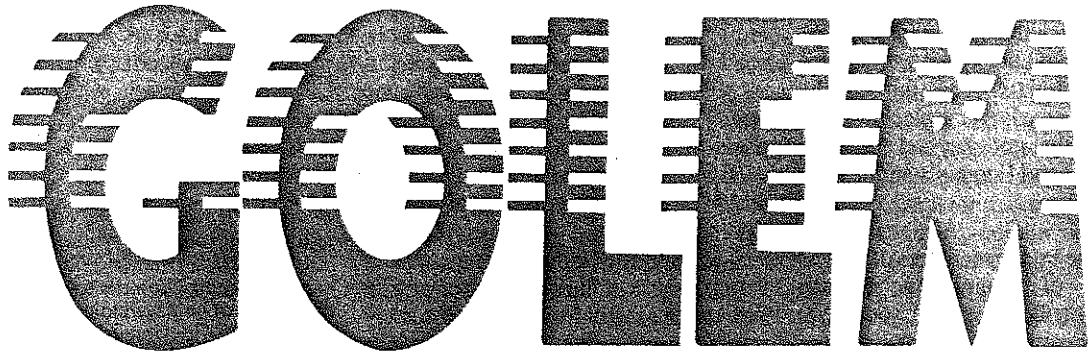


NEWSLETTER OF TECHNOLOGY AND EDUCATION

CNR (Institute of Psychology) - OLIVETTI - University of Rome La Sapienza (Int. Center for the study of Literacy Processes)

## EXPLORING THE PROPERTIES OF THE MEDIUM

**Alessandro Duranti***

All of the articles presented in this issue address a related set of questions. In trying to reckon with the uses and misuses of computer technology in education and the workplace – the two are not mutually exclusive, as shown by the classroom site, where someone's education is produced by someone else's work –, these articles center around the discussion of what is the best way to put computer technology at the service of human development and cooperation. The diversity represented by the articles in this issue accurately reflects the current variety of assumptions, methods, and goals in this area. Such a variety is largely due to the different ways of defining the properties of the medium "computer".

To borrow a term from Gibson's [1] ecological approach to perception, we can say that any artifact, just like any medium, affords different types of functions. Air affords breathing, the soil affords walking, a pen affords writing, and a television affords viewing and listening. As apparent in this list, the properties of the medium are not inherent in the medium itself. They depend on the subject who uses the medium. Thus, air affords breathing as long as there are animals with lungs around, pens afford writing as long as there are humans who can read and write, etc. Furthermore, when we are talking about cultural material objects such as computers, we must add the crucial role played by the socio-historical context of their use. What computers can afford is not something restricted to the interaction between the machine (with all its complex technology) and the users (with their complex cognitive abilities). It also includes the history of the subject, of the medium, and of the acts produced as well as the cultural context of their interaction. This means that one of the tasks faced by those engaged in trying to understand computer technology is a process of "deconstruction", that is, an interpretative procedure through which already known or potential properties are examined for their implications and consequences. In this sense, computer technology is the ultimate reflexive artifact of the post-modern age. It both constitutes and assumes an object which, to stretch and paraphrase Edward Sapir's well-known metaphor about culture a little further, "leaks all over the place". The complexity of the medium is such that one cannot start talking about its implementations without raising issues of cognition, economics, and social responsibility. It is in this context, that I would encourage the readers of Golem to approach the papers presented here.

To think of computers mainly as machines that can offer tutorials in the form of simulation programs, as discussed by Ray and Grimes with respect to college economics classrooms, is quite different from Meyrowitz and Loomis's use of Hypertext and Intermedia. In the former case, the computer is mostly used to replace the teachers in some of their functions and motivate the students to do "more of the same", whereas in the latter case, certain features of computer technology such as multiple screens and pull-down menus are exploited to teach college students what a teacher by herself

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cannot do, namely, to provide a flexible context in which to experiment with different sources of knowledge and become inquisitive scholars. How this can be implemented on a larger scale, however, is a question that goes beyond the scope of Meyrowitz and Loomis's stimulating contribution.

The article by the members of LCHC (Laboratory of Comparative Human Cognition), on the other hand, goes in yet another direction. Its authors explore what it means to think of computers as part of large and complex mediated activities through which students are linked to other classrooms and to centers outside of the classroom via electronic mail. Their approach is more global and at the same time more realistic for their awareness of the economic barriers to, and consequences of, widespread use of computers in education. What is special about their proposal is the will to link the computer to settings and activities that are usually not thought of as interconnected (e.g. the classrooms and community centers, junior high schools and university, teaching and research environments).

Finally, the interview with De Cindio and Menapace raises issues of transfer that have a strong social significance. The ways in which these researchers try to make sense of the new roles of women in a technologically advanced society remind us of the ways in which cognitive processes (e.g. the understanding of how a machine works, what it could do for its users, etc.) are embedded in their social context [2]. It is in this sense that an understanding of old technologies (e.g. weaving, cooking) can be of help in the understanding of new ones. To think that the two are unrelated and that computers offer a completely new challenge means to see only one side of the moon. The other side is full of old and interesting stories, including failures as well as successes.

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**Notes**

(1) See James J. Gibson (1985) *The ecological approach to visual perception.* Hillsdale, NJ: Lawrence Erlbaum. I owe the idea of adapting Gibson's terminology to the discussion of new technologies to the members of the Laboratory of Comparative Human Cognition in San Diego and to Gerald Balzano in particular. Any potential or actual misuses of Gibson's theory are of course exclusively my own.

(2) See Jean Lave (1988) *Cognition in Practice: Mind, mathematics and culture in everyday life.* Cambridge University Press; Barbara Rogoff and Jean Lave (1984) *Everyday cognition*: Its *development in social context.* Cambridge, MA: Harvard University Press; Sylvia Scribner (1984) Cognitive studies of work. *Quarterly Newsletter of the Laboratory of Comparative Human Cognition,* 6 (1 & 2).

## EDUCATIONAL RESEARCH

# COMPUTERIZED SIMULATIONS AND TUTORIALS IN THE COLLEGE ECONOMICS CLASSROOM

**Margaret A. Ray***
**Paul W. Grimes****

### Introduction and History

The continued increases in microcomputer capabilities combined with dramatic growth in the availability of educational software have made the computer a common instructional device in the college economics classroom. In this short paper we report on the current trends in computerized economics instruction and we review the findings of recent research studies evaluating the effectiveness of computer usage in elementary economic courses.

In the U.S., computer-based instruction has a relatively long history in the teaching of basic economics at the college level. Computer usage in economic education began in the late 1960's with computer-assisted instruction (CAI) and computer-managed instruction (CMI) programs that ran on large mainframe computers. Early CAI programs used simple question and answer formats to provide students the opportunity to study in an interactive environment. CMI systems were used to manage testing and record keeping for self-paced and "programmed learning" courses. Most of the early programs were highly text oriented and did not take advantage of the graphical capabilities of the computer medium. Educational researchers who evaluated these first attempts at using computers to teach economics found the methods successful in generating student learning, but no more so than traditional methods (Yoho and Walstad, 1990). Given the high costs, in terms of both computer and instructor time (early experimenters had to write their own programs), some economists concluded that the potential for computers in the economics classroom was limited (Soper, 1974).

In spite of such conclusions, many economists continued to search for unique ways to integrate computers into the economics classroom. As in many fields, the advent of the modern microcomputer revolutionized the use of computerized instruction in economics. In comparison to mainframe computer hardware, microcomputers offer flexibility, low cost, and readily available software. Additionally, improving the "computer literacy" of students has become an important goal for most American colleges. Given that microcomputer skills developed in economics courses complement those now sought by prospective employers of graduates, computerized instruction is now pervasive in the economics discipline. The prospects for continued and expanded microcomputer use in the economics classroom are bright.

### Current Trends

The most frequent application of the computer in the economics curriculum has been the use of microcomputer tutorials in elementary theory courses. The widespread use of tutorials has been promoted and encouraged by textbook publishers offering software as a supplement to their products. American publishers have concentrated on developing programs which are essentially electronic workbooks with "drill and practice" exercises. (All major publishers of "Principles of Economics" texts, more than two dozens, now offer computerized tutorials