

Using Mimio Boardcast in an Online Principles of Macroeconomics Course to Improve Student Performance

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INTRODUCTION

Clayton College & State University (CCSU), located in Morrow, Georgia, is an extraordinary example of a University with a diverse, highly time-constrained student body (Deis and Nakos, 2001). Only 11 percent of the students in the School of Business are between the ages of 18 – 21 while 41 percent are married. Approximately 65 percent are working full-time and 20 percent are employed part-time. Most of the students are also coming to school part-time and are not planning to change jobs following graduation. Many are returning to school after a long absence.

CCSU recognizes the impact of technological change on our student's ability to find and to keep employment. CCSU was the third post-secondary institution in the country and the first in the Southeast to require laptops of all students. As a result, CCSU is committed to incorporating technological enhancements in the classroom where sensible and feasible. Model classrooms with projectors and Ethernet connections exist in most of the classroom buildings, and certified technicians are available to help both students and faculty with computer-related issues. Most importantly, CCSU has a dedicated Center for Instructional Development (CID). The mission of the CID is to help instructors improve. While much of what the CID does is to help the faculty use high-tech innovations, the CID also teaches and encourages low-tech solutions.

The School of Business adheres to the University's policy by incorporating laptop use into most of its courses. The mission of the school explicitly states that instructors should use technologically enhanced methods of teaching and provide flexible delivery of course offerings. Furthermore, faculty evaluations at the end of the year give substantial credit for development activities. Beginning in the spring of 1997, students in the School of Business at CCSU had the opportunity to take many courses, which had previously only been offered on campus, online.

While distance education has not had a good reputation among academics (Wilson, 1998), it has always been viewed as a means of reaching otherwise unreachable students who have potential. Online education serves as a means of filling that niche. The impetus for online education was to reach those constrained by distance (Vachris, 1999). However, online courses seem to appeal most to those constrained by time (Vachris, 1999; Jackson, 1998) by alleviating scheduling conflicts and the need to commute. And, while it is also true of web-enhanced on-campus courses, online courses can make various kinds of instructional tools available in a way that is far superior to the televised and programmed instruction of correspondence courses (Siegfried & Walstad, 1990).

ONLINE INSTRUCTION

The principles of good teaching cited by Chizmar & Walbert (1999) offer a rubric for ensuring that online education is quality education. Specific ways to improve online economics instruction (and, for that matter, on-campus instruction) include:

- Developing an attitude that focuses on student responsibility and empowerment in the learning process,
- emphasizing time on task,
- interacting with students on a regular basis,
- giving appropriate and timely feedback, and

- **acknowledging and incorporating individual needs.**

As noted by May and Short (2003), the most significant determinant of a successful online experience is teacher attitude. Since the burden of learning shifts to the student, a positive, collaborative approach is necessary to keep students motivated and on task. The instructor then develops experiential or collaborative learning exercises to replace lectures and in-class assignments. Both May and Short (2003) and Vachris (1999) state that effective course design requires extra upfront time.

Time on task is also an important ingredient in student success. There is simply no substitute for practice in mastery. Romer (1993) and Durden and Ellis (1995) both show that attendance is important to success in an economics class. This may be one of the most difficult problems in teaching an online course. Online students need to spend at least as much time as on-campus students do to succeed. However, online students are usually full-time employees with family responsibilities. Ensuring that the tasks that they do are crucial to mastery helps to ensure that students take them seriously and spend the time needed.

Another way to emphasize time on task is through continuous interaction. May and Short (2003) and Vachris (1999) noted that continuous interaction is a very important component of a successful online course. Students do not usually have the verbal and non-verbal cues that they get from face-to-face interaction. The energy and enthusiasm easily conveyed in the classroom is hard to put into posted notes and PowerPoint slides. Frequent e-mail contact and monitored discussions with other students help to alleviate these problems.

In any course, whether online or on-campus, one of the most important determinants of success is quick feedback (Chizmar & Walbert, 1999). This is one of the highlights of web-based environments. A student can take a quiz via WebCT or Blackboard and immediately get his score and feedback on the correct answers. For hand-graded assignments, the instructor can post grades when grading is complete. Since both WebCT and Blackboard have a grade book which can be downloaded to Excel, this saves a step and acts as a check. If the grade is posted incorrectly in WebCT (as sometimes happens), the student can catch it immediately. Students also have a complete listing of all their grades, so that there are no surprises at the end of the semester.

One major determinant of success in learning is attention to individual needs. Economics courses are considered among the most difficult in a business curriculum (Becker, 1997). One of the problems is that economists usually differ from the rest of the population. Using Kolb's theory of learning styles (Bartlett, 1996), economists tend to be "assimilators." Economists take in information through abstract conceptualization and process it through observation and reflection.

There are other ways to categorize student learning, but regardless of the paradigm, if there is a poor match between student learning style and instructor teaching style, the student will struggle (Wetzel, Potter & O'Toole, 1982). This effect may be worse for poorer students. One of the reasons that "A" students are "A" students is that they can cope with many different teaching styles. Weaker students may have more trouble adapting to different forms of instruction. As noted in Yang and Arjomand (1999) an online course may not be the best environment for some of these students (particularly auditory and dependent learners), nevertheless, among learners constrained by time, the on-campus option may not be viable. One of the challenges of online instruction is to present the material in a variety of different forms (Stone, 1999) to meet these needs.

One of the ways to deal with this challenge is to find a way to mimic the lecture when needed. Economics, like mathematics, seems to require some form of dynamic or progressive presentation. In the next section, we discuss one method that overcomes some of the limitations of currently available presentation software and computer-assisted instruction.

Using Mimio to Enhance Economics Courses

Macroeconomics has been offered in both online and on-campus formats in the School of Business. During a typical semester, the same professor teaches both online and on-campus sections of this course. Therefore, students in macroeconomics take identical examinations, have the same syllabus, and have equal access to information furnished by technology. The economics instructors were concerned that students in the different sections might not be receiving equivalent educational experiences. In addition to gathering data to determine whether students enrolled in an online economics course performed as well academically as economics students enrolled in a traditional course, a web-based lecture component was added to the Principles of Macroeconomics online course.

The ability to translate course content into learning should be positively related to success, as should the quantity of time that a student puts forth. Admittedly, brighter students and students with strong analytical skills should be able to earn a higher grade while spending less time than weak students. Weaker students may be able to substitute time for ability. However, since many of our students have multiple demands on their time, access to useful materials outside of the lecture and office hours is crucial. Usefulness depends on whether the student is capable of using the material and actually uses the material.

Economics, like mathematics, is a "chalk and talk" course that requires a dynamic presentation. However, much of the technology currently being used does not meet this need. PowerPoint with audio is not dynamic enough. Animation does not show the student how someone working with a pencil and paper might work a problem. The whiteboard that comes with online content managers (such as WebCT and Blackboard) cannot be reused, so information has to be repeated. In addition, the instructor must be available to use the interactive whiteboard. Video works well, but it is often too expensive in terms of production time and bandwidth.

To overcome these problems, the instructors have started recording Mimio presentations for our students. The Mimio Boardcast system allows the instructor to record a lecture on a whiteboard. When the student watches the presentation, he or she sees all of the graphs as they are drawn and hears what the teacher says. For example, in principles courses, students work problems using supply and demand curves. With the Mimio system, the instructor can not only show them how to draw the graphs and explain the important pieces, but can also discuss the intuition behind demand curves and supply curves. From there, the instructor can then demonstrate how to find equilibrium and how to adjust the graph when there is some perturbation in the economy.

The Mimio system is also useful for demonstrating calculations, such as the calculations of real and nominal gross domestic product (GDP) and price indexes (PI). Using this system, the student can see and hear every step in the calculation. You can do this with PowerPoint, but when using the Mimio system, everything that you write is presented as you have written it. This feature is especially attractive to students who struggle with math and find it difficult to follow the text-only explanations in books. Instead of hearing, "I understood everything when you did it on the board, but I couldn't do it at home," the students know that they have a way to see and hear what was done as many times as they need.

In addition, Mimio helps to break the material up into logical "chunks," which are necessary for active learning (Doolittle, 2003). For example, the macro models require only four separate (fairly short) Mimio presentations. The first develops the Keynesian Cross, the second derives Aggregate Demand (AD), the third goes over the relationship between Aggregate Supply (AS) and production possibilities, and the fourth puts the AS/AD curves together and shows the relationship between changes in the expenditures function and changes in PI and GDP. The students are better able to grasp the materials if the presentation focuses on one topic. There are a number of other benefits to a recorded whiteboard presentation.

- The system addresses different learning styles. While the visually-oriented students don't have much trouble coping with traditional online materials, the auditory

learners do.

- Students can go through the material as quickly or slowly as they need. If they need to go over a particular concept several times, they can, without using a lot of the instructor's time. They can also do so whenever they want.
- The students become more technologically savvy. The Mimio system has its own unique problems, and by helping students learn to fix these problems, they develop a set of strategies for working around other technical problems.
- The system requires fewer resources than video. The instructor needs only to prepare the lecture and record it. A competent technical assistant or technologically savvy instructor can get the presentations onto the Web in 10 minutes or so. From the student perspective the bandwidth requirements are minimal, so the presentations work even with poor internet connections. The system is inexpensive; the cost of the Boardcast system is about \$1000.
- Mimio presentations work very well with a modular approach to a course. Adult learners learn best when they go over the material in short bites at regular intervals (Knowles, 1984). The Mimio system is an excellent way to get them to do this, because it makes the student stop before they lose interest.
- The system rewards highly motivated students. Those who use the Mimio presentations do better on the tests, even for on-campus courses. This also helps the students in courses that meet for several hours one day a week. Since repetition aids mastery (Knowles, 1984), Mimio gives them a way to go over the material several times.

The next section shows how Mimio has improved retention and success in the Principles of Macroeconomics courses at CCSU.

ANALYSIS

From the fall of 1998 through the summer of 2003, a total of 2149 students took macroeconomics and microeconomics courses at Clayton College & State University. The Mimio system was introduced in the fall of 2002. Table 1 shows completion rates for these courses. Table 2 shows grade distributions.

As shown in the tables 1 and 2, retention and grades in Principles of Macroeconomics are higher since the introduction of Mimio. This is true for both the on-campus and online courses.

Table 1
Students receiving grades of A, B, or C

COMPLETION RATES: Students receiving grades of A, B, or C			
Principles of Macroeconomics			
Fall 1998 to Summer 2002	Campus	TOTAL	645
		% Completed	61
	Online	TOTAL	249
		% Completed	45
Principles of Microeconomics			
Fall 1998 to Summer 2002	Campus	TOTAL	643
		% Completed	64
	Online	TOTAL	229
		% Completed	49
Principles of Macroeconomics with Mimio			
Fall 2002 to Summer 2003	Campus	TOTAL	291
		% Completed	79
	Online	TOTAL	92
		% Completed	62

**Table 2
Grade Distributions**

GRADE DISTRIBUTIONS								
		A	B	C	D	F	W/WF	Totals
Principles of Macroeconomics: Fall 1998 to Summer 2002								
Campus	TOTAL	89	129	175	59	77	116	645
	%	14	20	27	9	12	18	
Online	TOTAL	26	26	59	29	37	72	249
	%	10	10	24	12	15	29	
Principles of Microeconomics: Fall 1998 to Summer 2002								
Campus	TOTAL	84	177	151	53	69	109	643
	%	13	28	23	8	11	17	
Online	TOTAL	24	39	50	22	35	59	229
	%	10	17	22	10	15	26	
Principles of Macroeconomics with Mimio: Fall 2002 to Summer 2003								
Campus	TOTAL	86	90	53	5	20	37	291
	%	30	31	18	2	7	13	
Online	TOTAL	23	15	19	6	9	20	92
	%	25	16	21	7	10	22	

SUMMARY AND REFLECTION

For courses requiring demonstration of graphs, charts or algebraic manipulations, the Mimio Boardcast System is an effective tool for recording lectures for off-campus viewing. Combining audio with whiteboard capabilities, students can watch a demonstration, hear the explanation and take notes. This system is also an effective tool for showing online students the basic graphical models used in economics as well as how to work problems using these models, and it also helps on-campus students.

The Mimio system meets two of the needs for effective online instruction. For effective online instruction, the instructor must have a portfolio of teaching techniques to meet the needs of different students. Despite the presence of a number of techniques to engage students, a fairly straight-forward lecture component may still be needed for certain kinds of material, even for highly capable students. The most common reaction heard from students is that it was nice not to have to spend all of their study time reading. Another common reaction was that many of their senses were engaged. They could hear, see and draw the graphs as they were drawn.

Furthermore, the Mimio system provides a unique odd form of interaction. Instead of a series of notes and slides, the students hear a voice and see a certain style of handwriting. Because they hear what the instructor is saying, they can gain a better understanding of what the instructor finds important. This helps alleviate test anxiety. Since online coursework involves more uncertainty than on-campus coursework (Yang & Arjomand, 1999), anything that can be done to minimize the stress is useful. In addition, the Mimio system allows economics instructors to stress how important the material is and how much students can benefit from learning economics.

Used in tandem with other web-accessible materials, Mimio presentations can become a valuable part of an instructional portfolio. For the instructor who needs to demonstrate graphs, charts and algebraic manipulations, the Mimio system can also provide a way to invert the classroom. Rather than completely abandoning the lecture that some students need, a Mimio presentation can replace the lecture, freeing class time for working problems and collaborative exercises. This may help those instructors who want to engage in active learning strategies, but are put off by tales of student resistance and scathing evaluations.

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