

Hypermedia Support Services for Instruction at Michigan State University

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Michigan State University

34,829	undergraduate students
6,722	graduate students
1,315	professional students
3,990	faculty and academic staff
1,686	administrative professional staff
2,119	clerical technical staff
86	nurses
25	resident advisers
4	stage hands
36	police officers
891	custodial staff
231	skilled trades
35	power plant operators
10,171	student employees

The Computer Laboratory supports academic computing.

Staff: 87.35 FTE professional and
clerical-technical staff;
120 student employees

Introduction

The awareness, uses and recognition of hypermedia which combines and integrates a variety of media and computer technologies to support instruction at institutions of higher education are increasing dramatically. This paper describes the facilities and services available at Michigan State University (MSU) to support instructional uses of hypermedia. These include a graphics facility for production of materials; an Interactive Video Instruction Laboratory with IBM InfoWindow and Apple Macintosh systems with videodisc players for student use of developed materials; installation of a large hypermedia technology equipped classroom and associated facilities in the fall of 1990; an instructional technology broadcast network; a staff of instructional designers and hypermedia technologists who assist faculty in developing materials; instructional technologies grant program; instructional software

collection; share videodisc production; instructional media services; events; contests; hypermedia user groups; training; and electronic conferences and bulletin boards.

Background

Michigan State University, founded in 1855, is a comprehensive land-grant university that has been acknowledged as one of the top research institutions in the country through election to membership in the prestigious Association of American Universities (AAU). The curriculum includes more than 200 programs of undergraduate and graduate studies, taught by nearly 4,000 academic staff in 14 colleges.

Demographics

For the 1989 fall term, 42,866 students (20,971 males — 48.9%; 21,895 females — 51.1%) were enrolled on

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MSU's East Lansing Campus. 34,829 (81.2%) were undergraduates, 6,722 (15.7%) were graduate students, and 1,315 (3.1%) were professional students. More than 84.9% of MSU students were from Michigan; some 2,270 (5.3%) international students came from 106 foreign countries.

Academic Computing And Technology

Academic Computing and Technology includes Broadcasting Services (Instructional Television and WKAR Radio and Television), the Instructional Media Center, and the MSU Computer Laboratory. Academic Computing and Technology also oversees the University-wide digital communications network, academic distributed processing facilities, and various microcomputing laboratories. A hypermedia specialist was added to Academic Computing and Technology staff this year to facilitate and coordinate MSU development of hypermedia. Academic Computing and Technology is advised by the Communications and Computer Systems Advisory Committee including faculty representatives from each college, representatives from twelve other units, and the chairpersons of each of seven subsidiary committees. Additional advisory functions are provided by the ITV Advisory Committee which concerns itself with issues related to instructional television.

Instructional Microcomputer Facilities And Services

There are four student microcomputing models on campus — centralized, departmental, residence hall, and in-room. There are a variety of instructional microcomputer laboratories located across the campus. More than 1,300 systems are divided among four residence halls, centralized public labs (in the MSU Union, the Computer Center, and key classroom buildings), and discipline-specific departmental microcomputing facilities located in the academic department's home building. Some are operated centrally by the Computer Laboratory, while others are run by various departments and colleges. Some are available for public use while others are restricted to individuals in a specific course or degree program. The fourth model implemented in Akers Hall involves system placement of IBM PS/2 model 25s in individual student rooms. MSU does not believe that any one model for student microcomputing is "best" for all students, and so we offer our students an environment including a variety of computing facilities, support and services from which to choose.

Funding

Academic Computing and Technology has provided financial, technical, and administrative support for the four distinct models of undergraduate microcomputing described above. Through Academic Computing and Technology, joint study projects and support in the form of hardware and software systems has been obtained from such companies as Apple, IBM, Microsoft and Zenith. Students at Michigan State University have not, in the past, been assessed a Computing and Technology fee. In

the summer of 1989 a \$3/term fee for Computing and Technology was approved by the Board of Trustees. The fee was collected from each student beginning in the fall of 1989.

Graphics Laboratory

The Graphics Laboratory contains a variety of hardware and software including a high performance graphics computer with animation software and video output, graphics microcomputer based workstations (IBM and Macintosh) with desktop publishing, presentation, animation, and paint and draw software, a digitizer, plotters, a color scanner, a color printer, and a 35 mm slide recorder. The facility is also staffed by consultants who provide assistance in using the systems.

A Stardent Titan high performance graphics computer was purchased by the Computer Laboratory to meet the needs of the MSU user community for high-resolution graphics intensive applications. Wavefront software is available on this system. This is a sophisticated software package designed to allow the creation and production of complex still and animated images. As the designer, the user controls the objects to be animated as well as lights and cameras. Animation sequences are built and displayed in 3-D motion. Recently, Wavefront animation sequences developed by staff in the Computer Laboratory have featured an MSU promotional announcement broadcast on Instructional Television, and the opening for the WKAR-TV23 Auction. In addition advanced classes in Telecommunications and Graphic Art are using Wavefront on the Stardent.

Desktop publishing and presentation graphics hardware and software is available for the production of camera-ready copy for newsletters, fliers, brochures, or overhead transparencies and 35 mm slides. Data may be input through a Howtek Scanmaster color scanner. Color laser print or transparencies is available via a Tektronix 4693DX color printer. 35 mm slides are produced on a Dunn Camera or an ImageMaker Plus.

Interactive Video Instruction Laboratory (IVI Lab)

The Interactive Video Instruction Laboratory (IVI Lab), located in the Life Sciences building, opened during the spring of 1989. The IVI Lab houses 16 IBM PS/2 Model 30/286 InfoWindow workstations with touch screen displays, 4 Macintosh II workstations. A Pioneer videodisc player is connected to each computer system to incorporate display of still and motion video at each workstation. A number of faculty have used the facility to include hypermedia based instruction in their courses.

The IVI Lab can be used by any faculty member to provide self-paced individualized computer-based instruction or to facilitate learning activities using hypermedia

courseware. Seminars and workshops involving the use of interactive video training can also be conducted in the IVI Lab.

Although the laboratory was established for use by all departments, to date it has been used exclusively by the Health Sciences colleges (Human Medicine, Nursing, Osteopathic Medicine, and Veterinary Medicine). However, faculty in other disciplines such as Chemical Engineering, German, and Humanities are presently developing interactive video instructional materials to be used by students in the facility. A brief summary of some of the instructional programs currently in use in the facility follows:

The Department of Pathology has offered courses in neuropathology on the Macintosh II systems. The courseware was developed by the instructor using HyperCard and HyperTalk. It includes stacks on Cerebrovascular Diseases, Cytopathology, Degenerative Diseases, Increase ICP, Inflammatory Diseases, Neoplasms, and Slow Virus. HyperCard stacks on Pathology Review as well as the interactive video *General Pathology Series* from the National Library of Medicine are used as supplementary learning materials in the Introduction to Human Pathology.

Faculty in the Veterinary Clinical Center developed computer-aided instructional modules using the Vagus authoring system. The modules, which run on the IBM InfoWindow systems have been integrated into the Veterinary Clinical Pathology Clerkship which focuses on concepts in laboratory interpretation and diagnosis.

The College of Human Medicine has used the stations to offer tutorial sessions to incoming medical students on how to search electronic national databases. Faculty have also developed a module on Measurement of Blood Flow for Introductory Physiology for Medicine delivered on the IBM InfoWindow systems. The program was developed using the IBM LinkWay authoring system.

The Clinical Center is currently offering a computer based testing program on the IBM InfoWindow systems to medical students in the Basic Surgery Clerkship. The program serves as a required review for the course.

Inclusion Of Hypermedia Technology In College Of Veterinary Medicine

The College of Veterinary Medicine at Michigan State University is finishing construction of a new Clinical Center. The college is currently in the bid process for several state-of-the-art hypermedia based facilities, including a 136 seat lecture hall, a 27 seat multidisciplinary learning laboratory, a 36 seat library facility, and faculty workstations which can function as development

and support systems. The college envisions workstation class performance with on screen full motion video support from a large variety of studio quality RGB sources together with appropriate hardware and software to enhance instructional delivery. Installation of the facilities is planned for fall quarter, 1990.

There will be a networked workstation at each seat. All workstations must be able to display full-motion video and still-frame color analog images on the high-resolution color monitors. Resolution must be high for displaying radiographs and other medical imaging. In the classrooms the instructor should be able to control the student workstations when appropriate. The instructor will have the ability to "compose" a screen at the instructor station consisting of a combination of text, graphics, digital images, and analog images. This combination can then be transmitted to all student workstations. At other times the students may be working independently. The instructor must be able to view an individual student's screen on the instructor station.

It is intended that these classrooms allow two-way communication in the educational process. The capability for the instructor to ask the students a question with instantaneous recording of student responses is required. The question may take two forms. It may be a normal textual question with multiple choice responses. Or, the second form incorporates the presentation of an analog or digital image with the student pointing to the correct anatomical area. In both instances, correct and incorrect answers will be tallied and displayed on the instructor's monitor.

Michigan Information Technology Network (MITN)

The Michigan Information Technology Network (MITN) was proposed to the State of Michigan by Michigan State University, Michigan Technological University, the University of Michigan and Wayne State University. It will include satellite uplinks at each of the four institutions, allowing them to transmit live and interactive courses, workshops and seminars to Michigan companies as well as Michigan colleges and universities bringing the latest developments in research, engineering, science and business to their own facilities via participating downlinks. A Scientific Atlanta, Inc. seven meter satellite dish was installed at MSU in September, 1989. Uplinks at the other three institutions are planned for completion by the end of 1990. MITN is also used for technical outreach collaboration with Michigan industry via the state-wide Merit computer network for high speed data exchange. MITN was incorporated in June, 1988, with Michigan State University designated as the site for the MITN headquarters.

Nearly 50 students at off-campus sites were able to enroll in graduate level Computer Science and Engineering courses offered by MSU beginning fall term, 1989 in the first broadcasts over MITN. The courses were viewed in Benton Harbor, Buchanan, Detroit, Grand Rapids, Kalamazoo, Midland, Saginaw, and St. Joseph by professionals employed by such companies as Dow Chemical, Dow Corning, General Motors, Jet Electronics, RTI Smith Industries, and Zenith Data Systems. Courses offered to remote sites by the MSU departments of Computer Science (CPS), Electrical Engineering (EE), Mechanical Engineering (ME) and Metallurgy, Mechanics and Materials Science (MMM) via MITN for the 1989-90 academic year were:

Fall, 1989

CPS 815 — Advanced Computer Architecture
EE 809 — Computer Arithmetic Algorithm Design
MMM 809 — Finite Element Methods

Winter, 1990

CPS 812 — Computer Networks
EE 875 — High Speed Solid State Devices

Spring, 1990

CPS 806 — Fundamentals of Pattern Recognition
EE 841 — Fourier Optics
ME 463 — Computer Aided Design

This spring MITN broadcast a teleconference featuring an MSU Chemical Engineering faculty member. This teleconference on "Features of Electromagnetic Processing of Polymers and Composites" was offered nationally via the National Technological University, and sponsored by the Office of Naval Research and the National Center for Composites Research.

Hypermedia Support Services

In an effort to encourage and support the use of hypermedia technology in the delivery of instruction, Michigan State University through the Office of Academic Computing and Technology and the Computer Laboratory established the Hypermedia Support Services group. An initial staff position was filled in the summer of 1988. The group presently consists of two full-time Instructional Technologists, a Post Doctoral student in Educational Systems Development, and an undergraduate student programmer.

This group assists faculty in designing, developing, delivering, and managing instructional programs using hypermedia, multimedia and computer-based systems such as interactive video instruction and CD technologies, computer systems, authoring systems, and expert system software development shells. Other services include assistance in evaluating hypermedia or Computer Aided

Instruction (CAI) courseware, and investigating classroom applications of hypermedia or CAI courseware. Assistance is provided through consultation, documentation and training including short courses and seminars on the uses, development and evaluation of hypermedia courseware.

Hypermedia Support Services staff is actively engaged in creating shells and development tools that enable instructors to easily create hypermedia based instructional materials to complement classroom instruction through visualization. Currently available tools include:

- LS3 — allows the user to create and present interactive visual demonstrations for a DOS based computer with a CGA adapter. Modules are developed from ASCII text files and PICT files. LS3 associates screens of text or pictures to be displayed with the selection of a menu item.
- LS/1 Development Tool — a library of preformed question, menu and presentation shells or templates developed to aid in the quick and easy use of the IBM Learning System/1 to author an interactive video course. The templates may be easily modified to an individual faculty member's style and needs.
- VDEplorer — a program for the easy exploration and display of videodisc images. It allows the user to access and display individual video frames and motion sequences from a videodisc.

Integrated Technologies-Curricular Development Grants

Proposals were solicited from all regular faculty in the first annual Integrated Technologies-Curriculum Development Grants (IT-CDG) competition. IT-CDG grants were awarded by Academic Computing and Technology in March, 1990. The purpose of the grant program is to support efforts to enhance undergraduate, graduate or graduate/professional instruction through the use of one or more of the following technologies:

- computer aided instruction
- film or videotape exhibition
- instructional television
- interactive videodiscs

Forty-two proposals were received, addressing needs in widely disparate disciplines and creatively envisioning the use of a broad range of technologies. Each proposal was reviewed by five individual referees drawn from a pool of thirty ranked faculty. Proposal evaluation criteria included relevance to and impact upon the unit, college, and University curriculum, appropriate and feasible usage of technology, qualifications of the proposing faculty member(s), intellectual authority and validity of materials

to be used or developed, attention to University values of diversity and pluralism, and appropriateness of the project plan. Thirteen grants were awarded.

Grants were awarded to faculty in Art, American Thought and Language, Geological Sciences, Entomology, Chemical Engineering, Physiology, Pathology, Telecommunications, Linguistics and German, Slavic, Asian and African Languages, the MSU Museum, the School of Criminal Justice and Computer Science. Awards were for up to \$15,000 in financial support for items such as hardware, software, videodisc mastering, and student labor, up to 200 hours of professional instructional design and authoring support by Hypermedia Support Services staff, up to 200 hours of professional videotape editing by Broadcasting Services staff, and up to 100 hours of computer animation design work by Computer Laboratory graphics design staff. Faculty release time was not funded through the program.

Instructional Software Collection

The Instructional Software Collection was established in March, 1987 as a joint project between Academic Computing and Technology and the MSU Libraries to provide faculty, staff and students with a facility for the demonstration, evaluation and assessment of commercially available and public domain instructional videodiscs and instructional software for use in graduate and undergraduate coursework, curriculum development, and research projects. The collection contains computer aided instruction packages, learning aids, simulations, models, problem solving guides, and drill and practice packages. Software is available for both IBM and Macintosh platforms. A videodisc player is also available.

In addition to software and videodiscs, the Instructional Software Collection maintains a supporting collection of reference materials. This includes software catalogs, evaluative materials, vendor catalogs, newsletters and selected monograph and serial titles.

Items in the collection may be checked out from the Library for three days by faculty, staff and graduate students or may be previewed in the Software Room. Holdings in the Instructional Software Collection may be searched electronically via MSUnet and Magic, the Libraries' online catalog system. The Instructional Software Collection has doubled its titles each year (from 50 to 450 currently), increased circulation 115%, and served over 500 users.

MSU Share Videodisc Project

Academic Computing and Technology, Broadcasting Services and the MSU Museum are presently working together to produce the second "MSU Share Videodisc". Faculty members from across campus have proposed

inclusion of slides from a wide range of disciplines. These slide collections will be transferred to videotape and eventually mastered onto a single videodisc. Multiple copies of the disk will be stamped and distributed to contributors for on-campus use.

A videodisc can hold up to 54,000 still images. The cost of mastering a videodisc is still well over \$1,000 not including any production costs. The purpose of this project is to allow a number of faculty with relatively small slide collections to pool together for the production of a single videodisc. This videodisc can then be used by the faculty during in-class presentations and included in hypermedia based instructional materials. Topics in this eclectic collection of MSU imagery include radiology slides, Egyptian, Roman and Greek Sculpture, 20th century art, computing facilities and services, urbanization process in Zimbabwe, poisonous plants of veterinary importance, anthropology collections, Japanese cultural history, African art, geologic formations, gross and microscopic photographs of tissue abnormalities, and entomology and weather patterns in Michigan. Additional MSU share videodiscs are anticipated in the future which will include motion as well as still video.

Instructional Media Center

As a pilot project the Instructional Media Center (IMC) is providing at no charge to departments, Super-VHS Camcorders for documenting information/events for use in regularly scheduled courses. A basic editing facility for faculty to edit their tapes is also available.

Faculty can make arrangements through IMC to audio record their classroom lectures remotely. Labor charges for recording are covered under the free classroom service program. Telephone line charges and the cost of cassettes are the responsibility of the department.

Under the provision of the free classroom service program the IMC provides projection equipment in large classrooms for regularly scheduled courses at no charge to the department. The equipment is capable of projecting both video tapes and information generated from on site computers. Similarly Liquid Crystal Display units are available for smaller classrooms for use with an overhead projector to project output from a microcomputer onto a projection screen.

Zenith Data Systems donated thirty Zenith TurboPort 386 portable microcomputers to Academic Computing and Technology for use by faculty and staff on a loan basis. Twenty of these systems are available for checkout through the Computer Laboratory. Priority is given to faculty and their classes wishing to use the systems as part of instruction. The remaining ten systems are available for

rental through the satellite Instructional Media Center in the Kellogg Center, the University hotel and conference center. These systems are intended to be used by presenters and participants in conferences, seminars, and workshops at the Kellogg Center.

Events

Over the past few years Academic Computing and Technology and the Computer Laboratory have hosted a variety of special events aimed at familiarizing MSU faculty, staff and students with the uses of hypermedia technology. These have included visits and presentations by recognized hypermedia experts such as Frank Hoffstader, Director of Academic Computing and Technology at the University of Delaware and an IBM fellow and Bill Hansen, an Apple Computer Multimedia Specialist. Dr. Hoffstader demonstrated Podium which he developed to enable fast and easy control of videodisc and other hypermedia technologies with minimal programming and computer knowledge. Hansen's speech discussed the latest developments in hypermedia for the Macintosh and demonstrated alternatives for using videodisc as a presentation tool. His talk was the opening session for the Great Lakes Macintosh Symposium on Instructional Computing co-sponsored by Academic Computing and Technology and Apple Computer.

The annual MicroS Unlimited computer show and conference hosted by the MSU Computer Laboratory is in its sixth year. The vendor exhibit features the latest in computing technology including hypermedia. Last year marked the addition of a conference to the vendor exhibition. Conference tracks included Computers in Education and Computers in Multimedia. These were the most popular sessions and additional sessions on these topics are planned for this fall.

The Computer Laboratory and Academic Computing and Technology have also hosted three Multimedia Events during the past two years. These one day events have focused on how a variety of technological tools may be combined to produce instructional materials. The events have included demonstrations of tools and devices that scan and digitize, utilize frames from video, allow touch-screen input, and use CD-ROM, as well as software that combines these inputs, or edits them, and allows for communication over networks.

Attendance for these events has always been good ranging from 50 to 200. The events are targeted for MSU faculty, staff and students, but have also attracted individuals interested in hypermedia technologies from local and state government and the public school systems.

Contests

Over the past three years several competitions have been jointly sponsored and promoted by Academic Computing and Technology and various computer manufacturers, most notably, Apple Computer, Inc. (HyperCard Contest), and Zenith Data Systems (Masters of Innovation). The contests are open to faculty, staff, and students and have generally been part of a national competitive program. All prizes have been computer equipment and were provided by the vendor. The purpose of the programs is to promote the innovative and creative use of computing technology in instruction or research. Entries are judged by a peer review committee on such criteria as accuracy of information, ease-of-use, creativity, originality and completeness. Each competition has resulted in the production of 10 to 20 new hypermedia materials. Examples of how some of the entries are being used today follows:

- A program entered in Zenith's Masters of Innovation contest is used in undergraduate and graduate level Chemical Engineering courses to assist in the teaching of distillation processes. DIST provides the student with an aid in visualizing computational results.
- The first prize winning stack from last year's HyperCard Contest is used to support a course in German in International Business Communications.
- Another winning stack was submitted by a team of thirty-six first year medical students in the College of Human Medicine. This group of students developed a unique solution to their first focal problem assignment on anemia. Each group member was assigned reading materials covering basic concepts. Each student then summarized the readings and entered the summary in the stack. The stack used the Slice of Life videodisc to add visual support where possible. Because of the success of this first project the group has produced a second stack on jaundice.

User Groups

In the spring of 1989 a faculty member in the College of Education founded the Multi-Media Design Interest Group. The members of this group are user of the Apple Macintosh platform for development of instructional materials. A similar group is being formed this spring for users of IBM microcomputer based platforms. Monthly meetings are planned.

Training

The first class held in the Interactive Video Instruction Laboratory was a class in Learning System/1 (LS/1). LS/1 is an IBM authoring tool for the development of multimedia instruction for an IBM InfoWindow environment. The IBM instructor showed the participants how LS/1 can

be used to develop IBM InfoWindow based multimedia materials that incorporate still and motion video, animated and still graphics, synthesized and recorded sound, and traditional text in an instructional environment that allows student interaction via typing, pointing and clicking, and touch. The class was attended by nearly thirty faculty, staff and students.

The Computer Laboratory presents a selection of training and educational offerings each term. These classes, targeted at MSU faculty and staff, include an *Introduction to Apple HyperCard and Its Academic Applications*, *Overview of Multimedia Technologies*, and *Producing Slides on the ImageMaker Film Recorder*.

Electronic Bulletin Boards

Both electronic conferencing and electronic bulletin board systems are available on the central academic computing host computer. The Contact electronic conference Compute provides a forum for the MSU community to discuss a variety of computing topics including hypermedia and multimedia technology. There is also an EMC² electronic bulletin board named Hypermedia. These serve as electronic forums for the exchange of information on hypermedia and multimedia technology, events, campus resources, projects, conferences and hardware and software products and demonstrations.

Conclusion

There is a growing realization that hypermedia based instruction provides learners with more efficient and effective instruction allowing the student to visualize and experience the concepts and theories which are being taught. However, development of hypermedia based instructional materials can present itself to faculty as an overwhelming task. Therefore, it is imperative that an infrastructure of support facilities and services be provided which encourages and promotes the integration of hypermedia technology in the curriculum. As discussed above Michigan State University is undertaking to provide an environment which fosters the development and use of hypermedia technology and materials in instruction.