ABSTRACT
     Although critics of educational technology have
asserted that the new media have attained little success, programs
like "Sesame Street" have shown that educational techn ogy is a
valuable resource. The Nixon Administration is determi d to support
the uses of computers, television, and all forms of technology in the
cause of education. The Offices of Education (OE) is formulating a
coherent Federal policy on this subject. It has established the
National Center for Educational Technology (NCET) to coordinate
projects and allocate funds in this area. It aims to seek redesigned
legislation providing for funds, coordination of programs at all
levels of government, and programming authority for the OE. Other OE
projects include "Sesame Street," "The Electric Company," the
establishment of the first State-wide library cataloging network, and
the Computer Utility for Educational Systems (CUES), which provides
computer services for small colleges which could not possess them on
their own. Still, in the utilization of educational technology, we
must not sacrifice human-ness in the rush for efficiency. (JK)

EDUCATIONAL TECHNOLOGY -- A VOTE OF CONFIDENCE*

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Those who insist on playing the advocate's role do so at

an admitted risk. If their cause is triumphant, they gain a

measure, of immortality and certainly a lot of personal satis-

faction. But there is always the possibility, particularly

if one happens to be touting the abilities of a machine of

some kind, that the whole episode will end up embarrassingly.

Frank Hague comes to mind.

Hague, arch-boss of American politics as Mayor of Jersey

City for three decades, decided to make political hay out of

the 1927 opening of the Holland Tunnel linking Manhattan and

Jersey City. He invited the Mayor of New York and other

dignitaries to assemble under the Hudson River, in the center

of the 8,000-foot passageway, that they might witness a demon-

stration of new fire equipment Hague had purchased to protect

his end of the tunnel. At the crucial moment an old truck was

set afire, Hague gestured grandly to his men --- and, as cruel

fate would decree, nothing happened. The water-pumping

mechanism failed and Hague left --- literally under a cloud.

I mention Boss Hague's contretemps because it seems to me

that those of us in education who have eagerly espoused the

cause of educational technology have suffered a similar

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*Before the annual meeting of EDUCOM (Interuniversity Communi-
cations Council, Inc.), Twin Bridges Marriott Motel, Washington
D.C., Thursday, April 13, 1972, 12:30 p.m.

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embarrassment. Perhaps somewhat incautiously and prematurely,
we invited the public to witness the educational miracles
technologies are capable of --- and then, for a variety of
reasons, failed to produce anything like a miracle or, in many
respects, even a respectable demonstration of the potential of
scientific devices and techniques in the direct service of the
learning process. As a result, there has been a widespread
failure to grasp the relatedness of technology and education
and an unfortunate and shortsighted tendency to denigrate the
importance of technology as an educational tool.

Critics have had a field day. Charles Silberman, writing
in Crisis in the Classroom, observes, somewhat tartly, that
"a great deal of money and effort . . . have gone into experi-
ments with computer-assisted instruction, whose advocates and
prophets have made extravagant predictions of wonders to come."
But the waters failed to part, and disillusionment with the
whole business, Silberman says, "is becoming almost as widespread
as enchantment was a few years ago."

Donald Barr, in a delightful book called Who Pushed
Humpty Dumpty, has this to say about programmed instruction:
"That there is a use for programmed instruction, and an important
use, I do not dispute. It is admirable for the training of
inventory clerks, of detail men for pharmaceutical houses, of
assembly-line technicians. But let us not call the damned thing
education."

Well, what have we to say to that? What about educational technology? Is the damned thing education? No, of course not, not all of education. But is it an important process of education? Emphatically, yes.

We cannot separate a book from a computer as an educational instrument on the grounds that the book is made of paper and ink and the computer is composed of metals and plastics. Both book and computer, as all other artifacts, are in essence human thought and knowledge made tangible, and thus both are legitimate educational machines. Human thought, not physical matter, is the true raw material of technology.

Despite start-up problems, technology in all its forms will soon be not only important, but essential, to the pursuit of learning in this country --- in our schools, our colleges and universities, and our homes. The wonders will come. Indeed, some of them are already here. I have said repeatedly, and risk the chance of boring you by saying it again today, but I believe that Sesame Street and The Electric Company --- both produced by the Children's Television Workshop in New York --- stand among the finest investments the Office of Education has made in any field, and rank among the supreme revelations of my 30 years in education. These shows work. They are teaching millions of children effectively, and, in the case of Sesame Street, at a amazingly low cost of $1.29 per pupil per year. Unit costs on Electric Company are not yet in. In untold numbers of ways the relationship between these two powerful forces --- education

and technology --- is deepening and broadening. Technology is infiltrating and influencing education --- by means of television, computers, audio-visual devices, films, satellites and combinations of the same and more. This is not, as many of us unfortunately predicted a few years ago during the "educational technology decade" of the 1960's, a revolutionary process of change; it is an evolutionary process. And yet it is change nevertheless --- a profound and pervasive change, and a change that is, I would say, proceeding at an accelerating pace due to the commitment of groups such as EDUCOM and certainly due to the interest and commitment of the present Administration in Washington. As you know, a major element of the President's 1972 State of the Union message concerned the need for the application of technology to the solution of major social problems and to ensure the general advance of our civilization. And, of course, the President said, as far back as 1970, that "our goal must be to increase use of the television medium and other technological devices to stimulate the desire to learn and to help to teach. The technology is here but we have not learned how to employ it to our full advantage."

My message to you today is essentially a reaffirmation of the President's determination to support the uses of computers, television, and all forms of technology in the cause of education. We intend to pursue a planned course of support and development of technology, not claiming wonders but gaining adherents and

rebuilding public confidence through sound applications of educational technology and through the achievement, with your help, of unquestioned successes.

A primary precondition for the success of this scenario, it seems to me, is establishment forthwith of a coherent Federal policy with regard to educational technology --- and I have been in this job long enough to know that the system under which the Office of Education at least has been operating for the past 10 years or so has not been noticeably coherent.

OE has, of course, been a major source for the support, development, and demonstration of technology, particularly computer activities. Over the past six years the Office has funded more than 500 projects involving the use of computers in every conceivable way --- tutorial presentations, problem solving, gaming simulation, testing, vocational guidance, instructional management, data analysis, information storage and retrieval, library services, administration, and organization. In 1967 alone, OE contributed about $865 million --- including cost sharing --- in support of instructional materials, media and media-based activities. From FY '66 to FY '69 these expenditures totaled nearly $2.5 billion under all programs, for all kinds of technology and related equipment.

But all these activities, as well as those in related areas of technology, though _individually_ useful, cannot be said to have achieved the maximum _cumulative_ results that could have been hoped for. No coherent body of knowledge, for example, concerning

the overall usefulness of computers in education has been developed
as a consequence of OE-supported projects because our support
was provided as part of a Federal response to particular educa-
tional problems rather than for the more general purpose of
building knowledge in the field. The use of computers was
incidental to the basic educational objective of each project,
whether it was educational diagnosis and prescription, improved
administration, or whatever.

In short, we have helped a project here and a project
there, a college here or a library there --- but the Office,
in my judgment, has not contributed to the design and fulfillment
of an overall strategy of technological innovation to an extent
commensurate with its investment, or to a degree compatible
with the leadership role that rightly should be expected of the
national government.

I was taken aback to discover, for example, that our funds
for the support of computer activities come not from one program,
one office, or under one legislative authorization, but are
provided under 15 different legislative titles and acts which
are administered by virtually every bureau and office in OE.
The money comes from Title III of the Elementary and Secondary
Education Act, the Cooperative Research Act, Title IV of ESEA,
Part F of the Higher Education Act, and so forth --- a situation
hardly reflective of coherent planning or systematic design.

Our intention is to gather the loose programmatic threads
into a synthesized, interactive, coherent fabric of support.

And so one of the major tasks that has occupied the management
of OE, including me, is to find ways to pull together for
greater effect the almost comically scattered legislative,
funding, and planning resources of the Office. As things stand,
we administer well over 100 separate programs, and require our
grantees, whether under formula or discretionary authorities,
to deal with immense amounts of duplicative and wasteful paperwork,
as well as hundreds of program people, in order to get from us
funds that serve only one purpose --- education. We are trying
very hard to change all that.

The Administration's plan for pulling together our formula
programs into a reasonable package of aid to the States is
called education revenue sharing, a fascinating and compelling
topic, though not the one for this audience today.

But our plan to reorganize and recast our discretionary
authorities is of more interest to you. We call it Educational
Renewal and an important part of this administrative regrouping
has to do with educational technology. In early 1970, technology,
as you may be aware, began its rightful rise to a more prominent
position in the OE organization when it was grouped with our
library programs to form a Bureau of Libraries and Educational
Technology --- BLET. Development of our renewal strategy in
anticipation of the creation of the National Institute of
Education created need for a different organizational alignment.
Thus, BLET's technology component was transferred last winter
to the office of the Deputy Commissioner for Renewal --- Don

Davies --- and reestablished as the National Center for Educational Technology.

This represents more, I hope, than merely shifting alphabet blocks on a many-armed organizational chart. I believe that the National Center for Educational Technology can be the vibrant point of contact between the Federal Government and the many problem areas throughout education for which technology should be able to provide workable solutions. Specifically we see NCET as having three major purposes: First, it would direct virtually all the dollars of the Office of Education specifically intended for the support of the development and application of technology --- seeking and applying sophisticated new products such as audio-visual cassettes for individualized instruction in institutions or at home; second, NCET would coordinate all OE educational technology activities such as the support for new kinds of teaching devices sponsored by our Bureau of Education for the Handicapped and the many technologically oriented projects mounted by our Bureau of Adult, Vocational, and Technical Education. In other words, NCET will be a central source of knowledge concerning the total range of OE-sponsored technology-for-education activities; third, NCET would serve as a true national focus for educational technology, defining public issues, encouraging States and localities to apply to their own situations the benefits of computers, television, and other forms of telecommunications as created, researched and validated by the National Institute of Education, EDUCOM, and other

agencies and organizations.

For Fiscal Year 1973 we have asked Congress to provide NCET with a $30 million budget; $20 million is spoken for, including $13 million for our Educational Broadcasting Facilities Program --- which has made a major contribution in expanding the number of non-commercial television station: in operation --- and $7 million to support the Children's Television Workshop, the same level as this year. The remaining $10 million will be used for large-scale demonstrations of the use of modern educational technology, including television, computers, teaching machines, and other techniques. About $5 million of this request will be used to support a massive educational telecommunication demonstration for the Rocky Mountain States using a NASA satellite scheduled for launching in the spring of 1973. In addition, we expect to support projects utilizing cable television for the schools and a bilingual children's television project for Spanish-speaking preschoolers modeled after Sesame Street and The Electric Company .

With the administrative framework of NCET in place and operating --- including a new Associate Commissioner whom we hope to name shortly --- th next logical step would be to seek redesigned legislation that would strengthen our hand in several ways: first, our ability to support newly developed telecommunications technologies; second, our ability to work with Federal, State, and local officials in moving experimental

hardware/software packages to the applied research stage. The
satellite experiments we are carrying out in cooperation with
NASA, other elements of HEW, and various State and regional
groups are good examples of this kind of cooperative effort;
third, to provide State public service telecommunications
authorities with grants to develop coordinated plans; and
fourth, programming authority for the Office of Education,
enabling us to expand our support for the research and develop-
ment of strictly educational software such as Sesame Street.
We are continuing to work closely with the White House and
the Corporation for Public Broadcasting in the development of
this technology legislation.

While I am convinced that the organizational and legislative
initiatives I have described are definitely necessary to
facilitate the changes in educational practice that a number
of factors, principally the knowledge explosion and the
rising cost of all forms of education, impel us to seek, I do
not mean to imply by what I have said that the field of educa-
tional technology has stood still during these past few years.
That certainly is not the case. There are many excellent and
encouraging developments afoot. Certainly the EDUCOM consortium
is one of the very hopeful movements, and Henry Chauncey and all
those who have had a hand in your activities are to be sincerely
congratulated. Your efforts to improve and increase the use
of computers and other communications technology in colleges
and universities during the eight years of EDUCOM's existence

have helped to establish a number of important new concepts and practices. I am pleased that the Office of Education has been one of the several organizations supporting your activities and I would encourage you to sustain and develop your relationship with OE, particularly now that educational technology is beginning to receive rightful recognition and attention in the Federal bureaucracy.

It is also true that despite our obvious need for greater efficiency in guiding our technology support, the Office has selectively channeled funds in ways that reflect considerable wisdom on the part of the men and women in OE who have been engaged in these projects.

Sesame Street and The Electric Company are the premiere items, of course. The Electric Company had been telecast only a few weeks this past fall when surveys indicated that the show had an in-school audience of at least two million youngsters in the first through the sixth grades --- and in cities with more than 180,000 residents two out of three schools with TV receivers and access to the series were tuning in. Given our schools' traditional reluctance to adopt innovative practices, I would call that a remarkable record. Moreover, these children are not just being entertained. They are being taught. Educational Testing Service's study of 200 second graders in Fresno, California revealed that pupils who watched The Electric Company regularly during its first two months on the air held a consistent edge over non-viewers in 17 test areas designed to

measure basic reading skills. And subsequent authoritative
studies have confirmed and expanded these results.

In the area of computers, one of OE's least publicized
projects, operated by the Ohio College Library Center (OCLC),
has resulted in establishment of the first State-wide library
cataloging network. The computer-based system handles all
cataloging and technical processing requirements of the
80-odd college libraries it now serves. During its first year
of operation the systme saved member libraries nearly $400,000
in cataloging costs. In addition to the on-line cataloging
system now in operation which can process 10,000 catalogue
cards daily, OCLC is moving toward a total automation system
which will give the user in any member college push-button
access through his college's terminal to any book in the
network. OE has invested $215,000 in this system since January
of 1970.

Some of you may also be familiar with another OE-supported
project, the Computer Utility for Educational Systems --- CUES.
This system, also known as the National Education Computer
Service, began in the late 60's as a feasibility study. It is
now about to begin providing computer services nationwide to
school systems and small colleges which do not have the financial
resources to own and operate a large, multi-purpose computer
system.

In the CUES system, a large computer operated by the Western Institute for Science and Technology in Waco, Texas, will be connected to participating institutions who can afford modest terminals. Once operational --- and we hope 60 to 70 terminals will be involved by this time next year --- CUES will provide four basic services: _first_, workaday chores such as record keeping, scheduling, payrolling, and so forth; _second_, a basic course in computer technology for students in the receiving systems to familiarize them with the equipment and teach basic skills; _third_, curriculum support through problem-solving exercises enabling students in courses such as chemistry, mathematics, business education to use the computer to support their in-class work; _fourth_, vocational training, enabling the receiving schools to train some students as key punch operators and others as beginning programmers.

This year OE has invested $400,000 in Cooperative Research funds to begin the difficult job of moving CUES off the drawing board and into educational practice. It is our hope that CUES will provide the educational community, and private enterprise as well, with verifiable evidence of the range of uses computers can reasonably and economically provide to education. What we learn from CUES should be of immense importance to all of us who think technology must succeed if education itself is to succeed in the difficult and challenging years and decades that lie just ahead.

I have no really substantial doubts that technology will eventually succeed in education because, with some hard thinking here and some tinkering there and some generous funding all around, machines usually do what they are supposed to do. Just because Boss Hague's fire equipment failed to operate at a rather crucial time does not indicate that it would never function. The fire was eventually put out. As President Nixon suggests, our problems will not be resolved by the invention of further technology, but by learning to use that which we now have. This is fundamentally a matter of conceptualization, of opening our minds to the rich potential of the technological-educational marriage.

But I would suggest that we must think very hard about the kind of success we are seeking for educational technology. What concerns me is the rather frightening possibility, and I am certainly not the first to perceive it, that in our rush to efficiency we will lose our humanity, that in our desire to cut the cost of education and increase productivity, we will lose sight of the primary purpose of education, which must always be to confer upon our students above all else a sense of humanity, a sense of the oneness of all mankind --- a sense of communion between teacher and learner.

I do not agree with all that Silberman says, but he is correct when he asserts that a mechanically minded approach to educational technology is likely to "compound what is most wrong with American education --- its failure to develop

sensitive, autonomous, thinking, humane individuals." And
these qualities, perhaps to our good fortune, can never be
reduced to computer "bits" and can never be enshrined in
the most sophisticated computer memory. Thinking is painful
and learning how to think is difficult, and education, whether
compucer-assisted or not, whether conveyed by means of a
television screen or bounced off a satellite, must lead
ceaselessly to the thought process --- if it is to be truly
education and not some lesser form of information transferral.

Tom James, formerly Dean of Stanford's School of Education,
expressed his reservations about educational technology in this
way: "The developing technologies for education" he writes,
"must display more humility and more imagination than they
have thus far --- for on the one hand, the micro-efforts to
transmit bits of facts ignore the great sweep of humane experience
to which the teacher in the past and the technologies developed
in the future can only be window-openers; and on the other
hand, the technologies emerging can through the use of multi-
media give wings to the human mind in ways that are yet to be
devised in helping man to encompass his environment."

As Dean James suggests, the future of education will be
determined not sc much by the strictly scientific capacities
of the United States --- we know they are awesome --- but by
the imaginative and humane uses to which we put those capacities

I think we have good reason to be modest in our claims, and to shun excessive expectations of our machines, as we press hard toward our objective of making the new technology the instrument of the teacher and the servant of education.

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