

## The Effectiveness of Technology in Teaching High School Economics

Despina Makridou-Bousiou<sup>1</sup>  
University of Macedonia  
Greece

### Abstract

*This article presents the results of a research dealing with the effectiveness of the use of new technologies in Greek high schools. The purpose of the research was to examine the extent to which blended teaching - i.e. the combination of traditional forms of teaching (teaching through lectures, etc.) and teaching economics courses with the use of computers - influences the effectiveness of learning when compared to teaching with traditional methods alone. The methodology followed is based on former research studies in this field, the overall results of which are presented in the first section of this article. To be more specific, the research discussed in the present article has to do with the teaching of the course "Principles of Economics" in the first form of senior high school with the support of computers and the Internet. The research took place at the 2<sup>nd</sup> Lyceum in Thessaloniki. Based on a post-research test that students took, we attempted to examine if there was a significant difference in the learning outcomes of students that were in the blended teaching group compared to a second group of students to which the same teacher taught the same material without the use of computers.*

*The basic conclusions reached were the following: with regard to the computer course, no statistical significance was found to support a difference in learning outcomes between students that were in the blended teaching group and those that were in the traditional teaching group. With regard to the students, evidence was found (62,2%) to support the hypothesis that most students feel comfortable with the use of technology.*

**Keywords:** Economics education, teaching economics, new technologies, senior high school.

### Introduction

In the last several decades there has been a large-scale emergence and use of technology in every area of human activity and especially in the educational field. This has brought about a dramatic change in instructional methods for general education and particularly for economics education. These methods have challenged the traditional teacher-centered, blackboard-lecture, text and class relationship.

In all subjects the exploitation of new technologies (such as microcomputers, personal computers, interactive and multimedia CD-ROMs, the Internet and the World Wide Web with its online simulations and interactive multimedia Web-based courses and virtual classes) has pushed instructional methods and didactics into promising new directions and has created new potential for teaching and learning. The effectiveness of these innovative technologies, however, has yet to be established in educational research.

The purpose of this article is to reveal to what extent the use of technology can influence the learning outcomes of secondary school students attending an economics course.

Existing research dealing with the effectiveness of the use of technology and the Internet on economics education has not provided strong evidence to warrant the use of technology as an effective alternative to learning. Much of this research has not been published and of the published research, only a small number of studies deal explicitly with the teaching of economics. In addition, most of the relevant studies are connected to teaching and learning economics at a tertiary level.

## **Review of the Literature**

### **Tertiary Education**

One of the first and most frequently cited research studies that examined the impact of the Internet as a powerful tool for enhancing the learning process in economics education is accredited to Agarwal and Day (1998). Their research included 210 university students among whom the experimental groups consisted of 40 post-graduate and 65 graduate students. An equal number of students participated in two control groups. The students were randomly assigned to the experimental and control groups. The Internet applications used by the experimental groups were e-mail, bulletin boards, and the World Wide Web. E-mail and bulletin boards were used to provide answers to students' questions regarding the course, while the pages posted on the Web were used to provide students with announcements and homework assignments related to the course, as well as the capability of accessing sources of data such as statistical series and data for their statistical assignments. The Agarwal and Day study examined the impact of technology on three crucial areas: a) student learning and retention of concepts, b) student perceptions of instructor effectiveness and c) student attitudes toward economics.

Agarwal and Day used TUCE (Test of Understanding College Economics) performance results and final course grades to compare the results associated with student learning and retention of concepts of the experimental and control groups. For the measurement of attitudes toward economics they used the ATE (Attitude Test of Economics), while student perceptions of instructor effectiveness were recorded with the use of a 5- Likert scale questionnaire that asked students to rate the teacher. The results revealed a positive impact of Internet implementation in economics courses on student learning and retention of concepts as well as on student perceptions of instructor effectiveness. The results were mixed with regards to the impact of the Internet on student attitudes toward economics. In the case of the ATE, Agarwal and Day took into consideration answers from participating students on the ATE questions regardless of the

recommendation by the designers of this test that “performance results should be interpreted on the whole as indicators of student attitudes toward economics” (Soper and Walstad, 1983:14).

Another study was conducted by Talley (1999) from 1997 to 1999 at the University of Dakota. In four departments student instruction included the use of technology, whereas in a fifth department students received traditional teacher-centered instruction. The instructional methods used not only incorporated the use of the Internet but also replaced course books with cd-roms and video. Students had access to course web pages on which they could obtain a variety of information such as course material, exercises, tests, and grades and were also provided with the possibility of communicating with their teacher and fellow students. Using simple regression and t-test, it was revealed that:

There was no statistically significant evidence to show a positive influence of using technology on student learning

Tally recommended the implementation of more technology-based courses for an improvement in learning outcomes.

Sosin, et al. (2004) conducted a large-scale study involving 3986 students from 15 universities in the USA. Her aim was twofold: on the one hand to examine the performance of students whose courses incorporated technology and on the other hand to investigate the time a teacher needed to spend on creating a technology-based course. She arrived at positive results to support the inclusion of technology in economics education since she found student learning to have improved significantly. Her study also reached the conclusion that course preparation time had also improved for teachers; the issue was how they managed their time and what use they made of technology.

Lim (1998) studied the impact of the WinEcon software in combination with the use of e-mail and web pages on the performance of students with low aptitude in economics. The study was conducted in Singapore and involved students taking an “A” level Economics course for the Cambridge G.C.E. Lim used an experimental method to compare the performance of students during mid-term and final exams. The control group consisted of 11 students and the experimental group consisted of 9 students using WinEcon in groups of three. WinEcon is an interactive electronic book for the instruction of Basic Economics that was a joint venture development by 8 British universities. It offered more than 75 hours of instructional content and consisted of self-evaluation questions, source data, a glossary of economics terms and references to economics books. In conjunction with WinEcon the experimental group also used web pages created for the course that included source data and e-mail to communicate with the teacher. The assessment of students was carried out with the use of a t-test and the results showed that for the experimental group there was a statistically significant improvement of average scores on mid-term and final exams in comparison to the control group. Lim commented on the results of the study, emphasizing that the results needed to be interpreted with caution because of the small number of participants and added that the positive results could be attributed to the novelty effect i.e. to the increased attention and interest that students display when an innovative teaching method is used. Lim’s study did not examine the impact of particular student characteristics to determine if a percentage of the positive results could be due to the collaborative approach used.

Coates and Humphreys (2001) examined the impact of supplementary Internet activities and learning content accompanying basic economics courses. Their study involved university students who were enrolled in two Macroeconomics courses and one Microeconomics course. Initially 66 students participated in the study; however, the statistical analysis is based on the data received from 52 students. The students were taught economics through the traditional lecture method but also had access to supplementary educational material that consisted of web pages which provided clarifications regarding the content in various ways, e.g. animated graphics or references to related web sites. The students could practice and be graded on tests that were created on the fly with questions in a data base and each test could be taken by students up to five times. In addition, students had access to synchronous (chat rooms) and a-synchronous (user list forums) communication services which they used to communicate with their teachers and fellow students. A percentage of student GPAs resulted from their active participation in the user list. The regression method was used to evaluate the impact that the frequency with which students accessed the user list and the practice they got from the supplementary tests had on final grades. A number of demographic and personal characteristics were also examined. The results of the Coates and Humphreys study indicated that using practice tests through the Internet and actively participating in user lists is positively correlated to improved learning outcomes. In contrast, the bare browsing and passive reading of topics in a user list is not positively correlated to improved grades in a course.

Terry, Lewer and Macy (2003) examined the effectiveness of using the Internet for economics education in comparison with traditional and with blended instruction. In the blended instruction approach, half of the classroom time was substituted for computer use including course notes, homework assignments and e-mail communication. This study was actually a continuation of a former study conducted by Terry (2000) at the same university. 242 post-graduate students who were enrolled in economics and finance courses participated in the study. The three groups consisted of an equivalent number of students: 84 participants were in the traditional instruction group, 80 were in the Internet group, and 78 in the blended instruction group. Learning was assessed in terms of student performance and grades on a final examination. Using regression researchers found that the Internet group had significantly poorer performance compared to the traditional group. The blended group also had poorer performance; however, it was not statistically significant. In addition, student evaluations of the course and the instructors were significantly inferior for the Internet group than they were for the traditional instruction and for the blended instruction group. The writers believe that these results indicate that a face-to-face relationship among students and instructors is a significant factor of the educational process.

The study of Navarro and Shoemaker (1999) who used a CD with a pool of questions and an electronic bulletin board for teaching economics also reached positive results with regard to student performance.

The conclusion reached from the research that has been conducted until now is that subordinate applications of technology have a tendency to play a role in either improving the performance of economics students or increasing their positive attitude toward economics courses, although more evidence is necessary to support this claim. What does become evident, however, under the light of the advancement of innovative technologies is that there is a need for the inclusive and thorough manipulation of the subordinate applications of technology, while at

the same time it is necessary to combine and integrate them into a unified whole. If, for instance, particular applications yield positive results, then their combined adoption may have an increased contribution to the accomplishment of learning goals.

### **Senior high school education**

Parris (2002) compared the performance of two groups of students whose instruction in management was based on two different teaching models: a) a traditional model and b) a collaborative model based on the use of computers. The study was carried out in a public school in Alabama with the participation of 60 students. Instruction in the traditional group involved lectures, discussions, and individual homework assignments. The collaborative model involved dividing the students into smaller groups of three, encouraging these groups of students to search for resources on the Internet, to interview local managers via e-mail and to use presentation software to present their group work. The results of this study did not provide evidence to support an improvement in the learning outcomes associated with the collaborative model compared to the learning outcomes associated with the traditional model.

Williams and Lonn (2004) examined the effectiveness of using computer technology in economics education and particularly for teaching concepts of economics to senior high school students. 210 students and 4 teachers were involved in the study. Teachers participated voluntarily, because they were keenly excited about incorporating innovative technologies into their instruction. Quantitative and qualitative methods were used in this research. More specifically the results showed that:

- Students who participated in the study and used technology did not perform better on the TEL than students who received traditional instruction
- Students believed that their knowledge had increased and that they had become comfortable with using technology
- Teachers stated that they were enthusiastic about using technology and that they were willing to spend time on incorporating other similar programs

In general, researchers emphasize that the use of computers and the Internet can help economics students because they provide them with numerous public sources of data and in addition, students equipped with technology skills have a competitive advantage in the job market (Sosin, 1997). However, although there has been a constant increase in the use of technology within the educational sector, there are not many references about its use in economics education and particularly with regard to its application in senior high schools. Furthermore, the largest part of the evidence has not yet been published (Simkins, 1999; Sosin, 1997).

## Research

### Method-Procedures

The research was conducted in Thessaloniki in the Spring of 2005. The data was collected by a graduate student (Nikitaki, 2005) for a research assignment carried out under the author's supervision. The study took place in secondary schools in a similar way to the Williams and Lonn (2004) study and involved 67 senior high school students enrolled in the course "Basic Principles of Economics". From these 67 students, 45 comprised the experimental group and were taught basic economics concepts through the use of web pages created for the purpose of the study. The remaining 22 students comprised the control group and received traditional instruction, i.e. class lectures without the use of technology. Moodle (Modular Object-Oriented Dynamic Learning Environment) was chosen for the dissemination of the electronic computer course. This environment was selected based on the criterion that it is an Open Source software and can be used at no cost on any server that is equipped with the PHP programming language and a MySQL database. It can also support other types of databases. At the University of Macedonia, in Greece, Moodle is currently being widely accessed through the web address <http://ermis.uom.gr/lessons>, where the web pages for the present study were also posted (<http://ermis.uom.gr/ecopaideia>). The web pages created were based on the course book "Basic Principles of Economics" and the accompanying activity book that students are supplied with in Greek secondary high schools across the country. The electronic course consisted of the course material, a glossary of new terms that needed to be introduced to students throughout the duration of the course, exercises and tests, as well as a content map for navigating through the web pages. The students in the experimental group were randomly divided into pairs and these pairs remained the same for the extent of the study. We examined the impact of technology on student learning of concepts as well as on student interest toward economics.

### Data Analysis

#### Student Questionnaire/Descriptive Statistics

A questionnaire was distributed to each of the 45 students (29 males and 16 females aged 15-17) assigned to the experimental group. It is important to note that 41 out of the 45 students (91%) had a personal computer at home and out of this number 20 students (48,8%) stated that they used their computer every day. 14 students (34,1%) said that they used their computer several times during the week, 6 students (14%) used their computer once or twice a week and only one student stated that he never uses a computer.

In terms of familiarity with computers, 62.2% of the students in the experimental group claimed to be extremely familiar with using computers, whereas 37% felt that they had regular familiarity with computers.

With regard to the purpose for which students used computers, the responses showed that: 84.4% (38%) of the students only played games on their computer, 77.8% (35 students) used their computers for browsing on the Web, 75.6% (34 students) for tasks related to programs such as

Word, Excel, PowerPoint, etc., 33.3% (15 students) for e-mail, 42.2% (16 students) used chat rooms and 51,1% (23 students) used other types of programs (Figure 1).

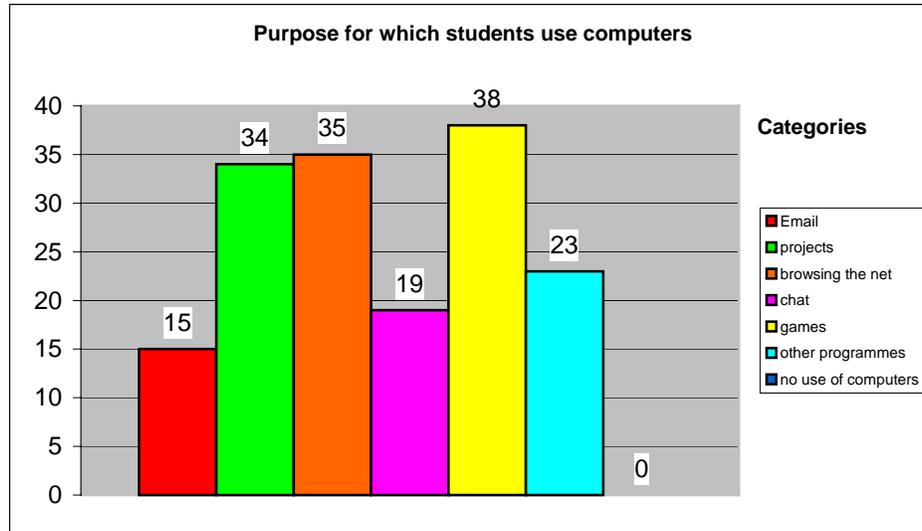


Figure 1. Computer Usage Categories

The rest of the questions on the questionnaire were related to the computer course. Students were asked to state the instructional approach that they preferred. The analysis showed that 41 students (91%) found the course interesting, three students (6.7%) were indifferent about instructional approach and only 1 student responded that he did not consider the computer course to be useful.

Overall student responses revealed that most students felt at ease with computers, they found the computer course interesting and they would welcome the integration of technology in more of their courses.

On the whole, the enthusiasm that students displayed in this study is similar to the Schmidt (2003) and the Agarwal and Day (2004) results, in which students showed a positive attitude towards the use of technology to support the teaching of economics courses.

### Analysis of the final test

On the final test students in both groups achieved equivalent scores. Similarly to the Talley (1999) study, the final test included questions related to topics that the teacher had given special attention to in class. Some of the questions were derived from the activity book accompanying the course book “Basic Principles of Economics” and others were created by the teacher. The purpose of the test was to examine if there was a statistically significant difference in test results between the experimental and control groups so as to determine the impact of technology on effective learning. Learning was measured in terms of achievement on the test for the two groups.

Specifically, the groups involved in the study were: 20 groups of students who had computers integrated into their course (these groups will be referred to as “Group A”) and 8 groups of students who received traditional instruction (these groups will be referred to as “Group B”).

The statistical program SPSS 11.5 for Windows was used for the analysis of the results. The scores for the students in Group A ranged from 7.8 to 20 (on a 0-20 scale) whereas for the control group the range was from 4.4 to 19. These grades did not lead to any conclusion. We therefore examined the average grades of the two groups to determine if there was a statistically significant difference. The students in the control group had an average of 14.43 with a 95% error  $\pm 3.76$  (Group A) which is one mark higher than the students in the control group who had an average of 13.4 with a 95% error  $\pm 4.98$  (Group B). A final t-test on the results showed that this difference was not statistically significant (giving a p-value of 0,556)

### **Results and Conclusion**

No statistical significance was found between the results of students who were instructed through an economics course that had been integrated with computers and students who had received traditional instruction for the same course (Basic Principles of Economics). Therefore, consistent with our initial hypothesis and in contrast to many corresponding studies that have shown a positive effect of technology on learning, our findings confirmed that the use of computers and the Internet for economics education does not have any impact on learning. Due to the small sample size of this study, it can be considered as a pilot study for future research that we plan to conduct.

Finally, it should be noted that the majority of students found the computer course interesting, and stated that they preferred the computer course to the traditional course.

### **General Discussion**

The literature has shown that computers as well as the Internet can contribute to making economics education more interesting and effective. The related research is not yet capable of providing us with totally generalized results. In particular, Greek research related to the use of new technologies for economics education is still in its early stages. At the University of Macedonia we are attempting to advance research in this area in hope that our efforts will lead to significant conclusions in the near future.

### **References**

- Agarwal, R., & Day, A. E. (1998). The Impact of the Internet on Economic Education. *The Journal of Economic Education*, Spring, 99-110.
- Coates, D., & Humphreys R. B. (2001). Evaluation of Computer-Assisted Instruction in Principles of Economics, *Educational Technology & Society*, 4(2).

- Lim, P. C. (1998). The Effect of Computer-Based Learning (CBL) Support Package on the Learning Outcome of Low-Performance Economic Students. *Computers in Higher Education Economics Review*, 12(1).
- Navarro, P., & Shoemaker, J. (1999). The Power of Cyberlearning: An Empirical Test. *Journal of Computing in Higher Education*, 11(1), 29-54.
- Nikitaki, E. (2005). *Research on the effectiveness of technology in teaching economics in Senior High School*. Unpublished master's thesis, University of Macedonia, Thessaloniki, Greece.
- Parris, B. J. (2002). *High School Entrepreneurships Education: A Comparison of a Traditional Teacher-Led Learning Model with a Computer-Supported Collaborative Learning Model*. Doctoral dissertation, University of Alabama, Alabama.
- Simkins, S. P. (1999, Summer). Promoting active-student learning using the world wide web in economic courses. *Journal of Economic Education*, 30, 278-287.
- Soper, J. C., & Walstad, W. B. (1983). On Measuring Economic Attitudes. *Journal of Economic Education*, 14, 4-17.
- Schmidt, J. S. (2003, Spring). Active and Cooperative Learning Using Web-Based Simulation. *Journal of Economic Education*, 34(2), 151-167.
- Sosin, K. (1997). *Impact of the Web on economics pedagogy*. Retrieved from <http://cba.unomaha.edu/faculty/ksosin/WEB/webteach.pdf>
- Sosin K., Blecha B., Agarwal R., Bartlett R., & Daniel J., (2004, May). Efficiency in the Use of Technology in Economic Education: Some Preliminary Results. *American Economic Review*, 2, 253-258
- Talley, A. D. (1999). *Technology and Teaching: Learning in High Tech Environment*. Retrieved from <http://www.homepages.dsu.edu/talleyd/papers/TalleyTeachingandTechnology.pdf>
- Terry, N. (2000). The effectiveness of virtual learning in economics. *Journal of Economics and Economic Education Review*, 1, 93-99.
- Terry, N., Lewer, J., & Macy, A. (2003, Summer). The Efficacy of Alternative Instruction Modes in Economics. *Economic Research Network Educator*, Retrieved from <http://ssrn.com/abstract=392561>
- Williams, R., & Lonn, St. (2004). *Using Handheld Technologies in High School Economics: A School-University Collaborative Design Project*. Retrieved from [http://www.ncsscufa.org/NewFiles/ti/CUFA\\_TI\\_Report\\_12%2013%2004.pdf](http://www.ncsscufa.org/NewFiles/ti/CUFA_TI_Report_12%2013%2004.pdf)

---

<sup>1</sup> Dr. Despina Bousiou is an Associate Professor at the University of Macedonia in Greece. She can be reached at: Department of Applied Informatics, University of Macedonia, Egnatia 156, GR-54006, Thessaloniki, Greece. E-mail: bousiou@uom.gr; Phone: +30 (31) 089-1887; Fax: +30 (31) 089-1290.