13 EXPLORING STUDENTS' VIEWS ON THE TEACHING OF MACROECONOMICS AT UNIVERSITY WITH THE USE OF NEW TECHNOLOGIES

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Abstract

The basic hypothesis to be inquired is the use of computers and the internet in the teaching of economic modules does not affect student learning and retention. The research restrictions were that research was carried out at a Department of the University of Piraeus during the 2006-2007 spring semester. 55 students took part in the research in total. The module was taught at the computer lab – there were 25 computers for the 23 students who participated in the computer-based lesson, therefore each one worked individually. The remaining 32 students were taught in a lecture hall and there was no use of technology involved. Before the start of the lessons students took a pre-test comprised of five true-false questions and five multiple-choice questions. During the final lesson students took a post-test, after the completion of the lessons students filled in a questionnaire and expressed their views on computers and the teaching that took place both at the computer lab and the lecture hall.

Key words: Macroeconomics, Productivity output and employment, Money – Banks, Economics, Teaching, Education, New Technologies, Computer learning.

JEL Classification: E00, I21, J24

Research description and methodology

The research carried out for this paper was based on the mentioned literature. The basic hypothesis to be inquired is the first hypothesis posed by Agarwal and Day[1] in

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[1] *Agarwal, R. & Day, A. E., (1998). "The impact of the internet on economic education",* Journal of Economic Education*, Spring 1998, 29 (2), 99-110.*

their research. That is, the use of computers and the internet in the teaching of economic modules does not affect student learning and retention. Their other two hypotheses will not be inquired.

The module of Macroeconomic Theory was selected because it is an introductory and obligatory module for the study of economics. 55 students took part in the research in total. The module was taught at the computer lab – there were 25 computers for the 23 students who participated in the computer-based lesson therefore each one worked individually. The remaining 32 students were taught in a lecture hall and there was no use of technology involved. Six two-hour lessons were delivered and the material covered was the 7th chapter "Finance-credit Market, Money and Rates" from the Macroeconomics book.

Before the start of the lessons students took a test comprised of five true-false questions and five multiple-choice questions based on the 3rd chapter of the Andrew Abel & Ben Bernanke book "Macroeconomics", Volume A, with the title "Productivity, output and employment".

In order to conduct the research the programme "Macroeconomics" by the Keystone company was used with which three lessons were created based on the 7th chapter of the Andrew Abel & Ben Bernanke book "Macroeconomics" entitled "Money – Banks".

Each of the computer-based lessons contained in different format the material covered, a glossary with the new terms for students, exercises and a knowledge test. How the lessons appeared on the computer screen and the units that were used can be found below.

The participating students did not change during the course of the research and each one could access the programme both from the computer lab and their home computer as they were given a copy of the programme. Therefore, students could revise, work more carefully on particular difficulties and practise on the chapter's questions and exercises. There is a part of the lesson's content that was not included in the programme but it was taught through a Power Point presentation.

Some other students also attended the lessons but they did not take part in the experiment since they were not always present. The 55 students who participated were present in all three classes.

Students logged on the programme with the help of the tutor if necessary and then they were taught the predefined material with the programme's guidance. During the final lesson students took a test of five true-false questions and five multiple-choice questions based on the taught material and they also answered a questionnaire with general and more specific questions on their views of the computer-based lesson. This particular number and type of questions was selected so that the second test would have the same format as the first and it could be easily corrected and graded.

The test was completed by all 55 students that took part in both classes. The study and comparison as well as the statistical analysis of the tests are presented in detail in the following chapter.

Moreover, after the completion of the lessons students filled in a questionnaire and expressed their views on computers and the teaching that took place both at the computer lab and the lecture hall.

Research Restrictions

The research restrictions were that research was carried out at a Department of the University of Piraeus during the 2006-2007 spring semester. A considerable number of students were rounded up and they contributed to the research with their views and knowledge so that relevant conclusions could be drawn.

Problems

It is natural that some small problems did come up during the research. Initially it should be mentioned that it was difficult to find the appropriate bibliographic sources and mainly similar studies that provide theoretical background. As mentioned by Simkins[1] and Sosin[2] most of the available data has not been published and there are very few empirical studies that focus on the teaching of economics at university level.

Moreover, the lab was equipped with slow access computers therefore there were often delays during the computer-based sessions although the problem was not so serious to cause the lesson to stop completely. The third problem was that some of the students visited irrelevant webpages and surfed the internet during the lesson and at times there was a slight disruption in the computer lab.

Additionally, another problem that could not be avoided was that some students skipped classes and in average there were usually two absentees during each lesson.

What is more, we should mention that some students lacked basic computer knowledge and although their number was small slight delays were caused because of them.

A mentioned in the questionnaire analysis none of the students used the programmed on the personal computers and this can be attributed to the following factors: 1) students were not used to such a method of teaching, 2) there were exercises that students had to check and solve at home and 3) not all students owned a computer or could work on the programme using another computer. Thus, the lesson could not be based exclusively on the electronic format and this was intensified by the following problem.

Computer labs at the University of Piraeus are most of the time busy with other lessons taking place so it is not possible for students to enter freely whenever they do not have other classes. If this was possible they would be able to use Word, Excel, PowerPoint or other programmes for their assignments, surf the net and look up information or visit useful webpages.

Last but not least there was a difference in the level of difficulty between the two chapters, since chapter 7 used for the experimental computer-based lesson is more difficult than chapter 3 that was taught in a lecture hall. Chapter 3 on the other hand is longer than chapter 7.

[1] *Simkins, S. P. (1999). "Promoting active–student learning using the World Wide Web in economics courses". Journal of Economic Education, vol. 30, summer, pp. 278-286.*

[2] *Sosin K., (1997). "Impact of the Web on economics pedagogy".*

The programme

The programme used for the design of the computer-based lesson was 'Macroeconomics' by Keystone company.

The 'Macroeconomy' CD-ROM is from the key-book series which consists of basic knowledge and reference CD-ROMs addressed to students, pupils, teacher and the wider public that wish to become acquainted with the particular subject-matter with the use of computer.

In addition, offered features such as electronic bookmarks, notes and printing are additional tools for conquering knowledge. Its philosophy is simplicity, practicality, speed and user-friendliness and it is characterized by substantiality and usefulness. /it is rather substantial and utilitarian.

The electronic study aid 'Macroeconomics' CD-ROM of the key-book^{+} series was designed bearing in mind that in order to substantially comprehend the laws and operational mechanisms of the economic system critical ability, creative, rational and methodical thinking, and continuous linking of theory and practice are essential.

The Macroeconomy material contained in the CD-ROM is presented in two ways: thematically (Concepts – Definitions) and alphabetically (Index) so that they can be best comprehended and consolidated. It is divided in 9 units each of which comprises of five sections:

1. Concepts – Definitions, where the material is systematically presented and divided in self-contained parts. The texts are accompanied by photographs and commentary, whereas a great number of concepts are presented with the aid of animation.
2. Comprehension Keys that help for the further knowledge consolidation and systematization as depending on the nature of the section they can contain: in-depth presentation of concepts important for understanding the unit, summary of the basic points, comparative and compositive presentation of the unit's concept groups, methodology presentation and examples of how to solve the exercises for the units that contain exercises.
3. Questions (open type) that test theory comprehension.
4. Exercises that test content comprehension at practical and computational level.
5. Objective type exercises that cover two different categories the answers of which are graded and clocked by the programme:
   - Multiple choice exercises where students have to choose one out of five possible answers
   - Gap and table filling exercises where students are given either a text with omitted words or a table with omitted numbers and they have to fill in the gaps.

Presentation of Experimental Teaching

Psychological–pedagogical principles

This programme solves the problem of accuracy lack and assists student trials and hypothesis. At the same time it is useful for discovering with ease and with clarity the

substantial relations hidden in shapes. It helps teachers design and apply in the classroom some educational activities of a rather high level, oriented towards rich educational objectives with the constructive model as a main axis, that is, activities focused on comprehension and thinking rather than student fertile memorization and simple practice. These activities have to be supported by a framework of general psychopedagogic principles.

The psychological principles described below concern education and sum up some or the most important findings of current research on learning. They attempt to incorporate researches from various areas of psychology among which are educational, developmental, cognitive, social and clinical psychology. These researches have contributed new ideas on the learning process and the knowledge evolution in many fields of study. As a result, the way of teaching is currently changing, attempting to become more student-centred rather than teacher-centred, to connect education with real life conditions and focus on comprehension and thinking rather than students' fertile memorization and simple practice.

All 12 principles are easier to understand as an organised unit where each supports the rest. In total, the principles are suggested as a unified framework for the design of curricula and teaching methods. They really are behind a number of innovative programmes worldwide.

We will begin by negotiating the three principles that are widely recognized as the basis on which educators should design the learning environments of today. That is, the learning environments that encourage students to learn actively, to cooperate with other students and to use meaningful activities. We will continue with seven principles that focus on cognitive factors that are basically internal but they interact with environmental factors in significant ways. Educators have to take these principles into consideration so as to design more effective curricula and teaching methods. Finally we examine the negotiation of developmental and individual differences as well as how motives affect learning. These two final areas are very important for knowledge and teaching and it is worth becoming the focus of other papers so that they can be sufficiently developed. The 12 principles are the following:

1. Learning requires active and constructive student participation.
2. Learning is primarily a social activity. Student participation in social life is fundamental so as to achieve learning.
3. Students learn with greater ease when they participate in activities that they consider useful for real life and are related to their culture.
4. Students' new knowledge is constructed on the basis of everything they understand and believe.
5. Learning is improved and becomes faster when student learn to take advantage of effective and flexible problem-solving strategies.
6. Students have to know how to plan and observe their own learning, set their own goals and correct their mistakes.
7. Sometimes pre-existing knowledge can block the path to new knowledge. Students have to learn how to solve internal inconsistencies and reconstruct existing concepts when necessary.

8. Achieving learning is easier when the material is organized around general concepts and explanations and not based on memorization of independent data and processes.
9. Educators can improve students' ability to apply knowledge with the aim of solving real world problems.
10. Learning is a complex cognitive process with no room for precipitation. A lot of time and practice is necessary so that a particular skill can be formed.
11. Research has shown that there are important developmental and individual differences in learning between students.
12. Learning is drastically affected/ determined by student motives. Psychologists discern two types of motives:

a) External encouragement and b) internal prod

External encouragement is caused when positive reinforcements are used, such as praise, high grades, awards etc while internal prod appears when student take actively part in activities meaningful to them without having to be praised for that.

Educators, therefore, can stimulate students' attention and interest not only with their behaviour but also with classroom activities so that they can create motives which are an essential prerequisite for achieving learning.

Students in the computer lab

Taken into consideration that we are based on the above mentioned principles as well as on the programme's potentials we propose the following educational activity in the framework of three lessons of Macroeconomic Theory at the Department of Statistics and Insurance Science at the University of Piraeus. It would be wise for the teacher to divide the class in pairs and each pair work on their own computer. It is suggested that this activity should be carried out in three stages:

First Stage

The teacher will provide students with instructions on the programme so that they can experiment with the educational activity.

Second Stage

Students will start working individually.

Third Stage

Students of each pair will exchange views. Whether a pair comes up with the correct answers should not be a problem for the teacher.

Fourth Stage

An open discussion on the answers will take place.

Educative Learning Goals

a) As to the cognitive level

In the framework of traditional teaching, approaching concepts that do not fall under students' immediate and natural experience is problematic and in particular approaching abstract concepts such as money demand. This way the development of motives and the active nature of learning are restricted and as a result it is not possible to solve the cognitive conflict and to construct new cognitive forms. However, the simplicity in using the programme, its speed and accuracy combined with its dynamic handling and concept representation contribute greatly to familiarization and finally to comprehension of complex concepts by students and this is the main aim of this activity.

It is also aimed that:

1. Students activate and take advantage of their previous knowledge on a) inflation, b) offer, c) demand, d) capital, e) balance and f) unemployment.
2. Students comprehend the concept 'money' and in particular: a) What is money? What's its use? b) Portfolio management and c) Money demand.
3. Students should be in the need to invent one or more strategies in order to solve a group of problems.

b) As to the use of New Technologies

A parallel educative aim of this activity is familiarizing students with computers and making them practice at basic computer skills of the software. So our goal is that students after understanding the basic commands of the software's main menu will be able to:

1. Use the mouse as a dynamic handling tool.
2. Create graphs representing money flow and interpret them.
3. Save and retrieve their work.

c) As to the Learning process

The selection criteria for the design of this educational activity were:

1. Activating and taking advantage of students' previous knowledge and experience.
2. Direct student use and experimentation with shape, as a result of taking advantage of intuitive thinking.
3. The view according to which a problem creates the need to refer to previous knowledge.
4. Problem solving creates the learning framework within which student constructs economic knowledge.
5. Student contact with the methodology of conducting experiments, that is:
   a) Hypotheses creation
   b) Control of the legitimacy of these hypotheses
   c) Confirmation of these hypotheses
   d) Conclusion formulation

1. The need to invent a strategy as a methodology for active knowledge acquisition.
2. The study of the concept of balance in the financial credit market.
3. The cultivation of students' analytical and composite thinking.
4. The creation of new pedagogical roles within the classroom both for teachers and students.
5. Student involvement in procedures that promote cooperative learning and communication.
6. Student practice in oral and written skills.
7. Change of the concept of error in student perception.

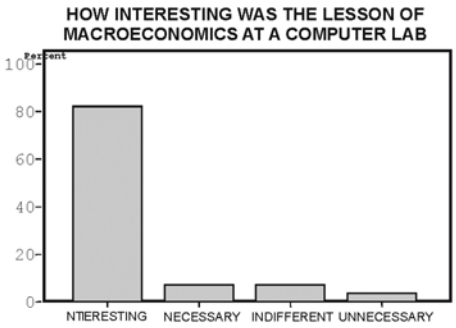
Presentation of the questionnaire results on student views concerning computer lab teaching

The particular section of the questionnaire was completed only by the students who took part in the teaching process. As shown below 89.3% of the participants thought the process was interesting and had a positive contribution (Table 1).

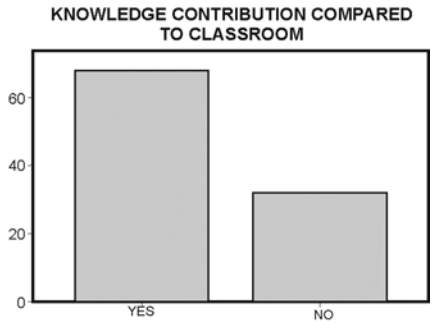
Table 1

How interesting was the lesson of macroeconomics at a compurer lab

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	INTERESTING	23	82.1	82.1	82.1
	NECESSARY	2	7.1	7.1	89.3
	INDIFFERENT	2	7.1	7.1	96.4
	UNNECESSARY	1		3.6	100.0
	Total	28	100.0	100.0	



Graph 1



Graph 2

Table 2

Knowledge contribution compared to classroom

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	19	67.9	67.9	67.9
	NO	9	32.1	32.1	100.0
	Total	28	100.0	100.0	

As we can see 67.9% of the participants considered that the contribution of knowledge was greater compared to that of a traditional classroom (Table 2).

Table 3

Interest on the programme's potential

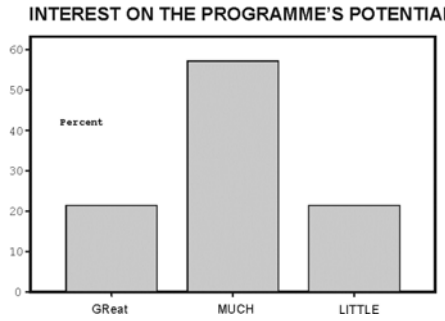
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GREAT	6	21.4	21.4	21.4
	MUCH	16	57.1	57.1	78.6
	LITTLE	6	21.4	21.4	100.0
	Total	28	100.0	100.0	

78.6% of the participants expressed interest in the programme's potential (Table 3) while 89.3% thought the programme was easy or very easy to use.

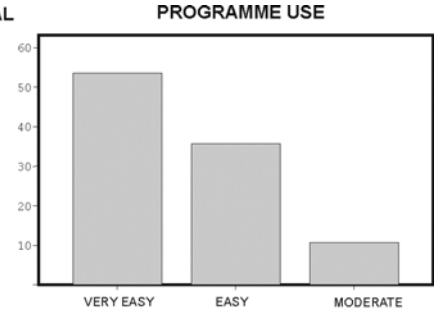
Table 4

Programme use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY EASY	15	53.6	53.6	53.6
	EASY	10	35.7	35.7	89.3
	MODERATE	3	10.7	10.7	100.0
	Total	28	100.0	100.0	



Graph 3



Graph 4

As shown 89.3% of the participants believe that using the programme is time saving (Table 5). The same percent think that teaching more computer-based lessons would be useful (Table 6).

Table 5

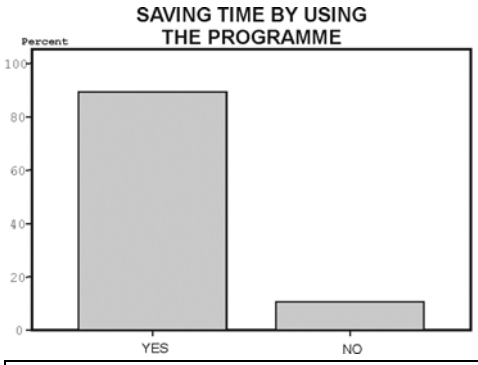
Saving time by using the programme

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	25	89.3	89.3	89.3
	NO	3	10.7	10.7	100,0
	Total	28	100.0	100.0	

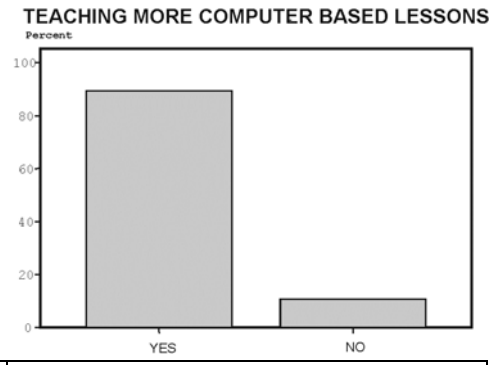
Table 6

Teaching more computer-based lessons

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	25	89.3	89.3	89.3
	NO	3	10.7	10.7	100.0
	Total	28	100.0	100.0	



Graph 5



Graph 6

Conclusions

The important role of informatics in the educational process is beyond arguments and this does not only mean introducing a new tool in all levels of teaching but developing a new dimension in educational technology. Computers are being diversely used in education, although there are various views as to the effectiveness of using them for teaching. However, it has been claimed by many researchers that computers can be of invaluable assistance in teaching economics both for teachers and students. It can offer learning opportunities with the general aim to enhance teachers' communicability

of knowledge and students' understanding. Thus, teachers of economics are aware of the benefits of technology and are trying to get acquainted with it. At the same time they should assist the creation of appropriate educational software.

Educational software development is at a very early stage in Greece. The inflexibility of our educational system along with the insufficient teacher training in new technologies make the task of incorporating new informatic applications in the teaching process difficult. The teaching hours available for economic modules are few and the number of economic modules at the Department of Statistics and Insurance Science at the University of Piraeus are restricted and most are choice courses, therefore a science that has many applications in many of our life is not paid the appropriate respect.

The most important research conclusions about higher education are:

1. Clarity in presentation, enthusiasm and respect towards student views had the greatest positive influence on lesson evaluation by students. On the contrary, teachers underestimate significantly these two factors and overestimate the importance of being well prepared for the lesson and knowing their subject-matter.
2. Students' attitude towards Economics affects their knowledge of the subject. In general "attitudes" towards Economics derive more from what students learn rather than being motive of what they learn.
3. Student effort matters and students claiming to have tried harder at a module acquired higher grades, so tension and the total amount of time spent studying affects the learning of Economics.
4. Different students of Economics learn the subject in different ways. Very little is known about how particular teaching methods influence particular student traits. More recent studies support that student learning styles, dependent, independent or co operational, affect the total of economic knowledge. It has been further discovered that if the teaching style matches the students' learning style, the result is positive – 50% higher performance.
5. Sex matters, since two thirds of studies on understanding economics have discovered a statistically important differentiation between male and female students. In particular, men have a higher level of comprehension compared to women in Economics and they get better grades than women in tests such as TUCE. The difference is small but statistically important, while only one third of the studies that relate student sex with learning discovered a statistically important difference in favour of men. Namely when we use a flow model and we attempt to explain acceptance at the end of the lesson there is usually no difference between male and female students. In other words, they can be taught economics to the same degree. There are many explanations towards where the original disadvantage derives and one of these mentions the means of measurement used for the evaluation. Most studies make use of multiple-choice tests as a means of measurement. The findings show that boys are better at multiple-choice tests whereas girls do better at questions with longer answers and they also have higher abilities in space and numbers.

6. Having studied economics at school was not a negative factor for student performance at University but did not provide an important advantage either. In general however further research is required with larger student samples and from different educational systems.
7. Teaching assisted by games and computers is almost as effective but probably costs more than conventional teaching. Computer based study systems appear to be more effective than game and simulations especially for students of weaker performance. Educational programmes are effective because students can reach a standard level of qualification sufficiency in less time but students are not very fond of them. Students enjoy being taught according to their personal style and this increases performance in some cases. In general research results show that the advantages of applying the use of computers in teaching economic modules are controversial.
8. The size of the class little affects performance. However, some researches have discovered that larger classes can have negative effects in some economic fields and may influence financial benefits from education. According to Blinder the issue is of great importance and further research is required.
9. The results showed that students that attended a Microeconomic lesson at first and then a Macroeconomic one, performed better than students who did it the other way round. Students who followed the Micro-Macro order seemed to like Economics more. Blinder reaches the conclusion that the answer is not clear enough and more answers are needed before decisions are taken.
10. Having mathematical background knowledge helps comprehension of economics and respectively studying economics enhances mathematical abilities to a satisfactory level.
11. Students prefer computer-based lessons over traditional lessons to a very high percentage.
12. The conclusions from this research are related to the conclusions of researches carried out at foreign University Institutions.

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