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ABSTRACT
                Although computer use in a variety of educational
environments has grown tremendously in the past five years, issues of
who uses the computer and how they use it are arising. Preliminary
research indicates that computer access is related to both
socio-economic status (SES) and sex, with male students from
wealthier school districts being most apt to have access to
computers. SES is also related to computer use, with higher SES
students being more apt to use computers in creative ways, and low
SES students being more apt to use computers for remedial drill and
practice. Access to computers is additionally influenced by
geographic location, with the least amount of computer usage in the
south, and ethnic background, with white native English speakers
overwhelmingly predominating as computer users. As computers play an
increasing role in society, and as studies provide additional
evidence of the positive effects of computers on achievement and
motivation, the problems of computer equity must be addressed and
solutions found. A 17-item bibliography accompanies this paper.
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# Computers in Education:  A Question of Access

## Access to Computers

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During the past five years, computer use in education has grown
tremendously.  As computers are used in a variety of educational environments,
issues of who uses the computer and how arise.  Preliminary research indicates
that computer access is related to both socio-economic status (SES) and sex,
with male students from wealthier districts being most apt to have access to
computers.  SES is also related to computer use, with higher SES students
being more apt to use computers in creative ways, while  lower SES students
are more apt to use computers for rememdial drill and practice.  As computers
play an increasing role in society, and as studies provide additional evidence
of the positive effects of computers on achievement and motivation, the
problems of computer equity must be addressed and solutions found..

A paper presented to annual meeting of the American Educational Research
Association, Montreal, Quebec, April, 1983

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Computers in Education:  A Question of Access

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Micro-computers have taken education by storm and are becoming of
increasing importance to our educational lives.  Children are learning to
program with BASIC, think with LOGO and improve their basic skills with any
number of available software packages.  Unlike earlier generations of
educational panaceas, parents and most educators appear to be in agreement
with federal, state and local governments that computers are the most
important educational innovation since the printing press.  Since their
introduction, in the schools, in 1979, over 96,000 computers have been put
into 29,000 of the 84,226 public school buildings, in this country.
Approximatly 11% of elementary schools, 25% of junior high schools and 43% of
senior high schools have at least one computer (Market Data Retreval, 1981).
It is expected that this growth will continue and by, June of this year, over
36,000 schools (or almost 43%) will have computers.

Unlike previous educational innovations, this one is not being primarily
funded, by government.  Federal and state funds account for only about 30% of
the funds allocated for computers.  The other 70% come from local tax levies,
industry gifts and everything from PTA car washes to bake sales (Lipkin,
1983).  The primary determinant of who receives computer instruction, in this
time of the "New Federalism" is not who needs it, but rather who can afford it.

Just recently people have begun to become concerned about where computers
are located and who has access to them.  As a recent letter to Education Week
stated: "There is a great danger that computers may simply add to the inequity
of our society by being adopted only in suburban upper class districts and in
private schools (and homes) with boys being the favored users"(Education Week,

1983, p. 8). The teacher/author of that letter has a legitimate concern.
Currently computers are disproportionatly located in larger districts serving
wealthier populations. For example, less than 33% of districts serving fewer
than 2,000 students had computers, while over 67% of districts serving over
5,000 students had computers. The relationship between computer access and
district socio-economic status is even greater. Thirty percent of districts
with fewer than 5% of their students under the poverty line, had computers;
compared to 12% of districts with over 25% of their students below the poverty
line. Twenty-one percent of districts with 5-11% of students below the
poverty line had computers, while 17% of those with 12-25% of students below
the poverty line, had computers. The amount of federal funds a district had,
did not appear to be positively related to their use of computers; if there
was any relationship, it was a slightly negative one (Market Data Retreval,
1981).

Socio-economic issues are related to how computers are used as well as to
if they are used. Currently there are three major models of computer use in
education. These are the student as programmer, the student as user of
existing software programs and the student as computer aware person.
Unfortunatly programming has generally been seen as the perview of the gifted
and talented or higher socio-economic status students, while drill and
practice computer-assisted instruction has been more frequently found with
"disadvantaged" students. For example a California survey of computer use in
education found that children from lower socio-economic strata were more apt
to be using computers to develop lower level skills than were students from
higer strata. When parents' occupational status was rated 1,2 or 3, with 3
being the highest rating, the average rating of students using the computers

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for computer-assisted instruction was 2.19, while for those learning computer literacy, it was 2.32. Other breakdowns were; games and simulations-2.28, programming -2.35, creative approaches-2.40, reading-2.08, vocational work-2.12 and math drills-2.16 (Euchner, 3/2/1983).

Watt (1983) came to similar conclusions, finding more affluent suburbs more apt to use computers for programming and computer awareness, while less affluent urban and rural areas were more apt to use computers for computer-assisted instruction. Indeed, he concluded that computers, as they are currently used, may reinforce existing socio-economic inequities rather than fostering educational equity.

Even within suburban districts, there are differences in who uses the computer and how. The Andover, MA model where gifted children learn how to program, while average students learn computer awareness, is a model that is followed by many districts. Of the teachers responding to the National Education Association survey on computers, 33% use the computer to teach computer literacy while 77% use it for computer-assisted instruction (Norman, 1983).

Access to computers is also decided by geographic location. The National Assessment of Educational Practice found the least amount of computer use in the south. Nationally, by the time they are 13, 23% of students have used the computer; in the south, that figure is 12%. Minnesota is the most active of the states, exposing 95% of the students to computers, prior to their graduation from high school. Other active states include Alaska, California, Deleware, Florida, North Carolina and Texas (Euchner, 2/16/1983).

While socio-economic status and even geographic location have an influence on student access to computers, there are other variables, such as sex and ethnic background that even more directly influence computer use. For

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example, although 50% of the students in school are female, over two thirds of the students learning about computing are male (Computer Literacy, 1983). Girls are being kept out of the computer revolution. Keeping girls away from computers starts early and is often unconscious. For example, in Michigan a group of pre-school boys created a computer club and would not let girls, in the class, have access to the machine. In other schools the more aggressive males have been found to usurp access, to compuers, from the less aggressive girls. In yet other schools, computers are presented as advanced math electives, taken by few math anxious young women (Kiesler et.al.,1983).

Stereotypes have played a major role in determining who uses the computer and how. The stereotype that boys are stronger than girls, means that boys are more frequently chosen to help bring the computer to the classroom. Another accepted stereotype, that boys are more mechanical, means that it is the boys who are asked to help set up the computer and "introduce it to the class".

When boys alone introduce a new idea or object to a class, then both boys and girls have a tendency to view it as an activity for boys, not girls (Greenberg, 1978). Thus boys get more involved with the computer, stereotypes are supported and computer use is limited.

Things are changing. Teachers are setting up rules to determine who can use the computer and for how long. Under these rules girls are spending as much time as boys on the computer (Kiesler, Sproull and Eccles, 1983). Educators are presenting computers with an "art" orientation rather than one of science and math and girls' interests are increasing (Berger, 1983). Programmers are beginning to become aware that girls are more attracted to

non-violent games and organizations such as Computers for Girls are begining
to develop and distribute such software. As more female teachers become
involved with computers, the number of role models for girls are increasing.
Most "hackers" are still male, but more and more females are joining the fold
(James, 1982).

While more girls are becoming involved with computers, they, and the
boys, are still overwhelmingly white and native English speakers. There are a
variety of reasons for this. First, and prehaps most importantly, the poorer
districts, mentioned earlier as having less access to computers, are also the
districts that are most apt to have large numbers of minority students. Too,
more and more students are learning about computers by participating in the
ever growing number of private computer camps, after school and weekend
programs. Again, almost all of the students who attend these programs are
white, native English speakers. Most minority parents just don't have the
resources to allow their children to participate in these programs (Learning,
1982). Minority children are also underrepresented in the ranks of those
defined as gifted and talented, the group most apt to learn programming in
school.

Things are particularly serious for students whose native language is not
English. Because, in part, of selection procedures that are based on English
standardized tests, these students are severly underrepresented in gifted and
talented programs. They are also limited in their use of computer-assisted
instruction by the almost total lack of software in Spanish or almost any
language other than English or French. Even the ability of these students to
learn about computers is impaired by the lack of materials in Spanish, the
lack of information on using computers with bilingual classes and the lack of

role models.  Parents, of students whose native language is other than

English, are more likely to be poor and unable to afford their own computers

or private training.  And these schools are the also the least apt to have

computers.  In terms of computers and computer use in education, the

non-English dominant student is just left out.

The exclusion of these students and others, from access to computers has

serious implications for education as well as equity.  Computers have been

found to be very effective aids to learning.  Studies of computer-assisted

instruction have concluded that "there appears to be rather strong evidence

for the effectiveness of CAI over traditional instruction where effectiveness

is measured by standardized achievement tests" (Jamison, et.al., 1973).

While these studies were done on larger mainframe computers, more recent

studies, using micro-computers, have found similar results, with an additional

benefit of being more cost-effective (Pitschka and Wagner, 1981).  More recent

studies of computer-assisted intruction have been found to increase speed of

learning as well as achievement (Lipkin, 1983).

There have been some indications that computer-assisted instruction can

also be of assistance in learning second languages.  While work has not been

done at the elementary level, work has been done, at the college level,

teaching English speakers French, German and Russian (Allen, 1973).

Evaluations of these programs have found computers having a positive effect on

student second language learning (Allen, 1973).

Although less studied, learning to program appears to have even greater

educational benefits.  Students who learned to program in BASIC were found to

score significantly higher on standardized math tests than did a control group

(Canuto, 1981). Young programmers have also been found to become better

problem solvers, than their non-programming classmates (Lipkin, 1983). And of

course, the motivating effects, the stories of students who give up lunch,

stay after school and do almost anything to work on the computer, are well

known.

While the inclusion of all students, in computer education, is a simple

matter of justice, it is also a matter of national need. When government

officals and others talk about the need for a technologically literate

population, they are not excluding those who are female, poor or whose native

language is other than English. Indeed this year, the federal government is

funding model projects to incorporate technology, including computers, in

bilingual education programs.

The computer, if properly used can be a powerful tool for educational

equity as well as for educational achievement. However if computer use is

limited; if the computer serves primarily white, English dominant males, from

higher socio-economic backgrounds, then we are increasing the schism between

have and have not students and as educators, we are failing. As one eight

year old girl explained; "Someday I'll need to use a computer badly. People

will give me one and I won't know how to use it. I want to learn now." We

need to help her do that.

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