CAI or Teachers? Not Either/Or — But Both!


At the spring 1988 annual conference of the Northwest Council for Computer Education the keynote presentation was a panel discussion by Karen Billings, Sylvia Charp, David Thornberg, Tom Snyder and myself. Leroy Finkel was the moderator, and the central focus was the future of computers in education.

The initial part of the discussion was a brief presentation by each panel member. The various points of view were mostly upbeat and can be summarized by:

1. Computers in education are a good idea and progress is continuing.
2. Computer-as-tool is great. (This was the main point I made, and it was reinforced by other speakers.
3. Routine CAI drill and practice has proven quite useful.
4. Empowering the teacher, and focusing on how to make effective use of one computer per classroom, is a great idea.
5. Teachers are wonderful. The human-to-human interaction of teacher with student is at the core of quality education.

A variety of questions from the audience focused on the same issues. Each comment about maintaining the current central role of teachers brought cheers from the audience.

As the discussion progressed, I found myself growing more and more frustrated. Two major themes had been ignored in the initial presentations and were being ignored in the discussion. One was the issue of whether students in the future will be learning any solid computer science and computer programming. Surprisingly, no panelist made a prediction in this area and no member of the audience raised the question. But that contributed only modestly to my feeling of frustration.

The second major theme that nobody seemed willing to raise was that of computer assisted instruction as a vehicle for presenting curriculum units or entire courses. Sylvia Charp, who is a strong proponent of CAI, had focused on supplemental drill and practice in her presentation. At an opportune time, I mentioned the topic and suggested that it will gradually produce a massive change in education. Sylvia Charp cheered, several other panel members immediately jumped into attack mode, and many of my former and current graduate students blanched. I was pleased that my statement had brought increased life to the panel presentation.

As the discussion continued it became clear that many people view CAI in an either/or mode. That is, they think of CAI and our traditional educational practices that make little use of CAI as being in direct competition. Either we maintain our current system or we have CAI. They do not acknowledge the fact that we already have both in many schools.
Those who oppose CAI then go on to paint a frightening picture of children spending all day chained to a soulless, inhumane machine that assumes full responsibility for their education. Many of us are brought to the verge of tears just thinking about what a terrible thing this would be for our children.

Those who favor CAI tend to talk about increased rates of learning, teacher productivity, individualization of instruction, and an increased range of learning opportunities. The picture of children learning more, better, and faster, and achieving their full potential, is heart warming.

Surprisingly, the panel discussion never got beyond these two extremes. There was no suggestion that a compromise position might be appropriate. It seems inevitable to me that during the next two decades our school systems will gradually move toward making substantial use of CAI. However, during that time human teachers will continue to play a dominant role in the overall educational process. Computers will gradually fill roles that they do better than humans. Humans will gradually move in the direction of filling roles that they do better than machines. We will have both humans and computers deeply involved in the instruction of our children.

I enjoy discussing which aspects of instruction might gradually be relegated to computers, and which aspects are best preserved to human teachers. The human brain is a wonderful thing, and there are many things that humans do far better than computers. Perhaps the most important of these is having a deep understanding of what it is to be a human being. This includes understanding human verbal and nonverbal communications systems. The very best work of researchers in artificial intelligence has not yet begun to develop computer systems that even show signs of eventually leading to systems that have such human abilities. Thus, to the extent that teachers are making use of these human abilities, they can far outperform the very best of current CAI systems.

But much of the educational process is not based on intimate, one-on-one human interaction that requires use of these human communication abilities found in all teachers. We cannot afford an educational system in which there is one human teacher for each student. Moreover, it is essential that students learn to learn from books and other resource materials, such as computerized information retrieval systems. Routine drill and practice is an important part of education. CAI can provide rich simulations, opportunities for trial and error explorations requiring higher-order cognitive processing, greater opportunities for individualized instruction than most current classrooms provide, and so on.

It seems obvious to me that our educational system would be better if it were based on a combination of well-prepared and dedicated teachers and an abundance of high quality CAI. The cost of providing a computer for every student and a wide range of CAI materials is quite modest compared to our current educational expenditures. If we devoted five-percent of current annual school budgets to this task, it would soon be accomplished. I strongly believe that we should be working toward this objective.