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Should Students Use Computers in Education?

We are a society of technology users. Therefore, one reasonable goal of student's computer education would seem to be to develop a basic knowledge of the structure and operating principles behind the most common tools. But as the technology has grown more complex interest in conveying this knowledge to all students before graduation from high school has diminished, even as use of high technology has expanded. This attitude causes a number of problems concerning the nature of the relationship between humans and machines.

Machines are becoming more and more complex and inscrutable. Facing an apparent impossibility of understanding how they work the human response has been not greater curiosity but apathy. In this sense, it causes people to become less humane. It may, therefore, have negative influences on any areas that require curiosity and investigation, not only in relation to machines but in personal and social relations.

In the case of computers, students have to consider that they have penetrated into every human activity because they replace or simulate a certain part of one's thinking. One does not find a car or a washing machine inside an office, a bedroom, or a factory. But one may very well find computers in those places - and nearly everywhere else. Due to this ubiquity, it is necessary to teach students what computers are, how they may be used in general applications, how they may be well or badly employed and what beneficial and undesirable effects they can have on the individual and society. Some of the latter influences, such as the impoverishment of information due to the necessary quantification of all data, can only be understood if one has

some knowledge of the computer's internal structure, from the hardware and the logical points of view. These are the reasons why this is a subject that is best addressed at the universities, so that all young people can obtain a fundamental knowledge of how the computer operates both for us and on us.

Computers can be used in teaching students at the universities in four broad categories:

1) The first one makes use of computer programming as a developmental or «authoring» tool. Applications like Hyper studio are among the most popular and versatile of these programs. The most articulate advocate in this area is certainly *Seymour Papert*, developer of the LOGO language system. He used the programming language LOGO to develop a mathematical reasoning in children or students. LOGO is an interesting programming language, with very simple but powerful graphics commands. It draws students into a thinking environment Papert called «mathland.» The use of this term suggests that Papert agrees that LOGO, as any programming language, requires the kind of highly structured, formal, and reductions form of

thinking. He also clearly agrees, that highly abstract thinking is not appropriate for young people. BUT he does not seem to recognize that this is precisely the type of thinking operating a computer requires. He bases his embrace of computerized elementary education on the astounding assertion that computers reinforce concrete thinking [3, p.11-12].

2) Another form of using computers in education is «programmed instruction» introduced conceptually by *B. F. Skinner* in the early 1950s. The computer presents a subject, often using sound and animation (the so-called multimedia of recent times). After this phase (sometimes in the midst of it), questions are posed to the student, and the answers lead to other topics of investigation or the repetition of previous ones that were not properly «learned.» One may also classify in this category the «drill-for-skill» types of games (often disparaged as «drill-to-kill»). Obviously, in programmed instruction, the computer forces the same type of thinking as in any other application, because the commands given by the students also constitute a formal language, and the computer reacts always according to a ri-

gid mathematical formula, based on nothing more persona than the students' previous responses. BUT learning is here reduced to memorization and the capacity for solving problems directly related to the covered material; the program cannot take into account the level of maturity, creativity, and intuitive abilities of different users. Moreover, programmed instruction is extremely narrow, leaving no room for improvisation. It boringly repeats itself - a fault recognized by Papert and his followers, who would replace it with the «open» space presented by a programming language such as LOGO [6].

3) Another form of computer use in education is simulating experiments. Instead of observing and doing something real, either in a laboratory or in the field, students explore simulations on the computer screen. For example, one program popular in the early '90s, and elaborated on in various forms ever since, simulated a natural ecosystem. The students could change a number of characteristics of the habitat, the ramifications of which were then played out for them to observe and from which they were to draw conclusions. It remains a fascinating program that would

seem to teach children that one alteration in an ecosystem can trigger a whole series of unanticipated changes. But it suffers from the same type of mathematically rigid reasoning that one finds in working with a programming language. But *C. A. Bowers* pointed out a number of cultural problems created by trying to reduce problem solving to mere data analysis. One aspect of this tendency is that the simulation, which is based on sophisticated mathematical models hidden from the user's view, gives the illusion of conforming to the real world, when in actuality it only conforms to the very limited contingencies anticipated by the programmer. What the child comes to learn is that the ecology of a deer's environment is predictable, possessed of discrete variables that can be manipulated with precision and that constitute a finite, closed system. It fosters a mechanical view of nature just as a political simulation fosters a mechanical, rational view of social relationships, also available to manipulation and control. It is not the way young children should learn to relate to nature or other human beings. Real habitats possess none of the simple cause and effect characteristics that the simulation is based on. This is

a deficiency that adults and older teens who have had a wealth of experience with the real thing can work around. Children, without that experience and ability to maintain an accurate abstract image of a real pond, have no means by which to distinguish reality from impoverished representation. Experiments should be performed in a lab or in the field, and not simulated. One of the biggest problems of education today is that it is too abstract, divorced from reality, which is one of the main reasons that it is not interesting to students. Computer simulations increase this abstraction, because students do not have the opportunity to encounter the real thing. One could object: but not everything may be performed in a laboratory or in the field, as for instance simulating the fall of bodies on the moon. Our answer is that up to the last high school grades, if an experiment cannot be done in the lab, maybe it should not be taught at all, because it will have nothing to do with the student as a whole, but only with the intellect. Examples used as illustrations to theories should be taken from day-to-day life. What might be sacrificed in breadth of knowledge would be mo-

re than made up for in relevant depth, without disturbing the child's appropriate way of learning.

4) Finally, one may use computers as productivity tools, both within content areas and as an area of study for future use. This means teaching general software, such as word processors, electronic spreadsheets, graphic, database, and communication systems. Here is encountered the problem of software requiring, for their operation, the use of commands that constitute a formal language and that force a highly constricted, logical thinking.

Surely, it's worth making mention of ***arguments in favor of use of computers at the universities:***

a) Computers should be learned and used as much as possible because they will be essential for the individual in the professional working place.

b) Students who do not master computers will not keep pace with their groupmates.

c) Computers are good tools for learning.

d) Computers improve students' achievements.

e) Computers accelerate student's intellectual development.

f) Computers may provide a free environment for learning.

g) Computers may promote social (and family) cohesion.

h) Computers provide a fascinating learning environment, one that attracts young people.

i) Computers provide for a challenge of traditional educational methods and values.

j) Computers induce a certain vision of the world.

k) Computers make it possible to learn without tensions and pressures.

l) Computers (through the Internet) make students get interested in foreign cultures and people.

m) Computers develop self-control.

n) Computers may provide for a more humanistic teaching.

o) Computers may enhance imagination and creativity.

p) Computers may be used to make children conscious of their own thinking process.

q) Computers provide for an individual way and pa-

ce of learning.

r) Students who don't use a computer at home may develop psychological and social problems (e.g. a sense of inferiority).

s) Through the Internet, computers make it possible for students to access all sorts of information not available through other means [3, c.23-47].

But speaking about merits, students should also remember about ***some demerits of use of computers:***

a) Computers are becoming so easy to use and learn, on-line tutorials and helps are becoming so powerful, that any person will be able to learn how to use computers very fast at any age. The use of computers will be part of on-the-job training, provided by the enterprises themselves. Just look at the millions of people now using computers without having had any previous special training, sometimes just with some hints from other people.

b) It is necessary to consider if teachers are requiring something that only students with computers at home can do, for instance handing in an essay necessarily composed with a text editor, or looking for some information

through the Internet. In these and similar cases, the teacher should be advised that it is not fair to discriminate against students who don't have access to a computer.

c) Students, working with computers, can get wrist and neck injury, eyestrain, obesity (to the extent that computer use replaces physical activity in a child's lifestyle), and the possibility of toxic emissions and radiation.

d) Emotional and social demerits include social isolation, weakened bonds with teachers, lack of self-discipline and self-motivation, emotional detachment from community, and commercial exploitation.

e) Intellectual disadvantages include lack of creativity, stunted imagination, poor language and literacy skills, attention deficit, too little patience, plagiarism, and distraction from meaning.

f) Moral hazards include exposure to online violence, pornography, bigotry, an emphasis on information devoid of ethical content, lack of purpose, and irresponsibility in applying knowledge. This category is primarily related to the World Wide Web, and these concerns are quite real for Web-based learning.

So, the real danger for disadvantaged students is just the opposite of what many people fear: ***«In the end, it is the poor who will be chained to the computer; the rich will get teachers»*** [2, p.14].

In conclusion we can say that computers have penetrated every human activity. Problems caused by them aren't direct or visible. Computers not only replace thinking but can shape it. For all these reasons we have to be extremely careful in using them in education. The University of Future need not be a more technological one, but it must be a more humane either. It should have human teachers and classrooms, but teachers will have to fight courageously to resist the pressures to turn them into technicians, information repositories, transmitters and facilitators. They will have to relate to their students as human beings in development, and not as storing and sorting machines; as real individuals, and not as collective abstractions. Whereas computers handle all their users exactly in impersonal, cold manner - as machines - only a human being can respond to a student out of a deep personal knowledge and intuition of the individual needs, aspirations and moods. Students need

understanding, compassion, love and sacrifice from their teachers far more than they need access to billions of bits of information. They are in urgent need to admire their teachers as individuals with knowledge, life experience, and wisdom, for the problems of youth. More than mere trainers of skills they need teachers who can help them to develop and appreciate noble qualities, such as social responsibility and sensitivity, compassion, courage, love, sacrifice, honor, and justice.

To be able to put the computer in education or in individual or social life it is necessary to understand very well what it is, as its main characteristic is that it is an abstract, and not concrete machine (as, for example, a bicycle). Taking into consideration that computers require enormous self-discipline, it is better to allow students' computer usage at the age of 19-21. This fits nicely with the young person's understanding what a computer internally is, learning afterwards how to use it and criticize its influence. In particular, it is impossible to teach a student how the computer works internally – this requires quite a bit of knowledge of mathematics and physics.

In particular there is danger that computers used too early contribute to creating insensitive, amoral adults, behaving and reacting like a machine, unable to feel interest in other people and without social responsibility.

Thus, introduction of computers only after a childhood environment steeped in love may make it possible for them to put these machines in their proper place. And the problem is not in computers themselves, but in the way we use them. We must remain human; always feel like human and think like human. And we should remember that computers oughtn't to be preferred to revive communication and studying, though their usage is rather helpful.

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