

Luehrmann, A. (2002). Should the computer teach the student, or vice-versa? *Contemporary Issues in Technology and Teacher Education*, 2(3), 389-396.

Reprinted by permission of the publisher from Taylor, R., Ed., *The Computer in School: Tutor, Tool, Tutee*, (New York: Teachers College Press, © 1980 by Teachers College, Columbia University. All rights reserved.), pp. 129-135. To order copies, please contact www.teacherscollegepress.com

Should the Computer Teach the Student, or Vice-Versa?

ARTHUR LUEHRMANN

This sermon begins with a parable.

Once upon a time in the ancient past there was a nation in which writing and reading had not yet been invented. Society was as advanced as possible, considering that it had no mechanism for recording the letter of the law or of writing agreements, contracts, or debts. Nor was there a way of recording the heritage of information and knowledge that had to be passed on from generation to generation.

As a result, a great fraction of the total effort of the society was spent in oral transmission of information. Master teachers, who themselves had been taught by older master teachers, lectured before children and young people of the society. Training a master teacher was a long and expensive process, and so the society could not afford many. For reasons of economy the curriculum was quite rigid and lectures were on a fixed schedule. Teaching, obviously, was a labor-intensive industry based on skilled, expensive talent. Education, per force, was a luxury that could be afforded by the elite classes only.

Then, one day, writing and reading were invented. Not surprisingly, the first application of this new technology was to business and government. Money was printed; laws were encoded; treaties were signed. In response to these needs, a reading and writing industry grew up. Within a few years it was able to offer a broad range of reading and writing services to its customers. The customers found this to be a convenient arrangement, since hiring readers and writers from service vendors eliminated the need for each customer to invest in an expensive R & D effort of its own. The customers remained illiterate.

At first the situation was somewhat chaotic. Each vendor of reading and writing service tended to develop its own favorite language and its own technique for encoding information, leading to incompatibilities that impeded the spread of the new technology. After a winnowing-out period, however, the number of competing systems settled down to a few and major difficulties were handled by translators—though inevitably something seemed to be lost in the process.

Always looking for new markets, the vendors of reading and writing service began to examine the area of education. In view of its elitist role in the society it had been dismissed at first as too limited a market. A few, more imaginative people, however, argued that the application of reading and writing technology could turn education into a mass market. They proposed the following plan of attack. Reading and writing specialists and master teachers would work as a team. The master teachers would deliver their best, most carefully prepared lectures to the reading and writing experts, who would write them carefully *verbatim* into books. The books would then be copied many times, and each copy would be made available to a new type of educational functionary—the *reader*. His only job would be to assemble groups of students and to read aloud to them the recorded lectures of the master teachers. In view of the fact that training such a reader would be far less expensive than the education of a master teacher, the on-going cost of such a program would be far less than that of the conventional lecture method. The new method came to be called Writing Assisted Instruction, frequently abbreviated to WAI.

Needless to say, WAI had its opponents. Established master teachers expressed doubt whether a less skilled reader would be able to communicate subtleties of inflection, and they were certain that a mere reader could not process student responses with skill or intelligence. WAI proponents counter-charged that the master teachers were merely expressing their vested interest in the present educational establishment, and, indeed that they ought to be fearful because the superiority of WAI would ultimately drive out the conventional practitioners. Even within the education establishment some younger members became WAI supporters on the grounds that the new method was a boon to education research. Until then, teaching had been something of a black art, shrouded in the privacy of the classroom. To compare one teacher with another was impossible. But in the future, they said, the written record of the lectures of master teachers would make the teaching experience explicit and subject to analysis, comparison and

improvement. It was high time, the young Turks exclaimed, that the teaching profession act with accountability to the public it served.

Unfortunately, such controversy remained for many years on a hypothetical plane. The number of actual WAI efforts was very small and their results were not striking. There was also a credibility problem. Many of the most outspoken advocates of WAI, especially in the legislature and in business and on local school boards, were themselves almost totally illiterate in the new reading and writing skills. How could they evaluate a new technology if they had not mastered it themselves?

Finally, government, business and some members of the education establishment decided to mount two or three large-scale demonstrations of WAI in order to show publicly the advantages of the new educational technology. For a period of several years curriculum experts collected information on a few key courses of lectures by assorted master teachers. The reading and writing experts wrote down the best series and read them aloud to the curriculum experts, who would criticize them and make improvements. The reading and writing experts would then incorporate the improvements in the next draft. Then came the field test. Readers began to read the drafts aloud to actual classes of students, and this led to further revision by the curriculum experts and rewriting by the reading and writing experts. At the end of a few more years a summative evaluation of the projects was undertaken by an independent, reputable educational testing organization, whose mission was to compare the cost and effectiveness of WAI with conventional education.

The parable is nearing its conclusion now. Actually it has two alternate endings, one happy and one sad. The sad ending, which follows now, is brief.

The educational testing organization reported that the projects were a complete vindication of Writing Assisted Instruction. It found that students taught by WAI performed even better on standardized tests than students taught by the average master teacher, that the student liked WAI better, and that the total cost of WAI was about a fourth that of conventional instruction. These pilot projects were imitated on a grand scale and education was revolutionized. Special institutes turned out vast numbers of readers and within ten years they were reading courses of lectures aloud to masses of people who could never have been educated before the new instructional technology arrived. The nation grew and prospered and thanked the day that the reading and writing industry was founded.

That is the sad ending. The happy ending is somewhat longer and more complicated. Here it is:

The educational testing organization found that WAI was neither measurably worse than conventional instruction, nor better. It found that costs were somewhat higher than anticipated, mainly because market demand for people with reading and writing skills had driven their wages up near those of master teachers.

But this lukewarm finding was anticlimactic when it came, for the impact of reading and writing on education had taken a new turn during the intervening years. Here is how it happened.

At first a few master teachers had themselves found it necessary in pursuing their own research to spend the enormous effort required to master the skills of reading and writing. As they became more and more competent readers and writers, they began to see clearly the power of the written word within their own disciplines. Naturally enough the humanists were the first to apply this new intellectual tool to their fields of interest. Literature specialists collected stones, wrote them down, exchanged them with each other and began to develop literary criticism to a new height. Language specialists compiled lists of grammatical rules, which became writing manuals. Scientists were slower in becoming literate, with mathematicians leading the way, since they grasped the possibility of writing mathematical concepts in abstract notation. Nevertheless, for many years scientists continued to remain in verbal darkness.

While reading and writing had its primary impact on scholarly research, at the same time many master teachers across the land began to wonder whether it might not be beneficial to introduce elementary uses of reading and writing to students in their courses. A few language teachers began to show students how to write phrases and sentences, and the more venture-some teachers even asked students to write sentences of their own. Such experience, they claimed, greatly enhanced a student's understanding of syntax and rules of grammar. Even in subject areas far removed from language, to which reading and writing have a natural affinity, teachers began to report pedagogical gains due to having students carry out elementary reading and writing tasks as an adjunct to conventional instruction.

One obstacle to student use of reading and writing was the awkwardness of the main systems of notation, which had been developed mainly for research

and business applications. The most popular such system was particularly difficult to format, since its characters all had to be positioned accurately in a fixed number of columns. Occasionally there were rumors that a group of teachers in a remote province near the northern frontier had developed a simpler writing system and all their students were using it daily. Such rumors were hard to verify; only a few people ever voyaged that far north, and, in any case, experts in the reading and writing industry seemed confident that anything that made the current system simpler would also take away its power and elegance. So most teachers adhered to it.

Within a few years teachers began to hold national meetings to tell one another how their students used reading and writing within their courses. Advocates of this type of use, which came to be called *adjunctive*, insisted that it be distinguished clearly from WAI. Writing Assisted Instruction, they charged, was nothing more than an improvement in the technology of delivering instruction. Adjunctive use of reading and writing by the student, on the other hand, represented a change in the intellectual content of instruction. They argued from the following philosophical premise:

Reading and writing constitute a new and fundamental intellectual resource. To use that resource as a mere delivery system for instruction, but not to give a student instruction in how he might use the resource himself, was the chief failure of the WAI effort, they said. What a loss of opportunity, they exclaimed, if the skill of reading and writing were to be harnessed for the purpose of turning out masses of students who were unable to read and write!

WAI advocates responded that it was well and good that a few elitist schools teach their students the difficult skill of reading and writing; it was enough that WAI teach lesser skills to masses that might otherwise remain uneducated and unemployable.

How much longer, asked the WAI opponents in rebuttal, will an illiterate person be considered educated? How long will he be employable and for what jobs if elitist schools are turning out competent readers and writers by the hundreds?

The more visionary advocates of mass literacy told of foreseeing the day when students would spend more hours of the day reading and writing than listening to lectures. Small research libraries had indeed sprung up at some

schools, but they were expensive operations limited to a few specialists who had to raise funds to pay for their use. Such people were particularly incredulous at the suggestion that every school ought to adopt as an educational goal the establishment of a significant library open freely to all students. School administrators were at first appalled at the idea that the library should not be on a pay-as-you-go basis but should be budgeted as part of the general institutional overhead costs.

But as time went on and even school administrators became competent and imaginative users of the skill of reading and writing, all schools gradually accepted as a mission the bringing of literacy to all students. Accreditation agencies examined the quality of libraries before approving schools. Books began to appear all over and finally even in people's homes. WAI did not die out altogether, but continued as a cost-effective alternative to the lecture. But as books reduced dependence on lectures, students made less use of both WAI and lectures and spent more time on their own reading and writing projects. The nation grew and prospered and wrote poems in praise of the day that reading and writing were discovered and made available to all people.

End of parable.

It is a perilous strategy, bordering on bad taste, to tell a joke and then for several pages explain why it was supposed to be funny. However, this allegorical tale has been told here not merely for entertainment but mainly for the moral lesson it carries. To compare reading and writing with computing might be dismissed as an amusing frivolity; but that would be wrong. Our fundamental philosophical premise here is that, like reading and writing,

[computing] constitutes a new and fundamental intellectual resource. To use that resource as a mere delivery system for instruction, but not to give a student instruction in how he might use the resource himself, has been the chief failure of the [C]AI effort. What a loss of opportunity if the skill of [computing] were to be harnessed for the purpose of turning out masses of students who were unable to [use computing]!

As this example shows, it is a trivial editing task to go through the entire reading and writing fable and turn it into a story about computing and its uses in education. In fairness, the author admits that the story really *is* about

computing and that reverse editing was done in the original telling so that it would seem to be about reading and writing. Yet, as a story about reading and writing it has considerable plausibility, doesn't it? The Writing Assisted Instruction program outlined in the story is not a totally absurd idea for putting reading and writing to use in education. One cannot argue against claims that committing lectures to writing would make education available to more people, would invite critical comparisons and a consequent improvement in subsequent revisions of written materials, and would be an asset to the study of the learning process itself. What does appear absurd, however, is the failure of these mythical WAI proponents to recognize that the best educational use of reading and writing is the teaching of reading and writing itself to everyone. Mass literacy is an educational mission about which few of us have doubts today.

Yet that consensus among us seems to vanish when one substitutes "computing" for "reading and writing" and "CAI" for "WAI." Mass computing literacy is not an agreed-upon educational goal. Today very few courses at any educational level show students how to use computing as an intellectual tool with applications to the subject matter being taught. Oh, there are a few isolated, subject-matter-free courses in computer programming; but their market is largely restricted to vocational-education students, at one end of the spectrum, and future computer professionals at the other. It is true that most schools consider it prestigious to have a large and powerful computer facility; but the fact of the matter is that such computers are usually the captives of research and administrative interests and operate on a pay-as-you-go basis. Ironically, it is in the most prestigious universities that students are least likely to be permitted to use those prestigious computers. It is a rare secondary school, college, or university that budgets and operates its computer facility in the same way that it budgets and operates its library. (There is a persistent rumor of an exceptional example in some remote province near the northern frontier, but so few people ever travel that way that the report is hard to verify.) In the main, literacy in computing simply is not an educational goal at many schools. Most educators seem to find bizarre the suggestion that accreditation agencies examine schools for the quality of their educational computing facilities, just as they now do with libraries.

The distressing truth today is that educators, local school boards and federal policy-makers are far more receptive to the plans of CAI proponents for using the technology of computing as a cost-effective delivery system

for instruction in math or remedial English than they are to making computing itself a part of education. This statement should not be taken as a blast against CAI. On the contrary, CAI advocates are to be commended for their desire to reduce the cost of instruction, to tailor it to the different learning style of students, to develop systems that encourage closer examination of what is being taught and systems for improving instruction, and to hold teachers and schools accountable to their clientele. With enough developmental work on CAI, it is likely that students will perceive the computer as a very superior teacher. Above all, CAI promises to make education a less labor-intensive industry and so to enable masses of people to become better educated. This is certainly a goal worth working for.

But there is a higher goal. If the computer is so powerful a resource that it can be programmed to simulate the instructional process, shouldn't we be teaching our students mastery of this powerful intellectual tool? Is it enough that a student be the subject of computer administered instruction—the end-user of a new technology? Or should his education also include learning to use the computer (1) to get information in the social sciences from a large database inquiry system, or (2) to simulate an ecological system, or (3) to solve problems by using algorithms, or (4) to acquire laboratory data and analyze it, or (5) to represent textual information for editing and analysis, or (6) to represent musical information for analysis, or (7) to create and process graphical information? These uses of computers in education cause students to become masters of computing, not merely its subjects.

It will be countered that such an educational mission is well and good for a few elitist schools, where students are willing to learn the difficult skills of computing; but it is enough that CAI teach lesser skills to masses of students that might otherwise remain uneducated and unemployable.

In response we ask, how much longer will a computer illiterate be considered educated? How long will he be employable and for what jobs if elitist schools are turning out competent computer users by the thousands?

The true story about computing and education is at its midpoint. Like the reading and writing parable, it has a sad ending. Which one actually occurs will be determined by you—teachers, school administrators, computer professionals, and government policy-makers.