Computers, Composing, and the Productivity Paradox

Background: Giving You the Business

In the world of corporate and business computing, there has arisen in the last year or so a specter called “the Productivity Paradox.” As described by InfoWorld publisher Bob Metcalfe, who doesn’t himself believe in such things, the Productivity Paradox goes something like this: “After all the billions of dollars [worth] of personal computers, networks, and software that people like me have sold to [business] people like you during the last decade, white collar productivity has not improved even one little bit” (July 20, 1992, p. 41).

The Productivity Paradox derives from some not-quite-scientific reports carried in the trade press, and Metcalfe treats it as a kind of viral virus, as a “dangerous new strain of nonsense.” His major argument against the notion of the Productivity Paradox depends, as might be expected, on how productivity is defined and measured. Here’s part of his rebuttal, based on a conversation with Dr. Robert Noyce, founder of Intel Corporation (a major developer of computer components).

Dr. Noyce retold the story of how transistors used to be bigger and more expensive than Corvettes. Companies like Intel have over the last twenty years made transistors smaller than gnats’ eyelashes and at a cost of a fraction of a penny. Any reasonable measure of productivity, Dr. Noyce claimed, would show what a good job Intel and its competitors did. Instead, economists measure productivity in something like dollars of sales per employee and thereby catch only a fraction of Intel’s productivity accomplishment. Dr. Noyce would say that current measures of productivity are holdovers from the Industrial Revolution and are missing the key points in our increasingly technological and service-oriented economies.

What’s particularly interesting is that Metcalfe ends his somewhat arch editorial with the following plea: “So now I need your help. Let’s collect the data that debunks (sic) the Productivity Paradox. Let’s prove that I’m not a fraud and you’re not a sucker ... Please send your arguments and their associated facts and figures to me. I will collect them, write them up, and make heroes of us all again.”

It’s not clear if those of us who are involved with the educational applications of technology should be heartened or discouraged by the difficulties that the supposed hard-headed business world is experiencing in justifying the kinds of expenditures that we would have thought (and have been led to believe) are one of the natural and expected ways of taking care of business.

Taking Care of Education?

Even before the current budget crises across the nation, I’ve often run into crises of confidence regarding the value and efficacy of money spent on technology in educational settings. For example, a major report focusing
on California suggested that most of the state money spent had been wasted because of ill-conceived notions of how and whom computers could really help ("Policy Recommendations for Developing Appropriate Uses of Technology in California Schools," Stanley Pogrow. Prepared for Policy Analysis for California Education [PACE], Spring 1987). Such reports have, of course, been contested on methodological as well as theoretical grounds. What's significant here is that such serious indictments could even have been offered.

From a national perspective, a recent collection of feature articles on computers in education in MacWorld (September 1992) decried "America's Shame... How We Abandoned Our Children's Future." The authors held discussions with Washington policy-makers and heads of professional associations for teachers and educational administrators. They visited schools around the country. They seriously examined both the rhetoric and the reality. They concluded that "our overall record on computer implementation in schools is perhaps most appropriately compared to the mismanagement of savings and loans associations ..."

What we found is a false dependence on statistical analysis and a reality so discouraging that it made us question how this situation has remained unremarked on for so long. Antiquated computers; unused computers; computers used for games and not for teaching; schools and teachers unprepared to use computers that they own; miseducated or misdirected policies; and hundreds of millions of dollars spent over the last decade for little return (p. 25).

Their prognosis? "No change."

I have certainly encountered the kinds of problems detailed in these articles and studies — situations in which $50,000 was spent on hardware and no money was budgeted for software; cases in which there was plenty of hardware and software but no money or time allocated to train teachers to use the systems.

For example, I was talking recently with a school principal who was telling me about the digital camera she had just ordered, which will allow teachers and students to put "photographs" directly into their computers, and the six or seven new Mac LC IIIs that the school's parent association had just purchased for the school. She did, in fact, have great plans for these exciting new tools. I asked her whether she had any plans to have any of her teachers and students join an excellent nationwide telecommunications and writing network. She knew about the project but said, "What's it cost now, $500? It's really hard to come up with the money."

Her comment seemed surprising in the context of the amounts implicit in the hardware purchases she had just described. She is the kind of administrator whom I would consider as America's pride, rather than shame. And yet... there was something out of whack here, something paradoxical with regard to the availability of new and flashy hardware and the "tight budget" when it came to supporting a proven service.

What Do Computers Produce? A Case in Point

Do word processors produce better writing?

Research on improving writing with computer-assisted instruction (in its broadest sense, i.e., not just drill and practice) falls prey to some of the same ills as does study in non-technological areas concerned with the teaching of writing. At one extreme, conclusions from research on computers and writing seem like someone's crashing through an open door: "Our one-year, $75,000 study suggests that computers may have some effect on kids' writing." At another extreme, the focus of the research may be so narrow as to be virtually irrelevant to the actual teaching of writing (sort of like walking into a closed door): "Our keystroke-catcher analysis suggests that the backspace/spacebar ratio is inversely proportional to the physical dimensions of the disk on which the paper is stored, at the .05 level of statistical significance." (Both quotes are fiction based on fact.)

While I'd characterize the above examples as Extremes, I would also label them as Commonly Found. This shouldn't be surprising, however, since theories and methods for studying the acquisition and use of writing skills are themselves still in the developmental stage. (Whatever happened, for example, to "composing out loud" as the method of choice for studying writing? Was it just the flavor of the month as a research method? Perhaps institutional and classroom "anthropology" will in its own time lose its status as favored metaphor.) As an intervening variable, the computer is a particularly complex "event." It's little wonder that researchers have trouble carrying out studies that are rigorous, yet provide truly thought-provoking data. The computers and writing research is finally beginning seriously to question experimental research paradigms and to catch up to the realization that looking at computers in the classroom requires an understanding of the classroom as a culture.

This is the perspective offered by Cynthia Greenleaf in a recent report from the Center for the Study of Writing and Literacy: "Computers do not function as independent variables in classrooms, but rather as part of a complex network of social and pedagogical

These views are supported by Henry J. Becker, a key figure in research on computer implementation in the schools. In a 1992 report of "How Our Best Computer-Using Teachers Differ From Other Teachers," he notes that "It is not true of volume of computer use that creates the conditions for exemplary practices to arise, but the culture in which that use is embedded" (Center for Social Organization of Schools, Johns Hopkins University).

Insofar as it focuses on successful classroom teachers, Becker's work was anticipated by the work of Barbara Bowen in 1987:

The issue is not whether computers can be used effectively. The issue is how. The issue is not whether computers can do a better job than teachers. The issue is how teachers can best take advantage of the power and flexibility of computers to enhance student learning ("Impact of Microcomputers on Learning: Some Promising Research Findings," Research Monograph, External Research Department, Apple Computer, Inc.).

Ok, but does word processing produce better writing?

There is no shortage of anecdotal evidence. Such reports have, in fact, been a major factor in fueling the enthusiasm for computer use in writing. People work with word processors. They undergo minor to major transformations in their experience of themselves as writers. They report these changes to their friends, and they want to share them with their students. And so it goes.

Unfortunately (although understandably) some administrators who are not themselves technologically sophisticated, but who are under pressure to make major capital expenditures for equipment and software, want harder evidence that the reportedly magical properties of the technology are not mere illusions. Fortunately, regular readers of professional publications will find ample support for their experience and intuition concerning the value of — the productivity resulting from — computer-assisted writing instruction. (Those who remain skeptical — and those whose unbridled enthusiasm needs tempering — can also find abundant cautionary tales.)

So ... does word processing improve writing skills?

While at Stanford University's Institute for Communication Research, William Paisley and Milton Chen asked some very astute questions about efforts to study technology. In part, they wanted to know whether research questions were being asked at the time of the students' initial or later use of the technology and whether the technology itself was in its early or mature state of development ("Children and Electronic Text," NIE Report, 1982). We could add the question of whether the methods for teaching the technology are in their early or later stage of development.

And while we’re at it, let’s add the very interesting perspective of Steven Gilbert and Richard Green, from EDUCOM, who have suggested that the question “Does word processing improve writing skills?” may be “more difficult and costly to measure than is warranted by the declining costs of providing the service” ("New Computing in Higher Education," Change, May/June 1986). To summarize their argument, in situations where the technology is being used for a variety of purposes, it's getting harder and harder to determine exactly what proportion of those costs should be attributed to word processing, and no matter how you slice them, prorated costs are dropping rapidly. In other words, it costs more to answer the question than it costs to provide the service.

By and large, students and teachers use word processors if they can freely choose to do so when and where they want to. Why should we be spending so much time and money proving whether or not they should? At Brown University, word processing is reducing by one year the average amount of time spent getting a doctorate (reported in Gilbert and Green, cited above). Should the money thus saved be used to determine whether graduate students should be using word processors?

Word-processing technology is still evolving and is still fairly primitive. Methods for teaching the technology, and questions about how and whether it should be incorporated into the language arts curriculum, are themselves still matters of intense debate. Focused attention on what we are doing and how we are doing it is an important stage in setting goals and planning change. However, if the past is of any use in predicting the future, we can be fairly sure that advances in the technology itself will initially outstrip our immediate understanding of what to do with it—and what to make of it.

Research, even of the open- and closed-door varieties referred to above, often enriches and educates the

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researcher more than the person reading about the research. For teachers who want to “research” as well as use technology, there remain some rather straightforward goals. Ask not what word processors can do for your students. Find out what students actually do with their word processors, which may be different from what they say they do. Learn from your students and for yourself what the technology can and cannot do, how it is changing habits and attitudes. This is one way to encourage students to think about their own composing process: what it used to be, what it is, what it could be.

Does word processing improve writing skills?
Ask your students. And see if they can prove it.

Prove What?
Has technology made a difference in the schools? Is it worth the investment? Trying to figure this out requires that we draw on what we know from research, teaching practice, and technology itself. In so doing, we’ll be encouraged to refine and extend our questions, broaden our perspectives on where answers can be found, and constantly reassess the standards we apply for determining what makes some answers better than others.

It’s also important to remember that we access what we assess, as consultant Steven Gross puts it, “People behave as they are measured.” “Teaching to the test” is just one way in which assessment procedures modify the behavior of key participants in classroom cultures—the teachers. Measurement systems also shape the behavior of those upon whom the testing instruments are visited. Major efforts to create alternative assessment procedures, like the National Standards Project proposed by the National Council of Teachers of English, will undoubtedly produce a measurement culture that is inextricably a part of the instructional milieu.

There are competing cultures embedded in, and surrounding, any classroom. There is also no necessary agreement on what constitutes “productivity” from the different points of view of these cultures. To continue the analogy, there is no agreement on who the “customers” of the educational system are, who is paying or investing the most (students, parents, future employers, society at large), or what precedence exists among these vested interests. There is bitter debate about whether schools should even be discussed in business terms: productivity, customers, clients, “total quality management,” profit- vs. cost-centers, etc.

The intent here is not to establish or defend a point of view or a discourse community. There may, in fact, be limited value in an extended comparison of the problems and paradoxes being discussed in education and business settings. There are both obvious and subtle differences between the two worlds. Still, there may be valuable lessons to be learned from not dismissing too quickly a reassessment of the progress we have or have not been making in educational computing in light of what is happening in other arenas. At the very least, this will take us further than trite and superficial indictments of the misuse of technology in writing instruction.

Robert Metcalfe, as noted above, wants to debunk the Productivity Paradox, but by treating it with the seriousness he does he validates the arguments upon which it’s based. The authors of the MacWorld articles are concerned that “inadequate support, training, research, money, and will” have produced students who “may never effectively compete in our technological world.” Their assessments and indictments, while coming from outside the field, are both fresh and familiar. They describe, not so much a paradox, perhaps, as a profoundly unsettling state of affairs.

I’m reminded of the spate of criticism against computers that I discussed back in 1984. Putting computers in classrooms “is a tremendous impediment to their effective use” said Henry Richer from Johns Hopkins University (cited in “What? So What? Now What?” Computers, Reading, and Language Arts, Winter 1984/1985). My view then is little changed from my sense now that to assess and develop the best ways to incorporate technology into writing instruction, we can hardly do better than to look to teachers, like those in the National Writing Project network, who have already been recognized as talented and committed practitioners. They are admirably suited to nurture, direct, and disseminate the best of current practice that incorporates technology into the teaching of writing.

The value of a paradox, whether a real or apparent one, is that it both defines and challenges our basic assumptions about what things are, how things happen, and how things work. Exploring these issues can only help us to shape the quality of life and learning in our classrooms.