

Computer Augmented Teaching In Large Lecture Courses: The Case Of American Government

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Lecturing to hundreds of students in large lecture classes will always be a part of college teaching. As a former student, you know the scene: a sea of undergraduates straining to record the words of wisdom that a lecturer intones in their direction. Want to ask the professor a question after class? Lots of luck, for there are five students ahead of you. Oh well, maybe you can ask a teaching assistant — if you can find one.

Now that you have become the teacher instead of the student, what can you do to improve the lecture situation? You already use computers to augment your research skills; can you also use computers to augment your teaching? Briefly, the answer is yes. Computers won't change a poor lecturer into a good one, but they can help improve the lecture situation for

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students by substituting a video screen for a blackboard, by providing students access to the instructor's own lecture outlines, and by giving students more opportunities to put questions directly to the instructor. At least this is how I used computers at Northwestern University to teach American Government and Politics to 170 students in the winter of 1987.

Although I used computers in lecturing on American government, I believe that my experience transfers readily to most lecture courses. If the instructor seeks to transmit a structured body of knowledge and information to a large audience, then

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these ideas should apply — regardless of subject. On the other hand, if the instructor teaches by asking questions in the Socratic method (which is extremely hard

to do in a large lecture situation), then these technological innovations have less utility. You must judge their potential for your own subject and your style of teaching, but I suspect that at least one of the three computer techniques described below will apply to virtually all large lecture courses.

Technological Solutions To Problems In The Lecture Course

I have taught students how to use computers in quantitative research since 1961, so I have had long experience with computer applications in education. However, I never previously used computers primarily as a teaching aid in a substantive course. My plans for teaching my American government course differently in 1987 coincided with the publication of *The Challenge of Democracy*, a new American government textbook which I co-authored with Jeffrey Berry and Jerry Goldman for the Houghton Mifflin Company. Using my own book as a text heightened my interest in the pedagogical aspects of the course and led to experimentation with technological innovations in teaching the subject. Judith K. Ingram, a doctoral candidate in Northwestern's School of Education and Social Policy, agreed to study my course in her doctoral dissertation, providing a rigorous evaluation of my efforts.

My course involved a number of innovations in teaching technology intended to deal with various problems in lecturing, but I will focus on only three in this article: 1) how to help students see the structure and development of the lecture, 2) how to help them obtain clear and complete lecture notes, and 3) how to help them put questions or comments to the instructor outside the lecture hall.

On-Screen Lecture Outlines My personal style of lecturing involves writing the outline of the day's lecture on the blackboard before each class. Unfortunately, I write slowly and barely legibly, and there never seems to be enough space

to accommodate my outline of topics plus the graphs and tables to which I frequently refer. Why not, I mused, make use of my carefully typed lecture notes that I had already produced on my IBM compatible PC using the *WordPerfect* program? In principle, I could simply connect my microcomputer to a video projector and display my lecture material behind me on a large motion picture screen as I spoke.

Using a microcomputer in this fashion is facilitated by a type of program called an "outline processor." Available for both IBM compatible and Macintosh computers, outline processors help authors generate outlines by automatically keeping track of logic/levels. More importantly from the teaching standpoint, they assist in displaying the completed outline by selectively "hiding" and "showing" its various levels, picturesquely called "parents" and "children." For instance, these programs allow an instructor to give an overview of the day's lecture by showing only the main headings (the parents) while hiding all subheadings (the children). After positioning the cursor to the first main heading, the instructor can direct the program to show all its subheadings — the procedure is the same for all the subsequent headings. This provides the ability to focus attention on the points being developed in the lecture.

Initially, I had intended to use *PC-Outline*, which operates on IBM compatible computers, for this purpose. I already had a set of full sentence outlines of American government lectures available in *WordPerfect* format, and it would be relatively easy to import the ASCII files into *PC-Outline*. Based on my experience with both programs, I requested and obtained funds from our administration to purchase a Sony multi-scan video projector for the lecture hall to carry out my intentions.

Unfortunately, I soon learned that an image projected by an 80-column screen of an IBM-compatible computer was too

small to be seen at the back of a lecture hall that seats 250 students. Less than a month before the class began, I shifted to outline processing software for the Macintosh computer. The great advantage of the Macintosh was that it allowed me to project a typefont that could be seen quite easily at the back of the room (14-point Geneva bold worked quite well). For outline processors, I turned first to *MORE*, a versatile and powerful program. I soon learned, however, that *MORE* would not "wrap-around" long sentences for display as outline headings. I then turned to a program called *ACTA*, which could handle the full sentence outlines I already had in machine readable form.

On the first day that I introduced the computerized outlines in my American government class, I found that the outlin-

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ing was not an immediate hit. I sensed that the students were encountering difficulty in reading the outline above my shoulder while they tried to listen to my lecture. So acute was their consternation in dealing with the radically new technique that I stopped the class to hold a general discussion of their problem. The students' main complaint was that I was projecting too much information on the screen behind me. I had opted to display full-sentence outlines just as they existed in my *WordPerfect* lecture notes. However, my American government students complained of interference in learning from two sources of information: 1) the sentences that were projected on the screen, and 2) the sentences that I was speaking!

Students became especially anxious because my sentences were displayed in full on a giant screen. The medium enforced

SHOULD IT BE FREEDOM, ORDER, OR EQUALITY?

I. The role of government

A. Freedom

1. Civil liberties — restraints on government
2. Economic freedoms
3. Philosophy of individualism
4. Favored by LIBERTARIANS

B. Order

1. Preserve life and protect property
2. Maintain established patterns of behavior
3. CONSERVATIVES value ECONOMIC freedom

C. Equality

1. Equality of OUTCOME
2. Civil rights — requires government action
3. LIBERALS favor action to promote equality

D. Strong government versus weak government

1. Strong government does not promote freedom
2. Strong government needed for ORDER
3. Strong government needed for EQUALITY
4. POPULISTS favor strong government for both

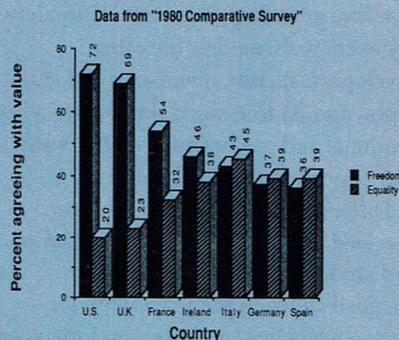
II. Freedom and equality in America

A. Contradictory values

B. Questions in a crossnational survey

1. "I find that both freedom and equality are important but if I were to make up my mind for one or the other, I would consider personal freedom more important, that is, everyone can live in freedom and develop without hindrance."
2. "Certainly both freedom and equality are important. But if I were to make up my mind for one of the two, I would consider equality more important, that is, that nobody is underprivileged and that social class differences are not so strong."

C. Findings from the survey



D. Partisan differences in freedom and equality

1. Democrats more likely to favor equality
2. Republicans to favor freedom

E. How well do B10 students reflect the culture?

FIGURE 1: March 10, 1987 *MORE* Notes

the message, convincing them that the sentences must be copied in full. (I saw students who had not been taking notes suddenly reaching for a pen and paper and frantically begin to write.) For a time, I thought that the whole "projected outline" approach was doomed. Most students seemed confused during that initial session, and some were definitely hostile. However, the exchange of comments with the students was extraordinarily fruitful.

The students themselves suggested that the projected outlines would work better if they were not full sentence outlines but were only keywords and sentence fragments. This would allow them to see at a glance the lecture's structure and would enable them to write down everything displayed on the screen without fear of missing anything. At the same time, they could still take notes on what I said — according to their traditional practice.

As a result of the students' comments, I maintained two sets of lecture outlines. The "long form" consisted of full sentences, many subheadings, and even data tabulations. (These were the notes that I had built up over years and which were in *WordPerfect* form.) The "short form" consisted only of sentence fragments that signaled topics only at the 1st, 2nd, or at most the 3rd level of headings. Because I no longer needed (or wanted) to display long sentences, I returned to *MORE* for my outlining program. *MORE* gave me better control over graphics and offered some other appealing features.

Some lessons about American government (and many other subjects) are best made with reference to tables or graphs. When teaching the course without computers, I frequently use the blackboard to lay out tables or graphs. For example, spending by the national government cannot be discussed without reference to the federal budget, and budgetary expenditures are more easily grasped when graphed by categories. A graph program (*Cricket Graph*) was used to produce far

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clearer and more accurate graphs of budget expenditures, congressional voting records, and public opinion data than I could draw on the blackboard. These graphs were then included in the *MORE* outlines and selectively displayed on the screen at appropriate places in the lectures.

In practice, it proved quite easy to type my "short form" lecture into *ACTA* or *MORE* from my long form lectures. A sample of the "short form" is given in Figure 1 which displays a portion of my March 10 lecture in *MORE* format. Eventually — and to their great pleasure — my students were allowed to print out their own copies of the long form lectures, produced in *WordPerfect* format, after viewing the short form during the lecture itself. Many students altered their note-taking practices by being less concerned with taking down points verbatim and by spending more time listening to the argument. The outline experiment that I once thought had failed became quite successful — after I adjusted my presentation to the students' abilities to learn in a lecture situation.

Lecture Outlines on the Mainframe

Students vary considerably in their ability to take lecture notes. Some do not even have a good conception of detailed lecture notes and could benefit just from seeing good examples. Since I already had my "long form" lectures available in machine readable form, I decided to help motivated students obtain good notes by making copies of mine. Accordingly, I converted my *WordPerfect* files to ACSII format, transmitted them via modem to the Control Data Corporation Cyber 845 computer at our computing center, and invited students to access the files and print my full sentence lecture outlines at their convenience after the class.

Contrary to what some readers might think, there was little problem in teaching

students to use the mainframe computer — even though the class consisted overwhelmingly of freshmen who had no experience with the mainframe and precious little experience with computers of any kind. In many ways, the mainframe is easier for beginners to use than a microcomputer. First, it is easier to tell new users how to log on to the mainframe than to teach them where to obtain program disks for the microcomputer, how to insert them into the disk drive, and how to run the program. Second, the mainframe (at least our Cyber computer) can operate under control of a specialized "user prolog" that executes each time a student signs on with his or her personal course subaccount. The user prolog then guides the student with prompts and menus tailored to the course.

Consider the user prolog for my American government class. Each time a student logged on the Cyber using a class subaccount, the computer automatically set certain parameters, called in needed files (all transparent to the user), and then displayed the appropriate message.

Occasionally, I altered the message —

```
MAIN MENU
1. Enter Cyber Mail system
2. Get a lecture
3. Exit
Select from the list above and
press RETURN:
      CHOOSE
1. Places you in the Cyber Mail
system where you can send or
receive messages.
2. Lets you retrieve a B10 class
lecture to view at the terminal.
You may also send it to the
printer.
3. Exits this procedure and places
you at the NOS command level.
```

FIGURE 2: Main Menu on the Mainframe

informing students that the textbooks arrived, that reading assignments were altered, and so on. After the students saw

the opening message and pressed RETURN, they entered the Main Menu.

If students chose option 2 — "Get a lecture" — they saw a lecture menu, as illustrated in Figure 3. The chosen lecture was then displayed on the screen, and the

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Which lecture do you wish to see?
1. FEB.09:The Nature of Interest
      Groups
2. FEB.10:The Impact of Interest
      Groups
3. FEB.11:The Media as an Interest
      Group
4. FEB.16:The Congress and Rule-
      Making
5. FEB.17:The Operation of Congress
6. FEB.18:Watergate and the Im-
      peachment Vote
7. FEB.23:The Office and the Person
8. FEB.24:The President and Rule-
      Making
9. FEB.25:Control of the
      Bureaucracy
10. === RETURN TO MAIN MENU ===
Select from the above and press
RETURN:
```

FIGURE 3: Lecture Notes

student was asked whether he or she desired a copy to be printed that would be ready for pickup at a central site in 20 to 30 minutes.

Sending Messages via Electronic Mail

Most students in a large lecture class rarely get the chance to communicate directly with the instructor. The more aggressive students compete for the instructor's attention after class, and few freshmen dare to seek office appointments. Computers and electronic mail provide a non-threatening alternative for communicating with an instructor. Most universities and many colleges offer some form of electronic mail through their minicomputer or mainframe computer at a central site. These mail systems can be used very effectively in teaching large classes.

Students in my American government class could send me a message by choosing option 1 — "Enter the Cyber Mail system" — from the Main Menu that appeared after they signed on. Through the

date: wed 25 feb 87 15.52.36 CST
from: A3857SN
to: A3857

DEAR PROFESSOR JANDA,
WELL I FINALLY GOT THROUGH TO YOU. THIS IS THE FORTH TIME I'VE TRIED THIS, SO IT BETTER WORK! WELL, TO SUMARIZE QUICKLY WHAT MY OTHER THREE MESSAGES SAID, I WOULD LIKE TO START OFF BY SAYING THAT I FEEL THIS TYPE OF COMMUNICATION/TEACHING METHOD IS VERY EFFECTIVE! THIS WAY YOU CAN KEEP IN TOUCH WITH YOUR STUDENTS ON AN INDIVIDUAL BASIS AND ANSWER ANY QUESTIONS WE MAY HAVE.
NEXT, I WOULD LIKE TO ASK YOU A QUESTION. IN MY DISCUSSION CLASS WITH ETHAN COSGRIFF, (ON 2-19-87) WE DISCUSSED THE ELECTION PROCESS. I AM STILL SOMEWHAT CONFUSED ABOUT PRIMARY ELECTIONS. I UNDERSTAND THE VOTERS POSITION IN THE ELECTION PROCESS, BUT I DON'T UNDERSTAND WHAT A CANDIDATE MUST DO IN THE PRIMARIES AND BEYOND. IF YOU HAVE ANY SUGGESTIONS OR COMMENTS ON HOW I MAY BETTER COMPREHEND THIS PROCESS, I WOULD GREATLY APPRECIATE IT.
SINCERELY, SUE

date: thu 26 feb 87 09.19.22 CST
from: A3857
to: A3857SN

Dear Sue:
You asked about the primaries, but I really don't understand what you don't understand. Let me review: In the U.S. (but not in most other nations), candidates for public office win the endorsement of a party by competing in and winning a PRIMARY election. This entitles the candidates to be listed on the ballot as a candidate of a given party in the GENERAL election. Because so many voters identify with either the Democratic or Republican party in the U.S., this gives a PARTY candidate an enormous edge over any independent or non-party candidate in the general election. Does this help? Why not review the discussion of primary elections in CHALLENGE OF DEMOCRACY?
By the way, why don't you type on the terminal in lower case so that your messages don't look like telegrams?

date: thu 26 feb 87 21.41.17 CST
from: A3857SN
to: A3857

Dear Professor Janda,
Thank you for the suggestions you sent me in your last message. I read the section in CHALLENGE OF DEMOCRACY explaining the primaries. The readings, along with your message helped me to better understand the function of the primaries in the election process. Thank you again!
Sincerely, Sue

FIGURE 4: Exchange of Electronic Mail with a Student

course, I received (and replied to) approximately 180 messages, some from students who wrote me two or more times. Students wrote about all sorts of things: questions about the lectures, comments about the readings, queries about politics,

quibbles about grading, and so on. Often, they asked questions that they would not ask in a traditional lecture course. Consider the exchange of correspondence that I had with a student named Sue in Figure 4.

Assessing The Innovations

There is only space here to cite a few findings on my course from Judith Ingram's doctoral dissertation, "Implementing and Assessing Computer-Augmented-Teaching in the Large Lecture Course." Her survey on the first day of the class disclosed that only 4% of the students thought that "computer-based technology can be used to make large lectures (a lot) more effective for learning." Her final survey contained the question: "Did any of the electronic processes significantly improve your ability to learn from this large lecture course?" In contrast to the initial survey, 82% said "yes" at the end.

When the students were asked to rank the innovations in the order of their effectiveness, 38% of the students listed the printed lecture outlines as the most effective

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innovative innovation, and another 28% cited the projected lecture outlines. (In third place was another technological innovation, named by 27% of the students, but not discussed in this article — film clips shown from the laser disk version of the *Video Encyclopedia of the 20th Century*.) Although electronic mail was chosen as the first-named innovation by only 2% of the class, our judgment was that the other innovations were viewed as even more valuable.

Clearly, my students valued computer augmented teaching in the American government course. One vignette illustrates the intensity of their commitment. When the term was about three-quarters over, I noticed that class attendance on a couple of days had dropped below 75%. I became concerned that the reason was the availability of my printed lecture outlines. If students failed to come to class, they

need only log into the Cyber computer and print out the full sentence outline of the day's lecture. Growing irritated over this likelihood, I abruptly announced at the beginning of a Wednesday lecture that I was discontinuing the printed outlines because they were contributing to absenteeism.

No sooner had I mentioned this than I faced a revolt from the floor. (You would think that I had announced that everyone's grade was going to be lowered by a half-step.) The students who were in attendance testified to the value of the printed outlines. Why should they be penalized just because some students abused the technology? In the next couple of days, my electronic mailbox was filled with messages asking me to recon-

sider. I soon decided to reinstate the printed lectures starting with the next lecture on Monday. After all, it was more important to promote learning among the more interested students than to increase attendance among the less interested ones. If the eager students who attended my lectures found the outlines to be helpful, I should not deprive them.

If I wondered whether anyone out there cared about my technological innovations, I soon found out. Students not only cared about how they were taught, but they also defended innovations that helped them learn. □

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