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AUTHOR DeWitt, Calvin W.; Nutter, Scott; Ayala, Mary; Hall, Debra
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ABSTRACT

This paper presents examples of best case practices of technology use in classes at Eastern New Mexico University (ENMU). The examples include successful and not-so-successful applications, with insights on the overall process of incorporating technology into the classroom. The paper focuses on the authors' experience in languages, business, and science. The pedagogical and epistemological impact that technology has made in courses in these areas is discussed. Topics covered include: (1) an overview of ENMU's approach to utilizing technology; (2) computer facilities and services currently available on campus; (3) current challenges, including the fact that merely providing faculty with technology and know-how does not necessarily lead to the incorporation of technology in the classroom throughout campus, and the need for dissemination of examples of appropriate uses of technology; (4) examples and experiences, including approaches to technology utilization that exemplify a wide variety of strategies; (5) extending technology used in Modern Languages to other fields, including special language-learning software, pronunciation programs, World Wide Web-based assignments, videos, presentation software, and incorporating meaningful graphic images into classroom presentations and assignments; (6) business school applications and experience, including presentation graphics and interactive television (ITV); (7) simulations in science; and (8) ITV in distance education. (DLS)

Best Case Practices of Technology at Eastern New Mexico University

Calvin W. DeWitt, Ph.D.

Scott Nutter, Ph.D.

Mary Ayala, Ph.D.

Debra Hall

Abstract

Eastern New Mexico University (ENMU) has been a front-runner in the use of technology to solve teaching and learning problems. In this paper, examples of best case practices of technology being used in classes at ENMU will be presented. The examples include successful and not so successful applications, with insights on the overall process of incorporating technology into the classroom. This paper focuses on the experience of the authors in languages, business, and science, while the presentation, which includes a short video, is a more general overview with examples. The pedagogical and epistemological impact that technology has made in courses in these areas is discussed.

Overview

Eastern New Mexico University is considered a leader in technology among small liberal arts institutions. Although the university is located in rural New Mexico and has a student body of only 3400 FTE, ENMU was one of the twelve original members of the AAHE national Teaching, Learning and Technology Round table (TLTR). Through our participation in the TLTR, we have found that our particular approach to establishing the use of technology in the classroom is unique, partly because we realize that the term "technology" is not merely a synonym for "computer." Indeed, many innovative teaching ideas utilize technology other than computers.

There are other key factors which contribute to our unique approach at Eastern. In particular, we are especially fortunate to have an administration that is committed to the incorporation of appropriate technology in our classrooms, a strong and supportive campus TLTR, and a network of faculty who are willing to share ideas on how to use technology effectively in our teaching and our research. Specifically, over the past three years, the administration has provided the institutional funding and

support needed to set in place several crucial foundations upon which the utilization of technology is based. A state-of-the-art on-campus center with student-accessible computers and software was constructed. Additionally, a competitive internal grant program, overseen by the TLTR, was established to provide faculty with the technology tools needed to implement their new teaching ideas.

However, educators sometimes use technology for all of the wrong reasons, and the impact on student learning may lead to disappointing results. After all, using technology for technology's sake is inappropriate. When we search for an appropriate teaching tool -technology based or not-- we must first identify the nature of the concept we are trying to teach. We can then determine the outcomes we are trying to achieve and consider how can we assess those outcomes. It is also important to define which learning/teaching modes are best suited for each portion of material, and then, finally, ask ourselves how technology can be used to assist in "presenting" the material in a manner that best fits the diverse learning styles of our students. Even when we devote careful consideration to this process, we can still have failures; however, our experience is that successes are greatly multiplied if we follow the above approach. Also, this method allows us to develop the basis for transferring successful applications of technology to other disciplines and courses. Thus we can answer the question, "Is music happening or do we just hear chopsticks?"

Facilities and Services

Currently our campus computer facilities contain a computer for every 12 students. The library and some of the residence halls provide areas with additional computers for student use. In addition, the new computer center includes presentation rooms specifically designed for incorporating technology in teaching. Each of these rooms seats approximately 30 people and is equipped with an array of teaching devices, such as a projection device which can display the screen of a networked computer, an overhead projector, and a VCR. Moreover, there are several rooms that filled with Windows 95 based machines and another room with PowerMacs.; all are connected to the Internet. Two of these rooms can be reserved by faculty for teaching classes needing hands-on experience at the computer. All of the key instruction buildings on campus have ITV rooms that are fully equipped for distance learning. The design of these rooms is constantly changing as technology improves and as faculty feedback pinpoints specific needs or possible problem areas.

For "casual" technology applications which do not require computers, we have a Media Services Center. This Center, housed in the library, provides slide projectors, overhead projectors, In-Focus machines with computers, video players and TVs all delivered to the classroom of your choice in your hour of need. For the more technologically inclined, the Computer Center can provide you with a laptop computer for use on or off campus. While some of this may sound Utopian, it is important to point out that we still experience occasional problems. For example, not every classroom is accessible to the equipment delivery carts; and, some classrooms were not designed for the use of a free standing TV or computer, and do not have sufficient space in the front of the class to place one with its cart.

In the area of support, our Computer Center periodically offers free classes to faculty, staff, and students on a variety of technology topics that range from maneuvering in to accomplishing advanced research on the Internet. For faculty and staff with particular needs or a conflict which prevents attending the appropriate workshops, a "House Call" can be scheduled in which a Computer Center technician will come to your workplace and personally help you to do or learn your task.

Current Challenges

Despite all this equipment and easy access to help, we have found that merely providing faculty with technology and the know-how to use it does not necessarily lead to the incorporation of technology in the classroom throughout campus. Some individuals have proven themselves to be adept at adapting the new technology to their classroom needs, while others do little more than take advantage of the offer to acquire bigger, better hardware. Challenges at the inception of our TLTR included efforts that focused on providing the innovators with the (usually) expensive tools for them to test their ideas. Later, as more faculty began to introduce technology into the classroom, our primary focus switched from providing tools to disseminating ideas. We have not yet been able to fully establish that bridge between the early

adopters and the mainstream. However, to facilitate the growth of ideas of the use of technology in the mainstream, we are currently attempting to disseminate examples of appropriate uses of technology and to point out to faculty how each example, while it originate in a field that is different from theirs, can be used to address similar teaching and learning problems that they might be experiencing. In other words, while the subject is different, the method or approach could very well be the same.

It is in this much-needed dissemination of ideas that we have met our greatest challenge to date. Many technological tools are highly transferable among seemingly unrelated disciplines. Therefore, we need to encourage all faculty, regardless of their discipline, to keep in mind some simple guiding principles when considering the relative benefits of various technological tools for the classroom: 1) using technology for technology's sake should never be the goal; 2) technology is not just glitter and great sound effects. Often, relatively unsophisticated technology, such as the judicious use of an ELMO or video clips, can prove to be quite effective; and 3) the best rule of thumb is to analyze the pedagogical task at hand and to choose the technology which best addresses the problem. When doing this, we should never be bashful about "borrowing" ideas from colleagues in other disciplines.

Examples and Experience

The manners in which technology is being utilized in teaching at ENMU are far too many to enumerate. Accordingly, we will briefly mention a few approaches that have been used on our campus in order to exemplify the wide variety of strategies instructors have taken. More specifically, we will focus on languages, science, business, and distance learning (the fields of expertise of the authors) to offer several more detailed examples.

Many music, theater, and dance instructors in our College of Fine Arts use sophisticated video taping equipment to record student performances for later critique (posture or fingering techniques, for example) or to provide immediate feedback with closed-circuit display. Many of the science instructors utilize CDROMs in classes and laboratories to enhance understanding through simulations, multimedia clips, and/or a wide selection of images. The nursing program has a computer with a laser disk player for the main campus and every ITV instruction site. This disk is specific to nursing and interactively teaches students to perform basic procedures through drill and practice. Listservs are routinely used in a variety of classes to enhance and continue discussion beyond the physical and temporal limitations of the classroom. One instructor who uses this tool has commented that the student who is quiet in class is not always so reserved in front of a keyboard. Similarly, e-mail has become a regular and important part of faculty and staff daily communication. While there is currently only one completely web-based class taught at ENMU, many classes have material available on the Web, such as syllabi, homework assignments and solutions, and pages with links to relevant material on the Web.

Video equipment has been used effectively in many courses as a vehicle for delivering student presentations. If, when giving a report or presentation, students have the option of submitting a video instead of performing live, most manage to achieve a more polished and organized end product with less wasted classroom time and more quality control. In addition, they often spend more time and conscious effort preparing the presentation. Of course, a downside to this approach is that it that "shelters" the student from the type of live, face-to-face interaction which they are most likely to encounter in the workforce, and students must learn to deal with snafus when they occur and there is no option to edit them out.

All of these applications of technology in the classroom are fascinating, but they are not very useful in isolation. The following sections will explore the manners in which specific solutions can be translated into models that will easily cross disciplinary lines.

Extending technology used in Modern Languages to other fields

A little thought and imagination go a long way when trying to generalize a specific use to other fields. The teaching of modern languages is a perfect case in point. Many theorists argue that language learning belongs in a category of its own, apart from all other types of learning, and the very least, many of us in higher learning (not just in languages) strongly resist the idea that our discipline is anything but special.

Still, we are doing a disservice to our students and to ourselves if we refuse to recognize the many ways in which technology can be adapted to address similar learning situations in a variety of disciplines. Here are a few such universal strategies, all of them very simple, which have been adapted effectively in the language classrooms at ENMU.

1. Special language-learning software which allows students to focus on weak points and practice mechanical skills is a great tool for first-year students. At ENMU, we make these programs available to students at the Activities Center of our library, and we will soon have a new Writing/Language Lab open for student use. When combined with the audio cassette programs, videos, and specific software included with most contemporary language textbooks, this gives the student ample opportunity for reinforcement of their language skills. Theoretical background Even some of the more recent rationalist proponents in linguistics, those who espouse an essentially natural approach to language acquisition, recognize that the formal structure of a language classroom is most advantageous to beginning students. This is because novices do not yet possess even the most basic skills needed to perform the complex creative and critical tasks of speaking another language. Furthermore, behaviorists feel that overlearning is the only effective type of language-learning. Reinforcement of language skills through drill and practice, as well as the repetitive association of a given stimulus with the appropriate response, is obtained through the use of this type of language software. Transferring the tool: Task-specific software programs, commercially available or developed by an instructor for a specific course, can be useful in any situation where the student needs to develop and perfect the skills needed to perform the basic tasks in that field. This is the perfect opportunity for reinforcement outside of the classroom, or to afford individualized attention to the student for whom contact time in the classroom is not sufficient for developing these skills. This type of tool is good for honing the mechanics of a discipline, but it is generally not useful in developing critical or creative skills. (In languages, for example, most high intermediate and advanced students quickly become bored when using drill-type software.)

2. Pronunciation programs are a helpful tool at all levels, especially for students who respond most readily to oral/aural stimulus. Theoretical background: Educators have long recognized that learners are diverse in the manners in which they learn best. Some work best individually, others in groups, some react well to visual stimulus, others to oral/aural stimulus, etc. A strategy which combines types of input has a better chance of reaching more students effectively. Transferring the tool: Any form of technology which can present material using stimulus that goes beyond the traditional written word expands the possibility of effectively reaching more students. A language tool that gives students oral/aural stimulus, an astronomy tool that presents material visually, a newsgroup or communication tool which allows isolated students to work in groups --all of these expand the opportunities for positive and successful impact among a wider variety of students.

3. Web-based assignments can be used at all levels of language-reaming to combine a wide variety of information sources with culture-specific examples of language in use ("real") such as soup can labels, television commercials, newspaper articles, recipes, and comic strips. Theoretical background: Linguists agree that language-reaming is most effective when communicative samples are culturally and contextually significant. The best means of achieving this is by using realia. The Web is a great source of realia. In addition, when affective filters are lowered, students will be more open to allow reaming to occur. Often, the opportunity to explore topics of their own interest on the Internet allows students to lower their affective filters. Transferring the tool: Apart from providing realia, the Web gives students access to an increasingly wider variety of information sources on almost any subject available, and in almost any language imaginable. The incorporation of real examples can be just as effective in business, political science, or journalism, as it is in modern languages. Using the Web to inspire written assignments, projects, and group tasks provides an instructor with a limitless resource for helping to develop critical and creative skills in any field. By allowing students to explore the Intemet, the instructor empowers them to shape their own learning tasks and helps them to escape the often quite limited options of pre-fabricated writing themes or case studies.

4. Videos are often a great way to provide students with a level of input that is slightly higher than their own. Theoretical background: If students are not exposed to input that is structurally a little more complicated than the level they have reached, no reaming will ever occur. This exposure needs to occur within a context which will allow students to surmise what they do not explicitly comprehend. Yet,

interaction with other students at the same level rarely elicits input at a higher level. Transferring the tool: Using videos which raise students to a higher level of linguistic or conceptual input will prepare them to meet increasingly more complex learning tasks.

*5. **Presentation*** software allows both students and the instructor to organize important points with clarity and brevity. Theoretical background: Again, learner differences are at play here, and some learners need to visualize in order to absorb material, just as others may have a certain degree of difficulty discerning the key points in a lesson. Transferring: the tool: Presentation software is one of the most universally transferable tools that technology offers us, yet it is ironic that many teachers don't discover its usefulness until they are forced to use it when they're deprived of the blackboard in an ITV class.

*6. **Incorporating meaningful graphic images into classroom presentations and assignments*** is useful in helping visual learners to connect with the subject. Theoretical background: For much the same reasons that Web realia is more contextually significant for students and provides a good base for critical and creative expression, the use of real images can provide positive stimulus for students. When these images include the instructor, fellow students, sites in town or on campus, or other familiar elements, they can become more contextually meaningful. Transferring the tool: A good scanner could be used to create a veritable library of images. Photos can be used to give visual examples, to inspire descriptive writing, to spark dialogue, to give a broader view of the subject at hand, or to provoke reactions, among other uses in the classroom.

Business school applications and experience

The use of presentation graphics in economics has greatly enhanced the class, since economics is a course in which faculty often try to present a large amount of information to the student in a short amount of time. The material is very factually based with concrete mathematical relationships. The economics faculty are using PowerPoint and video to aid in student learning with amazing success. PowerPoint is used to provide a visual stimulus which supplements the verbal lectures. These presentations organize the material and provide for consistent delivery . In addition, PowerPoint is used to perform simple animation by overlaying slides using the build feature. The faculty also uses video clips of common television shows and has the students discuss in groups the relationship between the show and the lecture. This application of technology has been deemed by the students to be very effective. Why? The faculty was able to use technology to verbally, visually, and collaboratively stimulate the student. Thus, the material was presented in various forms which appealed to different learning styles. The above is a simple use of technology that is very effective.

In Accounting, Finance, and Production Operations we are faced with trying to teach the time value of money. This is especially true when dealing with inventory or borrowing money. An accounting faculty member used PowerPoint to perform a simple simulation which graphically depicted dollar bills piling up over time. This was effective because it visually articulated a time dependent concept.

The Business Policy class is a good illustration of how technology can be used for ITV beyond the simple delivery of the material. Seven years ago, ENMU began using a computer simulation game in the Business Policy Class. This class is the senior capstone course for all COB majors. Students are placed in groups, and each group is a company. The computer simulation places the companies into a competitive environment, and it engages the students in the learning process. They must make decisions on pricing, borrowing money, building factories, pay rates, number of employees to hire, scheduling employees, advertising, etc. The groups meet for several hours a week to formulate their decisions. The computer simulation game itself is an excellent example of effective use of technology. The program helps students understand the interactive relationships of strategy decisions over time and visualize the economic relationships that exist in the business world.

Additional challenges are imposed when teaching the Business Policy class on ITV. Often you have one or two students at a site. These students have traditionally been given different assignments. We are now exploring using listservs and Microsoft's NetMeeting to facilitate virtual meetings. The decisions and results are then emailed. Our experience indicate that there may be some advantages to this. When students are meeting face to face often one person dominates the discussion and other members are less

likely to provide their input. This way the students are less intimidated and seem to provide additional input.

Simulations in Science

In the teaching of science it is very true that a picture is worth a thousand words. Simulations are useful in many teaching situations. We have specific examples from physics and chemistry. They address the visualization of time dependent phenomena whose time scales are too short or too long to permit demonstration in the laboratory, visualization of concepts or processes beyond the ability of humans to naturally perceive, the strong dependence of the time development of natural systems on the system's initial conditions, and training on instrumentation beyond our budget.

One highly successful example of use of a simulations program is the use of Skyglobe , a shareware program that shows the sky at any time or location in the northern hemisphere from 30000 BC to 30000 AD, in the introductory astronomy course. Skyglobe shows over 3000 stars, the locations of the eight other planets and Messier objects. With Skyglobe it is possible to show such celestial events such as retrograde motion of the planets and planetary conjunctions. A particularly successful application is in showing the resulting change in the location of the North Star due to the 27000 year cycle of precession of the equinoxes. Student response to the use of this software has been overwhelmingly positive. Skyglobe is easily available and easy to use.

Some phenomena are beyond the ability of humans to directly perceive. A set of physics software published by Wiley and developed by the Consortium for Upper Level Physics (CUPs) is used in introductory and upper level physics and astronomy classes to help the student see what is usually unobservable. An example of a particularly useful simulation package from this software set is a demonstration of the difference between linearly and circularly polarized light. The DOS-based software shows how the electric and magnetic field vectors change with time in a window which is fully rotate-able for a view from any perspective.

Nuclear magnetic resonance (NMR) techniques are important to learn for undergraduate and graduate chemistry students. NMR imaging is used in hospitals to do non-intrusive mapping of the human body. However, the equipment for NMR is quite expensive. Software is used at ENMU which simulates the operator console of an NMR machine. The package generates data at the students request as though the student were operating a real machine. The student learns to use the machine, what format of data to expect, and how to interpret the data. SKYGLOBE is shareware available on the network from KlassM Software.

Some simulations packages are quite outstanding and demonstrative, while others are not at all useful, whether it is shareware or expensive software specifically developed for teaching. The advantages of a good simulations package are many. Concepts and phenomena can be demonstrated clearly. In the example above with Skyglobe, epistemological change resulted through its use. Precession of the equinoxes and the resulting change in the night sky is a subject that was previously skipped or glossed over. Now it comes alive for the students. They remember and understand it. In the case with the nuclear magnetic resonance imaging simulations software, students can learn how to operate a piece of equipment and fully understand a measurement technique without having to actually purchase expensive machinery.

However, there are some disadvantages. There is no one "uberprogram" than can be used to simulate every physical phenomenon with meaningful nice-looking graphics. The time spent in locating and reviewing software can be quite great. In addition, there must be some method of displaying the software package graphics to the whole class. Presentation equipment, such as an In-Focus machine, must be used.

It is not always true that simulations software is expensive or hard to find. One faculty member has found an expensive and elegant way to get presentation software (Powerpoint) to be useful in describing the vibrations of a molecule. He alternates back and forth between two or more slides, each of which shows a molecule in a particular position. In changing the slides the molecule seems to move!

ITV

Another challenge faced by faculty at ENMU is that of distance education. ENMU has seven Interactive Television (ITV) remote sites. The College of Business provides students with the opportunity to complete their Bachelors in Business Administration and Masters in Business Administration at the remote sites. Here technology has met several needs. The ITV rooms are equipped with an Elmo overhead projector, computer, televisions, and VCR, all of which, through the use of a control panel, can be transmitted live to the remote sites.

Many of the faculty incorporate PowerPoint into their classes. In an ITV art class, the images from a slide projector come through beautifully on the TV screen. One faculty member uses PowerPoint for his film class and has learned how to put slides from videotape into his presentations. It looks terrific. A highly successful use of ITV is in composition classes. In this class, the computer easily becomes the blackboard. An incorrect sentence could quickly be corrected and seen by every student. Students call in their corrections and the instructor types them in as they spoke. ITV puts every ITV syllabus on the net, helping the students become more technologically literate (probably the faculty too).

As any ITV instructor knows, often part of every class is spent dealing with one problem or another. Time is taken away from instruction. Our biggest technological challenge with ITV is the communications system with sites. Audio feedback loops are persistent, microphones at the broadcast site do not pick up student questions or comments so the instructor must constantly repeat them for the benefit of the sites, and students at sites must phone in with questions or comments, creating a delay between the instructors statement and the students question or comment. Faculty report a variety of consequences for their classes, both positive and negative. One instructor, teaching an introductory research writing course reports that discussion is very difficult if not impossible. She believes, however, that her difficulty has as much to do with the students as the equipment. Students at the 100 level do not wish to speak their comments loudly so that far sites can hear them, nor do they want a camera on them. Discussion is stifled. In addition, some of her off-campus students are advanced high school students on their lunch hour who seem to be treating the class as a recreation time. On the other hand, another faculty leading an upper level combined undergraduate and graduate course found that the students at that level are more focused and willing to put up with the technical difficulties, and do not mind speaking up or being on camera.

Conclusion

The examples and challenges presented are meant to serve as samples of the way in which we can develop tech-tools that can be adapted for use in many disciplines. This is by no means an exhaustive selection of tools, and, indeed, it is only meant to spark the imagination of colleagues in and out of the field. We would have many more strategies to share if we could just look beyond the specifics of our applications of technology to the pedagogical reasons why they work, for it is in these underlying and more general levels of strategy where most disciplines meet.

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