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*Six-year-old Nicole Thibodeau, totally absorbed with her computer during a workshop at a shopping center in Golden Valley, Minnesota.*

PHOTOGRAPH BY DAVID BURNETT/CONTACT



# Second-Class Citizens?

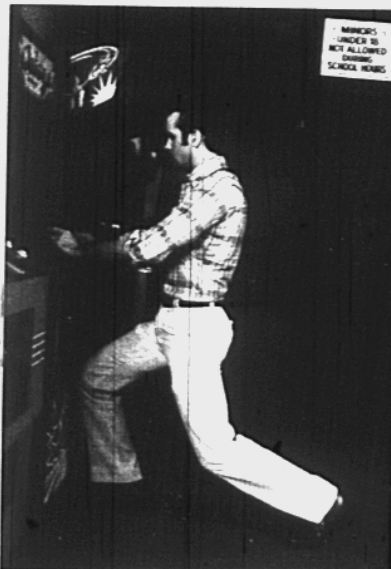
**FROM VIDEO ARCADES TO  
KEYBOARD CAMPS, GIRLS FIND  
THE WORLD OF COMPUTERS  
A MOSTLY MALE DOMAIN.**

**BY SARA KIESLER, LEE SPROULL,  
AND JACQUELYNNE S. ECCLES**

**L**ittle girls, it is said, are made of sugar and spice and everything nice. These days, however, "everything nice" includes the ability to operate and, in general, feel comfortable with the computer. We believe that little girls possess this ability, but the so-called computing culture places obstacles before them. These obstacles, while not insurmountable, present genuine problems. Unless they are removed, the girls of today may find themselves second-class citizens in the computer-intensive world of tomorrow. Consider the video arcade. Peer inside and, save for the elec-







PHIL HUBER/BLACK STAR

An arcade addict (above), puts his body and soul into the game.



At a Long Island arcade (right), a girl watches while her boyfriend plays.

JOE ORLANDO

tronic bells and whistles, you will see the poolroom of yesterday. Like the poolroom, it is largely a male preserve, a place where boys and young men gather. For many, it provides the first taste of the computer and, as such, serves as a doorway into a culture that is rapidly transforming the fabric of work. Closing that doorway to girls may inadvertently stack the deck against women in the electronic work place.

Within a few years, according to some industry estimates, computers will be the primary tools in 25 percent of all jobs. Increasingly, computer literacy is becoming an essential skill in the marketplace. One computer ad, for example, shows a young job applicant sinking lower and lower in his chair as he is forced to admit that he does not know how to program.

Children who are exposed to computers early on are most likely to develop "computer efficacy," learn procedural thinking and programming, and develop the sense of mastery that will encourage them to tackle more complex computer tasks.

The culture of computing is overwhelmingly male. With few exceptions, men design the video games, write the software, sell the machines, and teach the courses. Most games, according to Dan Gutman, editor of *Vid-*

*eo Games Player*, are "designed by boys for other boys." Until recently, boys outnumbered girls in programming courses and in computer camps by as much as eight to one. (In recent years, however, according to officials at several computer camps, the enrollment ratio has dropped to about three to one.) If this bias leads to an equivalent gap in competence and confidence, the girls of today will undoubtedly become second-class

citizens.

At first, computing is a strange and potentially humiliating activity, and girls need to be encouraged to take the initial plunge. The stylized nature of computing, and its arbitrary conventions, can be threatening. But those boys and girls who do acquire some proficiency usually advance rapidly. They learn discriminating attitudes toward games, machines, software, and programming styles. They learn to



DAN MACKAY/BLACK STAR

CHUCK SWANSON/CONTACT

Macho games for the home computer.

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work their way through the complexities of computing syntax, devices, and programs. And they learn the language and values of "hackers"—those who spend most of their free time "fooling around" with computers.

Most children receive their initiation into the world of computers by playing video games in the arcades, at home, or at their local computing center. One study of children who had home computers found that 67 percent of those over 12, and 88 percent under 12, used them to play games, along with other activities.

The video arcade is a den of teenage male culture, a place where teenage boys gather with their buddies. Occasionally they bring their girlfriends, whose main role is to admire the performance of their boyfriends, not to play themselves. In an informal survey we made on several busy Saturdays in a suburban Pittsburgh shopping mall, we found the video arcade populated overwhelmingly by boys. Of the roughly 175 people we counted, only 30 were girls. We saw several groups of girls playing the games; all the other girls were with boys. Not once did we see a girl playing alone.

The software sold for home computers offers an array of land battles, space wars, and other forms of destruction, as well as typically male sports. This bias is reflected on the colorful covers of the game packages. On the rack in one store, for example, we found such games as Olympic Decathlon (four male athletes on the cover), Cannonball Blitz (five men in battle), and Swashbuckler (seven pirates). In all, there were 28 men and



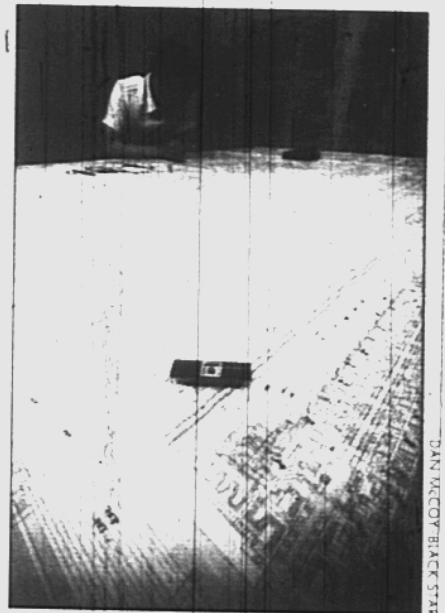
An IBM technician (above) install circuit boards in a data processor.

An Atari designer (right) works on plans for a computer chip the size of a fingernail.

only four women depicted on the game packages that we saw on this rack. This bias is unlikely to attract girls to such games.

In the arcades, however, things are beginning to change. For example, Pac-Man, and a dolled-up version called Ms. Pac-Man, seem to appeal especially to girls. This year, each of these arcade games produced record sales of nearly 100,000 machines. Industry executives, trying to take advantage of the still largely untapped market of female players, are turning out an increasing number of non-macho video games designed with enough whimsy to appeal to girls. (See "Crosstalk": Play, page 10.)

Computer stores are also an alien environment for most girls and women by virtue of the very products they stock. Most women are not familiar with electronics equipment, wires, and related accessories. This comes as no surprise, since the first customers for these stores were mostly male electronics hobbyists of the sort who used to build their own stereos. Computer stores are, in fact, electronics stores. The operators and sales people are mainly male; usually young, and often fervent advocates—to male



customers—of computing as a way of life.

Even the educational software designed for children bespeaks a young, male culture. As Mark Lepper, a Stanford psychologist, points out, "One sees . . . a variety of presumably educational games that involve the same themes of war and violence that are so prevalent in video-arcade games, and another large class of programs that involve largely male sports—baseball, basketball, and football. In the game of Spelling Baseball, for instance, the child's reward for superior performance is the opportunity to see one's own baseball team outscore the computer's team. When one watches chil-

JAMES BRODRICK/INTERNATIONAL STOCK PHOTO

DAN MCCOY/BLACK STAR

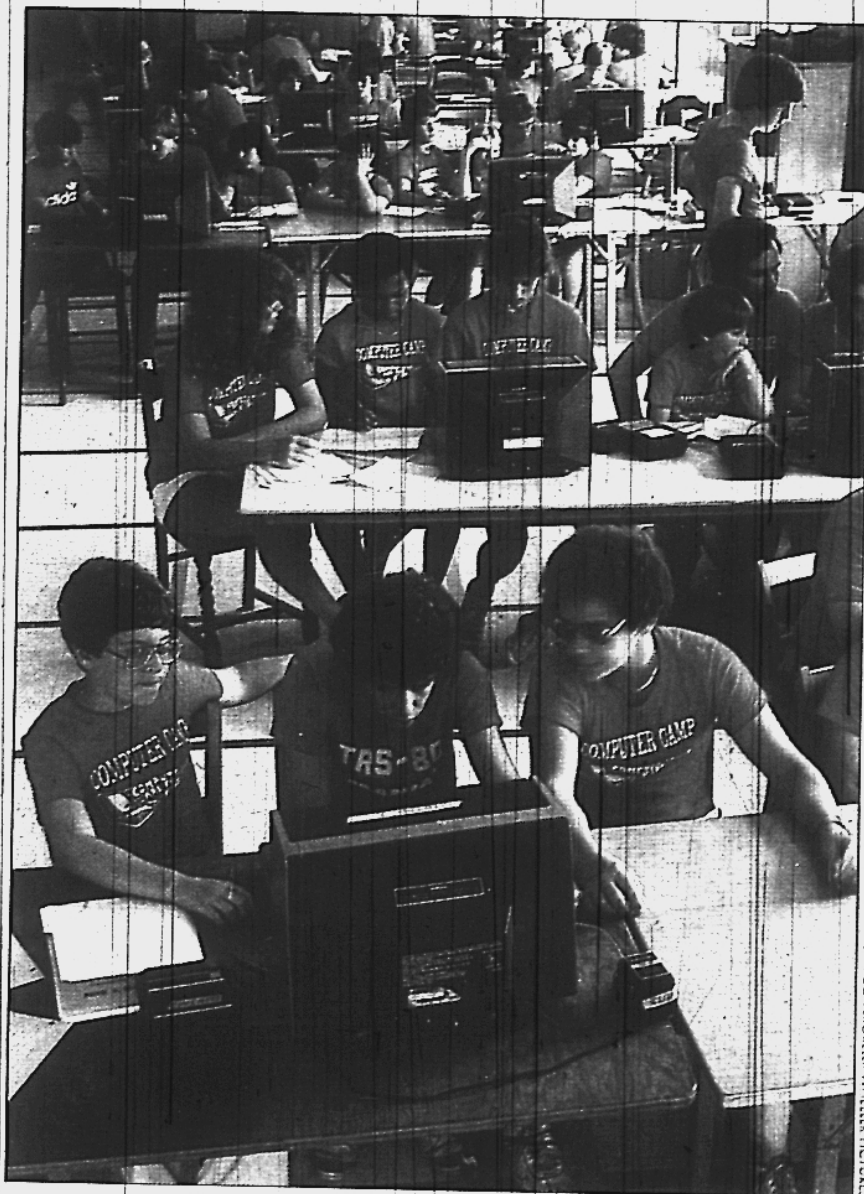


dren exposed to these games, it is hard to avoid the conclusion that these choices are not optimal for interesting girls in the world of computers."

Another obstacle for girls entering the world of computing is the visual format of the video games. Zooming through space, dodging asteroids, and shooting down alien battle cruisers are all spatial tasks. They require quick judgments of spatial relationships and intricate hand-eye coordination, and maneuvers based on those judgments. Accumulating evidence suggests that boys, on average, have an advantage over girls in just such spatial abilities. In a thorough review of the field in 1974, Eleanor Maccoby and Carol Jacklin, in *The Psychology of Sex Differences*, confirmed the fact that boys excel in visual and spatial skills, particularly in tasks that require depth perception and solving mazes—both essential skills for many video games. (Of course, these differences may also be partially due to social factors, like different styles of child-rearing for boys and girls).

One would expect from these research findings that boys would easily outscore girls on most video games, and that girls' supposedly inferior spatial abilities may be discouraging them from competing in the arcades. But in fact, girls can score just as high as boys on video games—if given a chance to master them. Carl Berger, professor of education at the University of Michigan, gave 100 boys and girls a chance to practice on a non-warlike—and therefore sexually unbiased—video "dart" game in which the players estimate the position of a rising balloon, and then try to pop it. At first, the girls in this study did worse than the boys. But after practicing for 10 complete games each, the girls began performing as well as the boys.

Finally, the computing culture appeals to the rebelliousness of teenage boys. Indeed, the professional computing community preserves many counterestablishment attitudes. Some hackers engage in such borderline activities as pirating software, unlocking telephone lines, or gaining illicit access to computer systems. The computer culture has bred a new kind of male punk, who prides himself on his talents at breaking codes, illegally copying computer games, and overloading time-sharing systems. Some even send



EMRICO HEBERTH-WITTEK PICTURES

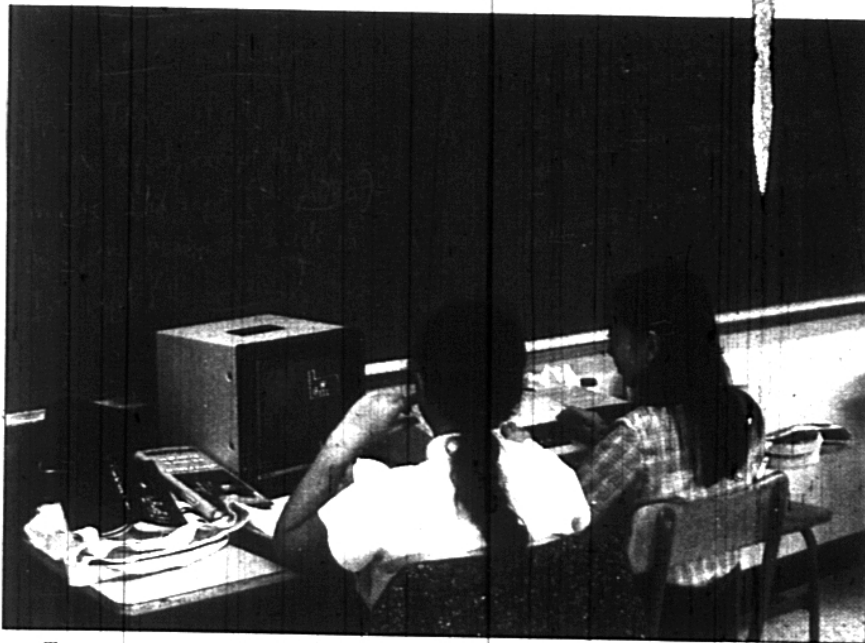
Boys far outnumber girls at computer camps.

electronic chain letters that can overwhelm networks. Children generally are not taught any computer etiquette; on the contrary, they are exposed to mostly male role models who teach them to break rules. As their skills increase, children on a system shared with adults can be truly destructive. At the computer summer school at Carnegie-Mellon University, for example, boys purposely ran programs using so much memory that the entire system's capacity was swamped. The network for the entire university "crashed" to a halt.

All of these observations suggest that the male bias in the culture of computing may explain the difference in girls' and boys' attraction to com-

puting. It is a world of electronic poolrooms and sports fields, of circuits and machines, of street-corner society transplanted to a terminal room. Hardly the kind of world girls find enticing.

We believe, however, that there is nothing intrinsic to computing that should discourage girls. The social aspects of computer use appear to be the main stumbling blocks. In fact, the very first computer programmers were women, hired by the Navy during World War II to calculate shell trajectories on mechanical calculators. When ENIAC, the first operational computer, was built, women were assigned to program it. They became known as the "ENIAC girls." Unfortunately, it was because programming



DAN M. COY/BLACK STAR

Two girls puzzle over a program at a computer course in San Francisco.

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year, has quadrupled in enrollment from 30 students seven years ago to 120 today," says Durso.

Some people claim that little can be done to increase girls' interest, because of sex differences in early socialization. Recent surveys have shown large differences between boys and girls in acquiring sex-linked skills. Young boys, for example, are more likely than girls to be able to repair a radio or bicycle; girls are more likely

to be able to cook a meal or repair clothes.

But computers are not machines in the traditional sense. The essence of computer literacy is really procedural thinking. There is no evidence that girls are deficient in this respect, or that their early training and interests are inconsistent with it. Indeed, computer programming is more like following a recipe or pattern than fixing a bike. If some of the initial alienating elements were removed, girls would be as likely as boys to take the steps toward computer efficacy.

To what degree are sex differences in game choice cultural? One clue may be the large number of women playing video poker, a new and relatively rare addition to gambling casinos. Anyone who goes to a casino will see strong sex differences in the choice of games. Men gravitate to craps and poker—confrontational, aggressive, put-yourself-on-the-line games. Women play less competitive games, like slot machines, which, unfortunately, offer worse odds.

The appeal of video poker for women, however, suggests that poker is not inherently distasteful to women, but rather that ordinary poker, played face-to-face, is somehow less attractive. We guess that poker and craps are both discouraged and discouraging for most women. They are masculine activities, and playing them usual-

was initially viewed as an occupation of low importance that it was assigned to women.

There are signs, however, that girls are finding their way into the world of computing, despite its male bias. A large proportion of the current enrollment in college computer classes is female. For example, at Mount Holyoke, a women's college, 50 percent of this year's graduates have used computers in their courses—up from 15 percent seven years ago. According to John Durso, professor of computer studies, the number of terminals available to Mount Holyoke students has increased from one to 40 over the same period. "The basic course in computing, taught twice a



FOR BROWN

Teenage girls in Long Island try their hand-eye coordination at Ms. Pac-Man.



"An ENIAC girl," as they were known in the '40s, at the Aberdeen Proving Grounds, throwing switches on an early computer.

ly entails challenging men, who generally are more experienced. In addition, playing these games requires taking psychological risks (apart from the monetary ones), such as conning others and being assertive. In its electronic versions, poker may be intellectually challenging (in terms of remembering probabilities and preferable strategies), but the psychological risks are absent.

We believe that redesigning computer games for girls can have similar salutary effects. For example, Thomas Malone, in an article in *Cognitive Science*, reported on how some typical computer games motivate kids to learn. In one math game, children were taught fractions by tossing a dart at a point on a line to demark a given fraction. If the fraction was  $\frac{3}{8}$ , then the child had to hit the corresponding point on the line. A winning shot popped a balloon. Boys loved the fraction game; girls did not. But when Malone offered an alternate version, with the darts and popping balloons replaced by a voice that said "correct" when the right line was drawn, more girls were attracted to the game.

Until recently, most children and teenagers cut their computing teeth on arcade and home video games. Consequently, girls were less likely to develop an interest in computers. With the introduction of computers into the schools, this need not be the case. But both parents and teachers must be careful not to let boys take over these

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school programs. In one Michigan preschool, the boys created a computer club and refused to let the girls have access to the equipment. The same thing happened in one elementary school we observed. In each case, when the teacher intervened and set up time-sharing rules, the girls spent as much time on the computer as the boys. Apparently, girls like to use the computer, but not if they have to fight with boys to get a turn.

Giving girls more access to computers in those schools that have them will help somewhat. But at this point, computers are spreading rapidly into homes as well as schools. There's no teacher at home to make sure that girls have their chance at the terminal.

But even if parents do take the responsibility to encourage their daughters to try their hands at computers, they are faced with the lack of commercially available software that would appeal to girls. At this point no one really knows what that software would be like—but games based on combat aggression and competitive sports are certainly not the answer.

Small advantages in skills at an early age can develop into great differences in competence later in life. Boys' earlier familiarity and ease with computer games, we fear, may put girls at a disadvantage when they try to enter the computer world. All the more reason to try to neutralize these early differences. Cultural factors and expectations, rather than any inherent disadvantage in capabilities, seem to keep girls out of arcades and away from computers. The actual differences between the scores of girls and boys on spatial tests are largely overlapping.

We suggest two other areas for change. First, there should be computer languages that use children's own interests rather than programmed games or activities. This is the philosophy behind LOGO, a language that can be used by children as young as 4. It seems reasonable to assume that if a child can use a computer to play, draw, write, or make music in ways that he or she finds most interesting, then sex differences in computer efficacy should not appear.

We must also take greater advantage of the computer's potential for communication to encourage girls as well as boys to establish and join networks. The contents of network messages need have nothing to do with computers: They can be about pets, recipes, rock stars, paleontology—whatever kids want to talk about. These activities could help children learn to use the computer in ways that matter to them. This chance should be open to all children, if they are to have equal opportunity for their place in the computer future. □

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