive. Many courses will be best served by relatively unique software. However, a few hypertext-based multimedia development tools could be supported widely within the institution and used as the 'base' for lectures. These general systems can then be used to 'link' specialty software that would be the responsibility of individual faculty to support. Copyright consideration will need to be enforced on the loading of software onto "public" classroom computers. Coordination is needed among the instructors who share a classroom computer to ensure software and hardware configurations are compatible and do not 'crash' each others work.

5. **Hardware and software for developing applications:** Instructors and support staff require computers and software that are at least as powerful as the classroom equipment. Classroom equipment is not available as the rooms are occupied during the day, and often at night.

6. **Training:** Most faculty benefit from training on the software and concepts of hypertext and multimedia, and advice from experienced faculty concerning techniques, and pitfalls of computer use in the classroom is also useful. Several good books are available (listed in references), but attending seminars, and visiting other projects whenever possible is also helpful.

7. **Multimedia resource support:** Access to support talent (computer illustrators, scanning devices, video equipment and operators) would be a great help to develop quality materials for the classroom. At minimum, access to a color scanner is necessary to import quality diagrams and photographs from other sources. However, copyright regulations must also be followed.

8. **Classroom scheduling:** Priority scheduling and accessibility is required for the classroom regardless of class size since this is where the computer is housed!

9. **Classroom lighting and equipment configurations:** Computer-display equipped classrooms need adjustable incandescent "spot lighting" over the students. This would allow adequate lighting for note taking and interaction with the instructor while allowing the display area in the front of the room to stay dark. Also, windowless rooms are preferred for electronic media equipped classrooms. Windows are very difficult to completely block. The computer system needs to be housed in a podium at the front, and to the side of the classroom screen so the instructor can face the stu-

dents, access computer controls, and see the screen. A small monitor in the podium for the instructor to view while facing the students is ideal.

10. **Security:** Keys or security systems are difficult to manage, but necessary with high-value equipment. Difficulties can arise in coordinating with other faculty who use the classroom. This is usually not a problem once the classroom is used exclusively by instructors for the equipment.

11. **Hardware and software maintenance:** It is very difficult to install new hardware or update software when the classroom is used almost continuously. Most maintenance and upgrading must be done at night or on weekends. It is advisable to have back-up equipment in case of failure.

12. **Backup:** Instructors should have "conventional" lecture notes ready at all times in case the equipment fails. This usually requires eliminating some planned material, but this does minimize the amount of time lost while equipment is repaired or replaced.

13. **Be prepared for anything to go wrong that can go wrong.** Computer-aided learning is high technology on the "bleeding edge". An adventurous and experimental attitude will assist with dealing with unexpected problems and extend the instructors' expected life span.

14. **Do one step at a time.** Start by reproducing relatively 'conventional' notes in the system, then just add a few new diagrams, photographs or animations. The objective is teaching and learning. Just because computer facilities exist does not mean the class has to be a non-stop multimedia extravaganza. Sprinkling in even a few motion or sound events in a lecture helps to maintain student interest.

Perhaps the hardest aspect of multimedia is to *refrain* from using it where it is not needed. Too much video, animation, or graphics will overwhelm the students, may cause the lecture to be even more passive than traditional chalkboard lectures, and distract the instructor and students from the learning objectives. Like any tool or technology, multimedia computing can be as easily abused as used.

15. **Have fun!** That is what teaching is all about, but multimedia opens so many more creative opportunities for teaching and learning! Try to think in new ways. The possibilities for presentations are almost as endless as the sources and quantity of information we receive daily. Observe how data and information are organized in magazines, on television and in other software. Teaching college-level agriculture courses is in the middle of a flood in the information age. There seems to be great frustration in coping with the rapid pace of change, and many people have difficulty in keeping up. The adoption of computers to enhance teaching and learning by making the process more stimulating, rewarding, and enjoyable may go a long way toward improving the attitude of the public and students toward education.

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CASE STUDY

"Consumer Satisfaction" Response from Kansas State Alumni

Andrew P. Barkley

Abstract

The determinants of the degree of alumni satisfaction with their investment in college education were identified using survey data from recent graduates of the College of Agriculture at Kansas State University. Over 90 percent of the graduates from the classes of 1978 to 1988 reported being "Satisfied" or "Very Satisfied" with their investment in college education. Statistical analysis revealed that extracurricular activities, grades, college work experience, student loans, job type, and job satisfaction were associated with the level of alumni satisfaction with their college education. Implications for teaching and advising are discussed.

Introduction.

Agricultural faculty and administrators are charged with the development and implementation of curricula that meet the needs of an ever-changing student population. The agricultural sector has undergone enormous change in the last several decades, brought about by advances in technology, complex government programs, and the internationalization of food and fiber markets. One indication of the success of agricultural programs in keeping up with rapid changes in agricultural production and economic conditions is the degree of satisfaction that former students have with their investment in education.

The attitudes of recent alumni towards their college degree provide useful information concerning the level of "consumer satisfaction" with their investment in an educational experience (Drueckhammer and Key 1986; Nippo 1983; Trinklein and Wells 1989). While a college education is in many ways different than a loaf of bread or a haircut, the consumer analogy is appropriate to academic programs

Barkley is an assistant professor in the Department of Agricultural Economics, Kansas State University, Manhattan, Kansas, 66506.

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