

REDESIGNING INTRODUCTORY ECONOMICS

Techno-collaborative Learning

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Abstract: Does computer-mediation enhance student performance or student interest in the learning process? In this paper we present the somewhat tentative results of an experiment carried out in teaching/learning methodology and pedagogy. The goal of the experiment was to examine, compare and elicit results to identify the differences, if any, in learning outcomes between two classes. One class was taught using computer-mediated technologies in conjunction with “active” learning pedagogical principles; and the other class was taught by the same instructor with identical course syllabi and textbook, but using a more conventional approach of lectures and tests to achieve learning.

1 INTRODUCTION

As (Brahler et.al., 2000), argue, the combinatory effects of increased workloads, larger classes, changing learner needs and improved instructional technologies all have resulted in an increased demand for on-line teaching material. Consequently, the aim of this project was to focus on creating a learner-centred, formatively assessed, course that used Web-enabled technology. Introduction to Microeconomics, was chosen as the course to be redesigned because it has many sections and because it has a “broad institutional impact”. In order to gather comparative data, another section of the same course was simultaneously offered by the same professor, utilising a more traditional “talking head”, summatively assessed, approach.

We proceed in the following section with a literature overview of computer-mediated learning. This is followed by a description of the experiment and the methodologies used. Given the data gathered during the experiment, tentative results and conclusions are delineated.

2 OVERVIEW OF COMPUTER-MEDIATED LEARNING

Does computer-mediation enhance student performance or learning interests? In this paper we examine the relationship between computer-mediated technologies and student intellectual skills and abilities (Salomon, Perkins and Globerson, 1991). It has been argued, and the premise is accepted, that many students prefer the “talking head” that enables them to sit and listen passively while information pertinent to examinations is organised for them. Other research shows that better retention, deeper thinking and higher motivation is initiated when students are actively involved in talking, writing and doing things relevant to their studies, both inside and out of class (Ahern and El-Hindi 2000: 385-396). Student evaluations exist for both types of educational practice (McKeachie 1997: 1219).

Implementing a change from the traditional classroom to one of collaborative, computer-mediated learning is not simple, either in organisation and structure, or in the process of carrying it out. The instructor is no longer the fount of wisdom or the only purveyor of interpretation. Even the hours of the class become manipulable by

students given the ability to log on to discussion forums at any hour of the day and virtually, submit assignments, read announcements gather supplementary reading and ask or respond to questions (Fuller, et.al. 2000). In any case, even with the aforementioned technological advances, poor pedagogical models emphasising the passive absorption of “authoritative” information is being passed onto students, thereby wasting the immense potential of the Internet (Crook 1997; Kirkpatrick and McLaughlan 2000). Clearly, the challenge is to weave the technologies into the learning process so that they become part of the process rather than an adjunct to it.

Computer mediated technologies have and will continue to have major repercussions on the organisation and process of teaching and learning. For those of us encapsulated in this process, pedagogical approaches have come under more scrutiny. Giving the student the chance to participate more actively, interactively and collaboratively with both peer groups and instructors is not only possible but more easily achieved (Bailey and Cotlar 1994: 184-193; Ellsworth 1994; Ragoondan and Bordeleau 2000).

3 DESCRIPTION AND METHODOLOGIES OF THE EXPERIMENT

Two parallel sections of the course (“traditional” and “innovative”), taught by the same professor, covering the same textual material, was offered in the same semester.

The traditional section involved lectures only (although students were encouraged to ask questions), using power-point slides in-class. The course syllabus and discussion forum was placed online utilising WebCT and a textbook was used for the required reading. Assessment was based on two hard-copy pop quizzes (10% each), a midterm exam (20%), two short reading assignments with students required to provide a summary analysis in the web-based discussion forum (15% each) class participation (20%) and a final exam (20%). In addition, a “learning styles” questionnaire (discussed below) was placed in WebCT online.

The innovative section involved very little lecturing by the instructor, but was facilitated mainly as student-centred, with open class participation and interaction. The students took turns giving short lectures on the textbook material using power-point slides in class. All course material, other than the

same hard copy text used in the other class, was provided online and online discussion was overtly encouraged. Assessment in this section included 10 weekly online quizzes (1% each), class and electronic online participation (20%), a group collaborative project that was uploaded and assessed on WebCT for all students to see (30%), a learning journal that was shared with the rest of the class upon completion (15%) and the same final exam given to the other class (25%). Here too, a “learning styles” questionnaire was placed in WebCT online. Classes were primarily “open forums” with learning activities, peer instruction, group assignments and individual participation. All of the students in this class had a personal computer which was used for most of the class assignments and activities. Students were encouraged to use the computer as the search tool for questions and gathering of information. “Instruction” in this class was primarily one of coordination and facilitation with assistance provided as required when computer searching, peer instruction or collaborative assistance amongst the students was insufficient.

The usefulness and reasoning behind the group projects and learning journal is discussed further to stress the pedagogy involved.

3.1 Collaborative Group Projects

Utilisation of the Internet to assist in collaborative learning at a sophisticated level has been discussed in the literature for at least a decade (Crook 1997; Edwards and Clear 2001; Light, et.al. 1997; McAteer, et.al. 1997; Sosabowski, et.al. 1998). Team (collaborative) learning emphasises a high level of active involvement and a great deal of self-management by students. The challenges include determination of effective team member role behaviours and skill, dealing with ‘free riders’, and evaluation of individual performance within the group (Aiken 1991; Alie, R., Beam, H. and Carey, T. 1998; Boyatiz 1994; Malinger 1998; Ramsey and Couch 1994). It was emphasised from the beginning that the students were going to have to resolve all “management” problems themselves as the instructor was not going to “referee” squabbles or disagreements. Secondly, to handle the ‘free rider’ problem, one-third of the project grade was based on peer evaluation of their colleagues in the group (Cheng and Warren 2000). Grades were given by each student to the others in the group anonymously, and these marks were averaged by the instructor. The caveat by McCuddy and Pirie that: “students generally receive little guidance as to how to assess peers but are simply told to provide an evaluation for

each team member”, was taken seriously and given credence. It is recognised that “peer assessment is a challenge to experienced individuals and can be a daunting task for the uninitiated” [2004: 154]. Therefore, detailed guidance was given.

Group projects are problematic, to say the least. Some students do not wish to study/work with others as they feel that they are held back by the group, or forced to coordinate their efforts with others who may have very different study habits, initiative or ideas as to what is a “successful project”. These students will insist that group work is time consuming with little benefit and in no way provides an enhancement of their learning. Computer-mediated communication may become a problem when members of the group log on at very different times or indeed, may not log on at all during times considered crucial for others in the group (“Is anyone going to respond to the point I made yesterday about sharing responsibility for the write-up...”). The point is that the technology is not living up to its promise NOW! (Harasim 1993: 119-130; Ragoondden and Bordeleau 2000) In fact, Repman and Logan (1996) argue convincingly that the benefits of group oriented pedagogy works primarily at a social and affective level rather than enhancing learning. One reason for this, also identified in the literature, is that collaboration does not work well within introductory courses, which attract a variegated group of students both in terms of backgrounds and interests. Rather collaboration appears to be more strongly correlated to learning in professional and graduate courses where homogeneity of background and interest is more closely aligned (Muffoletto 1997). However, in this class, small groups appeared to work reasonably well.

3.2 Learning Journals

What distinguished a learning journal in this course is the necessity to relate the theory and models of the classroom to lived experience. The intention is to both learn from the process of doing it, i.e., reflecting on lived experience in terms of information gained from the course, and to learn from the results, i.e., the application of classroom theory and models to actions, discussions, reading material or experiences that are encountered outside the classroom. The journal provides an intellectual platform for reflection on what is being learned as well as its usefulness. It counteracts “spoon-feeding” which are the hallmark of lecture notes and handouts. Instead, a personal approach to learning is

emphasised allowing the learner to incorporate the material in their own terms of understanding.

The specific instruction provided to the student is as follows: You will complete a journal/diary of approximately 250 words per week, over a ten week period (2500 words total). You will keep a record as to what you have learned that is relevant to your studies and life, questions that have been raised in your mind, identification of issues that you never thought about before. This is not to be a diary about what we did in class. It is to be a reflective journal relating the material covered in class to the rest of your life's activities, such as conversations, experiences, economic activities in which you were specifically engaged, or articles in newspapers read based on the material covered in class. How do the theory and models learned in this course connect to your lived experiences outside class.

4 AVAILABLE DATA TO ASSESS IMPACT ON STUDENTS

4.1 Learning Styles Questionnaire

There may be as many different learning styles in a classroom as there are people, which should directly impact on the way teaching is organised. Research, experimentation and results of work by Richard M. Felder and Barbara A. Solomon in this area is made available. They have developed a questionnaire to delineate amongst four dichotomous pairs of learning styles. The four pairs are: 1) Active and Reflective Learners; 2) Sensory-based and Intuitive Learners; Visual and Verbal Learners; and 4) Sequential or Global Learners. Examination of their efforts at URL <http://www.ncsu.edu/felder-public/> is recommended. This exercise was included in the project at hand. Of course there are numerous “ifs” and “buts” in the results of their work, but the questionnaire is a most practical and useful tool to get a mental image of the groups being taught. The results are more anecdotal, than analytical, but may provide room for consideration.

Results from questionnaire: Students in the Innovative section were all “active” learners, slightly sensory rather than intuitive, primarily visual, and all sequential learners.

Students in the Traditional section were half active and half reflective; slightly more sensory than the innovative section, similar in visual orientation to the innovative section and were split fairly evenly but slightly more global in approach.

Table 1: Summary and Comparison of Teaching/Learning Approaches in each Section.

Characteristic	Traditional Section	Innovative Section
Population	20 (mostly 1 st and 2 nd year)	16 (mostly 1 st and 2 nd year)
Textbook	N. Gregory Mankiw, Principles of Economics Chapters 1-17	
Material Online	Syllabus, topic notes, glossary, ppt slides, learning styles questionnaire, required and additional reading, assignments, calendar, bonus questions, discussion forum.	Syllabus, topic notes, glossary, ppt. slides, learning styles questionnaire, study guide, chapter links to relevant internet material, links to classical scholars in economics, calendar, bonus questions, discussion forum and quizzes. Student group projects and learning journals were uploaded for viewing by the entire class.
Lecture	Lectures by instructor with .ppt slides. Students were encouraged to ask questions before and during lectures.	Lectures by students using .ppt slides. Student centred, open class participation and interaction encouraged (e.g., peer instruction, group activities collaboration and sharing of computer searches to solve problems or discuss issues)
Class Environment	One computer, projector and screen for professor	Class projector and screen for use by all. Each student supplied with a personal computer. Software (Timbuctu) allowed any of the computers to use projection screen.
Assignments	2 readings and summary analysis uploaded on WebCT discussion forum	Group project; Learning journal uploaded on WebCT
Quizzes	2 paper-based pop quizzes, with normal assessment of correct answers.	10 online quizzes – one per week. Following quiz, peers discuss answers. Credit given simply for taking quiz
Direct Assessment	2 pop quizzes – 20% Class participation – 20% Midterm – 20% 2 paper-based readings and summary analysis – 20% Final Exam – 20%	10 online quizzes – 10% Class/Web participation – 20% Class project – 30% Learning Journal – 15% Final Exam – 25%
Indirect Assessment	Pre- and Post-course tests, Student evaluations, a Small Group Instructional Diagnosis, Learning Styles questionnaire, WebCT tracking student activities	

The instructor is seen as completely reflective and much more intuitive than either of the sections, but equally visual and verbal in approach, while only slightly more global than sequential.

Description of Categories

ACTIVE – retain and understand best by doing, applying or explaining.

REFLECTIVE – prefer to think about problems quietly to begin with before acting.

SENSORY – prefer the facts and a “positivist” approach; good at memorisation and lab work.

INTUITIVE – look for possibilities and relationships and exceptions; comfortable with abstraction and seeks innovation.

VISUAL – prefer pictures, diagrams, flow charts, time lines, films and demonstrations

VERBAL – prefer written and/or spoken explanation.

GLOBAL – prefer the “big” picture, connections, interrelations and move almost randomly to solution.

SEQUENTIAL – prefer linear step by step approach to solution

4.2 Pre- and Post-Course Test Results

The pre-course test was taken from the Third edition of William B Walstad and Ken Rebeck 2001 *Test of Economic Literacy*, New York: National Council on Economic Education which is used to measure achievement of American high school students in economics. A norming sample was provided showing the aggregate statistics for a sample of 7,243 American students who had taken an economics course. The numbers below are representative of the number of correct answers out of 40 questions. Both sections did better than the norming sample, and had much lower standard deviations. This suggests, that on the average, a number of students in this course had previous experience with Economics at the secondary level.

The post-course test was taken from the Third edition of Phillip Saunders 1991 *Test of Understanding in College Economics*, New York: Joint Council on Economic Education which serves as a measuring instrument in the teaching of introductory economics at the college level for

comparative purposes. A norming sample was provided showing the aggregate statistics for a sample of 1,426 American students who had taken the college course in economics. The numbers below are representative of the number of correct answers out of 33 questions. The Innovative section scored similarly to the American sample, whereas the mean of the Traditional section was lower than both, albeit with a smaller standard deviation. See Table 2 below.

4.3 Comparative Assessment of Final Exam and Final Grades

Summary: The results for the final exam and the final grades were very similar for both sections. The final exam results were (Innovative section – 75%, Traditional section 74%) and the final grades were (Innovative section had a mean grade of 83.8%

while the traditional section had a mean grade of 78.7%)

4.4 Comparisons of Student Course Evaluation

In Table 3 the innovative section shows, overall, a more positive attitude towards the course itself, but the only significant difference is with reference to the “reading materials”. This is most likely the result of the variegated possibilities that the computer offered the students in the classroom as a “library” reference source and the facilitation provided to gain access to up-to-date information relevant to the material being studied in the text. Table 4, with reference to the instructor, shows similar results. Although the innovative section ranks more positively (with the exception of “explains concepts clearly”) the differences are slight in every instance. See Tables 3 and 4 below.

Table 2: Pre-course and Post-course test results.

Pre-test results	Mean	Standard deviation
<i>Traditional section</i>	27.2	5.3
<i>Innovative section</i>	30.3	2.5
<i>American sample</i>	24.7	7.9
Post-test results		
<i>Traditional section</i>	13.4	3.9
<i>Innovative section</i>	16.5	5.1
<i>American sample</i>	16.67	6.3

Table 3: Evaluation (Mean) of Course on a scale of 1-5 with 1 = Strongly Disagree; 5 = Strongly Agree.

Question	Traditional section	Innovative section	Economics overall	School of Business
Reading materials are challenging and stimulate my thinking	3.80	4.43	3.94	3.78
Tests and assignments reflect the purpose and content of the course	4.30	4.29	4.18	4.03
Tests and assignments challenge me to do more than memorize	4.40	4.57	3.97	3.86
The number and frequency of tests and assignments are reasonable	4.10	4.43	4.17	4.00
The working load is appropriate for the number of credits	4.30	4.43	4.08	3.91
Overall, this is a useful course	4.40	4.57	4.18	3.99

Table 4: Evaluation (Mean) of the Instructor on a scale of 1-5 with 1 = Strongly Disagree; 5 = Strongly Agree.

Question	Traditional section	Innovative section	Economics overall	School of Business
Inspires student interest in course	4.29	4.33	4.08	3.94
Organised and prepared for class	4.43	4.56	4.45	4.23
Explains concepts clearly	4.00	3.94	4.19	4.01
Emphasises conceptual understanding and critical thinking	4.29	4.41	4.15	3.99

4.5 Small Group Instructional Diagnosis

In this exercise, the Director of the Center for Learning and Teaching and the Instructional technologist spent 30 minutes in each of the classes interviewing the students as to their impressions of the course half way through the semester. Below is a summary of their responses to two questions.

What helps you learn in this course?

Traditional section

Power-point slides in conjunction with lectures but there were a couple in the class who “hated” computers. Understanding is expected more than memorization. People asking questions: so that the point is covered again and professor is prepared to go over questions again.

Innovative section

WebCT: permanent interaction; helps us to learn in an innovative way (discussing amongst ourselves materials that we may not comprehend).

No need to memorize – no mid-terms, so there is a need to understand when writing in the learning journal. We have to take much more responsibility for our own learning.

An interesting teaching style.

Discussions in class and feedback through the online discussion is more important the sitting and listening to lectures.

Students become the role players in the class, asking each other questions and using the board and projector ourselves to show our understanding to other students who may not understand.

Always being up to date with what is going on in class and outside class.

What improvements would you like and How would you suggest that they be made?

Traditional section

Go slower

Spend more time covering class material relevant to quizzes.

Provide more worksheets with practical problems.

Show relations between chapters.

More participation and discussion needed in class.

Don't depend so much on WebCT

Innovative section

Provide more variety of choice for the group projects.

The discussion forum needs more structure and more input from the professor.

Make all courses like this.

5 SUMMARY/CONCLUSIONS

5.1 Pre, Post, Final Exams

Given the intervening variables and relatively small sample of students it does not seem appropriate to discuss questions of “significant” difference. However, practically, it can be noted that in all three exams (Pre-test, Post-test and Final exam) the mean and median results were higher for the innovative section.

5.2 Course Evaluation

The numerical results of the course evaluation, and qualitative observation by the instructional technologist indicated better student disposition towards the effect of technology on learning as well as student motivation. General disposition towards computer mediation was much stronger for the “innovative” section students than for the traditional section students (suggesting that it did enhance their learning process, etc). The innovative course consistently showed better results than either, the traditional course, and other courses in Economics, or all courses in the School of Business.

5.3 SGID

According to the SGID results the innovative section students were more comfortable with the speed of the course, the use of technology, and the material covered. The traditional section students were uncomfortable with the speed of instruction; felt their questions were not sufficiently answered and that the course was not sufficiently interactive. Qualitatively, the students in the innovative section seemed much more interested both in taking more economics courses and/or taking economics as a major; whereas the students in the traditional section showed much less enthusiasm for the material covered, or for economics as a discipline.

5.4 CAVEAT

There is insufficient quantitative and qualitative data to allow clear, undifferentiated judgements. Furthermore, an excessive number of intervening variables blurred both the accuracy and interpretation of results, which, among other things, is the analogue of Heisenberg's “principle of

uncertainty”, i.e., the biases, attitudes and behaviour of the facilitator.

No information was gathered with respect to gender, major and minor degree interest, or student backgrounds in economics in secondary school or university.

To conclude qualitatively, on one level the results indicate that the amount of work that goes into creating an activity-based alternative to the “talking head” and conventional testing approach may be unnecessary. However, at another level there was sufficient evidence to show that the learning process (and economics) was enjoyed much more by the students when engaged in an open, active, collaborative manner. The depth of learning which takes place remains to be determined in further research.

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