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ABSTRACT

Three issues raised in this speech on the prospects of converting education from a labor intensive to a technology intensive enterprise are the following: how technology might affect the quality of education; the relationship of technology to equality in education; and the transitory nature of technological innovations. It is observed that quality of life objectives are increasingly preferred by youth today and that these less tangible objectives should be considered in educational development. The question of equity is viewed as one of the most critical issues and the least amenable to a technological solution. Major problems in programs involving technological reform are reviewed as including preoccupation with implementation, coping with long-term implications, and community involvement. Features of these proposals focus on provisions for consumer choice, expansion of an apprenticeship tradition, and promotion of human interaction. While it is observed as unlikely to expect increased productivity at the elementary or secondary levels by means of technology, the university level appears as a possible target. A final summary advises cautious thinking in relation to the use of technology and its consequences, and notes the role of the Federal Government as working within policies compatible with pluralistic values and goals for education. (Author/KSM)

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Harry Silberman. November 1, 1971.

SOME RESERVATIONS ABOUT THE APPLICATION OF TECHNOLOGY TO INCREASE PRODUCTIVITY IN EDUCATION

Harry F. Silberman
November 1, 1971

There are a number of issues that are raised by the prospect of converting education from a labor intensive to a technology or capital intensive enterprise, but there are also a number of promising efforts in that direction. I am going to discuss three of the issues today--how technology might affect the quality of education, how it it related to equality in education, and the transitory nature of many technological innovations. Then I will touch on some of the more promising directions in the field of educational technology.

Technology and the Quality of Education

One question that should be considered before greatly increasing use of technology in education is whether the effort will seriously alter the outcomes that are likely to be obtained. This is the question of quality; even without greater use of technology to reduce costs, many people question the quality of life presently promoted by education. In a competitive society, where great value is placed on productivity and economic growth, it is not surprising to find that same value reflected in the schools and colleges as well. Young people are expected to work diligently in school in the anticipation of a comfortable, secure job at the end of the pipeline, a job which will supply them with material rewards that our modern society has to offer. This achievement or productivity goal has dominated members of the Depression generation, but it is losing its hold on increasing numbers of the new generation.

National Academy of Engineering, Wash., D.C.

Today's young people seem much more interested in self-development objectives and are refusing to play by the old rules. Quality of life objectives and happiness objectives are preferred over competitive and acquisitive goals. Students have humanistic ideals and are disenchanted with the more difficult but useful hard subjects used in training people to be a part of the productive society. Many young people are suspicious of technology and keep reminding us of the aversive consequences of its irresponsible use for economic growth and material acquisition. There is a widespread loss of faith in the nation's ideals and an increasing tendency on the part of many young people to reject those institutions that invite them to participate further in what they believe to be a destructive path leading only to a reduced quality of life.

This shift of attitude among the young recipients of our educational efforts may not be entirely misguided. If we consider how much the growth of technology in another sector affected education, we may gain perspective on the possible magnitude of results from a direct application of technology to our schools. The example is agriculture. We have witnessed the effect of unbridled development of technology in agriculture by the land-grant colleges; an endless parade of graduates left for the cities in search of jobs, and the cities became greater problems than the earlier problems on the farm. The agricultural technologist did a very effective job.

The industrial organizations in the city demanded adult labor, and mother and father went to work, so the children were put into age-graded schools, well isolated from the mainstream of the city. As the cities grew, it became more and more efficient to standardize the way the schools were being managed, so now these schools are very much alike, and somewhat monotonous places supported by mandatory attendance laws and operated solely by college-educated, state-certificated teachers.

Education institutions came to serve a gate-keeping function of screening and sorting people out for occupational positions at all levels of the status hierarchy. The selection function is undoubtedly an important factor in the relationship between years of schooling and lifetime earnings. Of course, other factors may also contribute to this relationship--genetic and aptitude variables, acquired skills and attitudes, faculty expectations, not to mention personal job contacts established while in school. The relationship between years of schooling and subsequent income has prompted more and more students to stay in school and seek ever-higher levels of certification.

This over-training phenomenon, coupled with the advancement of the average age of our population and a stabilizing economy, will probably create considerable unemployment at the top levels. But those who have once tasted the liberating effects of a college education may be less inclined to be satisfied with the highly specialized jobs available down in the middle and bottom of the organization hierarchy in our production-oriented society. Those students who left after high school and went to work in large, bureaucratic organizations might find it easier to adapt to the kinds of specialized jobs where one only sees a small part of the

total action than those who have completed a college or university education, since the lower levels of schooling emulate the highly structured lower levels of the bureaucratic organization, while the universities emulate the more autonomous upper, or managerial, levels.

For the education system to play its role in preparing people for the work force in an increasingly complex technological society, the students must be willing to cooperate in selecting the appropriate courses and specializing in the useful fields that are in demand. Students are not cooperating very well. The difficulty gradient of many of the specialized fields has increased, and instructional effectiveness has declined as a result of competing demands on the instructor's time. So, the quality of learning situations suffers.

Not only is the quality of learning situations questionable, but students are harder to please. The television culture has taught this generation to expect more entertaining and stimulating fare from instructors than the instructors can produce. Also, the work incentive for many students has diminished because the typical university student is from an affluent family, and the anticipation of a high-paying job does not provide the attraction that it once did for members of the Depression generation. Add to that picture a father who serves as the model of how well education pays off--one who exhibits all of the symptoms of the man who leads the life of quiet desperation--and you have a few reasons why students avoid physics and engineering and perhaps the campus itself.

Small wonder that the young want to bring down the system. They do not want to join the production line and be one of its cogs, having to race faster and faster. The recent graduate who decides to go on the bum after graduation is becoming an increasingly common phenomenon, perhaps another of the consequences of a technology that produced the highly successful production economy which must be tended by large, highly differentiated, hierarchical organizations filled with specialized positions that young people no longer find appealing. With increasingly fewer meaningful jobs available and a growing number of older college-trained people seeking those jobs, it may no longer be functional for one's very being, existence, and identity to be determined by and dependent on his productivity and accomplishments. If a person's advancement in the established ladder of success becomes the only basis for his being a valued person, there are going to be many unhappy people.

I believe we are at a turning point in the application of technology to education. In the past, technology has been grafted onto the existing system, but further significant increases may change the structure entirely. We must "face up" to what such change can do. In using technology to increase the productivty of education, we can doubtless do great justice for and be accountable for the specific knowledge and skill objectives. We will be able provide vicarious experiences by TV. We will provide efficent custodial supervision, and we will be able to perform the gate-keeping function in a more orderly manner and may even strengthen achievement motivation. But less tangible objectives--learning how to learn, to accept change, to be flexible, to be sensistive to the needs of others, to identify with problems of people one

t met, to work well with others, to accept people who are very

different, to appreciate beauty and accept leisure without guilt, to put together life experiences in an integrate way, to be self-directing--these could be readily ignored unless the people who do the development work think broadly.

Technology and Equality of Education

A second question is how increased productivity will affect the problem of educational equality. It may turn out that efforts to achieve efficiency are incompatible with efforts to obtain and maintain educational equity. The greatest rate of return on the investment in education might be had by working with those who are already advantaged. Kenneth Bolding, in describing the qualitative impact of technology, refers to a problem which he calls the "milk and honey" problem, in which the world separates out into two cultures in which a certain portion of people adapt through education to the world of modern technology and hence enjoy its fruits, while another portion fails to adapt and perhaps becomes not only relatively worse off but even absolutely so in the sense that what they had in the past of traditional culture falls under the impact of the technical superculture and leaves them disorganized, delinquent, anemic, and poor. In creamy societies, like the United States, the cream may be 70 or 80 percent of the population and the skimmed milk may be only 20 or 30 percent. Before we try to increase educational efficiency, we must be sure that we are not also raising that skimmed milk ratio to a threatening level.

Equity may be one of the most critical problems in education, and it--sadly--may not be amenable to a technological solution. The problem of inequality has dominated the popular press for some time, but there does not seem to be much real improvement. It has been well established that the lower the student's economic status is, the less likely he is to go to college. This is true of all levels of aptitude. Furthermore, the lower the college student's socioeconomic level, the more likely he is to drop out. It seems that in order to obtain equity, it is necessary to counteract the influence of the family. The disappointing results of huge expenditures on compensatory education efforts might indicate that academic achievement is more dependent on family background than on the contribution of the schools that the student attends. Family-promoted work values, such as punctuality, orderliness, and deferred gratification may be determiners of work success and may appear only as an exception among the very poor.

The current method for allocating fiscal resources exacerbates the problem. Dependency on local taxes promotes fiscal disparities and target-group differentials. In general, school taxes are regressive, and Federal aid at present is too small to close the expenditure gap among states. A disproportionate share of resources for education goes to higher education, where the fewest number of poor people are found.

Schools and colleges have also been criticized for maintaining educational stratification, since schools serve a selection function, yet little evidence has been found to show that the criteria used in the selection process are related to later occupational competence. It seems as if those who need education the most benefit the least, whether the objective is self-fulfillment or productivity.

It may be that technology could contribute to solving the inequality problem if some new ways are found for supplementing the work of existing institutions in providing high-quality educational services at low cost to those who need them most. But on a less sanguine note, Michael Katz recently expressed that our period of reform is at an end and attributes our lack of success in solving the inequality problem to built-in contradictions among leading reform proposals; for example, between integration and compensatory education, between integration and decentralization, and between radical pedagogical reform and community participation. One might add to the list the tradeoffs between egalitarianism and pluralism.

The Transitory Nature of Past Innovation

Before undertaking a major program of technological reform, it may be helpful to review the status of a few solutions that are being planned or have been tried already in education. Recently the Ford Foundation reviewed some 25 major projects that had been designed to achieve

comprehensive school improvement over a 10-year period, from 1960 to 1970, and costing them well in excess of $30 million. The results were quite sobering. In general, innovations were quickly dropped once foundation funds were no longer available. This was attributed to the tack-on nature of the activities and conservative backlash to changes that were great enough to make noticeable and bothersome differences. The majority of the efforts soon slipped back into traditional patterns of operation. New materials were no longer used by anyone except those teachers who developed them. New staffing patterns reverted to traditional modes of operation.

It seemed that those who were concerned with school improvement efforts became preoccupied with the novelty of implementing innovations, moving from one new practice to the next, without knowing what each contributed or how to make it a permanent part of the educational process. As a result, those in the projects felt very good about what happened, but when it was all over, nothing was really changed. The greatest change that took place in these comprehensive school-improvement programs, was in people development. Projects supported people and gave them a context for professional growth. The second most important benefit obtained was that projects learned how to attract more funds. Another finding was that the lighthouse approach, whereby one isolated school was established as a definitive demonstration, had little success in influencing even its own neighbors. A certain possessiveness and superiority feeling of those in the project tended to alienate those who were not included in that school.

This review found that technology was used while the funds lasted, but after the funds were withdrawn equipment gathered dust. Modular scheduling was tried for a while, but it allowed students too much free time and raised problems of control that threatened teachers and the community and was soon dropped.

One of the recommendations from the study was that one powerful change should be slected and then pursued in depth to its completion, exploring all of its implications. For example, in one project the basic idea was to create a school where students help one another. Students tutored students. Everyone involved was both a teacher and a learner. As the concept was implemented to a limited degree, it did not affect the total structure of the school, but as the idea was pursued until 80 or 90 percent of the students and teachers were involved, some rather substantial changes in the rest of the school structure became necessary. Existing scheduling and staffing patterns were no longer suitable for handling student logistics. Different types of materials were required, and human interactions among teachers and between teacher and members of the community demanded a higher priority than they had been receiving. The tutoring concept pursued in depth changed the whole school structure. It wa also found that what a project did and how it operated was almost entirely determined by the project director.

While the Ford study revealed comprehensive school-improvement efforts, there is a new study out by Allen Graubart and Tim Affleck that looks at the new-schools movement and examines the life history of many of the nonpublic, radical schools' reform efforts, such as new-left schools, third-world schools, open schools et cetera. They found that most of these new schools start with a great deal of enthusiasm and idealism but suffer from lack of structure and lack of funds. After a year or so of chaos the system leads to conflict and either some form does emerge or the school does not survive. One of the problems such groups have faced is that in attempting to honestly describe their objectives they lose public support, since their goals are at variance with conventional practice. The radical reform schools simply cannot obtain their share of the public learning dollar unless they join the system, and to the proponents of most experimental schools that is generally not an acceptable compromise.

In public-education reform efforts that seemed reasonable in the 1960's simply are not appropriate for the 1970's. Minority groups are demanding an end to the melting-pot notion of public education and are insisting that it is possible to establish a pluralistic form of education which will attempt to produce greater diversity suited to the needs of their respective cultures. Substituting the educational mosaic for the melting-pot function of the school requires greater community participation in control of education.

It is becoming increasingly difficult for school managers to ignore the demands of concerned parents and other nonprofessional groups for reform. They are rapidly learning that the entire society educates. Formal schooling is but a small part of the total learning environment, and recent proposals for educational reform concentrate on using the total resources of the community. There are many advantages and problems in involving the broader society in the provision of educational services. To provide educational experiences throughout society and throughout life is only possible if we go beyond professional schooling and tap the broad talent pool of noncertificated people to be found in the public and private organizations, in government institutions, in homes and neighborhood centers, in professional circles, anywhere that people can be found who have something to offer.

Reform Proposals

Many proposed reforms--technological and otherwise--take into account the problems and issues discussed above. A feature that is prominent in many of the current proposals is a provision for consumer choice in regard to the type of educational service and the decision of when and where that education should be obtained. If the isolation of schools from the broader society is to be eliminated, parents and students must have some options on whether they receive instruction in museums, libraries, churches, social agencies, hospitals, concert halls, companies, advertising agencies, or whatever. There are many ways of giving such

choices to the consumer. Accredited private schools could receive tax-fund vouchers from parents who believe their children are better educated in such places. Business and industry could receive special tax benefits for providing educational services and released time of professionals to teach. Or groups of parents could be subsidized to begin small schools. Some school board seats could be filled in the same manner that jury panels are filled now, in order to insure better representation.

Such measures might alter what amounts to a virtual monopoly by local education agencies and accredited teacher-training institutions. A number of recent reformers have called for a renewal and expansion of the apprenticeship tradition as a solution to current educational problems. Willis Harman has proposed the establishment of general benefit corporations. These corporations, each with its own unique character would be encouraged through tax incentives to perform some of the functions of each of a variety of organizations--profit-making companies, nonprofit foundations, and voluntary associations and universities. They would be attractive to young persons because they would provide socially meaningful employment and an outlet for entrepreneurial talent. They would inspire productivity by workers through appealing to belongingness and esteem needs and by providing opportunities for self-development. Such corporations, in other words, would combine education, profit making and public interest functions into a single institution. The general benefit corporation, of course, could be a consortium of institutions working together under a common charter.

Proposals such as the Metroschool in Chicago, the Parkway Plan in Philadelphia, the open universities, and plans to grant degrees to anyone who passes an appropriate examination are other examples of attempts to move in the direction of broader societal involvement in education. Ivan Illich has proposed that technology be regulated to make it possible to use informal education in the regular course of daily activities without mediation by professional educators or schools. This would be done by simplifying equipment and business procedures so that people can readily learn from minimal assistance what is necessary for them to know. His rationale is that since the cost of education for society rises faster than the productivity of the entire economy, man should be given personal responsibility for what he learns and teaches without the aid of professionals whose only claim to power is the stock they hold in some class of scarce and secret knowledge. He would view with alarm the proceedings of this conference to technologize education, which would then be protected by a large and capital-intensive organization that renders access to know-how even more formidable and forbidding than it is now.

His first step toward opening up access to skills would be to provide various incentives for skilled individuals to share their knowledge. He proposes that we work toward a society in which scientific knowledge is incorporated in tools and components that can be used meaningfully in

units small enough to be within reach of all. In effect, he is asking us to turn technology on itself, rather than using it to further complicate education and making it even more esoteric.

In addition to the many proposed solutions to bringing children and adults back together again in the world of work, some solutions focus on promoting interactions between parents and children and between children of different ages within the context of the family. For example, a group at the recent White House Conference on Children proposed a reevaluation of employer practices that separate families, such as work schedules, out of town weekends, evening obligations, and geographic moves which tear children away from familiar friends, schools, and neighborhoods. They also suggested revision of work laws affecting children in families, increasing the number and the status of part-time positions so that people who want to give more of their time to parenthood and family can do so, and low-cost insurance also to cover children at work. They also propose interactive television to promote a family discourse, games, and joint activities in the home.

Of course, it is easy to talk about proposals and solutions, but actually effecting change and lasting improvement has been very difficult. It is important to realize that in the application of technology to education we must ask whether new solutions are likely to add to our existing problems. It is no longer possible for us to assume that

increasing the efficiency of education is not a value issue. It is as much a social and political as a scientific or engineering activity. Frankly, I do not think we should expect to greatly increase productivity at the elementary or secondary school levels by means of technology. Even in the exceptional examples of Sesame Street and some of the work on computer-managed instruction at several of the regional R&D centers, the technology is probably best used in conjunction with a teacher or teacher aide. Furthermore, any slight increases in productivity at these levels will probably be offset by labor costs for maintenance, program updating, et cetera.

The university level is quite another matter. Faculty disinterest in teaching, higher unit cost, maturity of students, and availability of technical expertise make this level a better target for technology. This audience is well acquainted with the excellent work going on in designing computerized instructional systems, computer-based management systems, author languages, telecommunications systems, graphics, simulations, and so on. The recent publication by the Commission on College Physics, for example, edited by Ron Blum gives adequate testimony to the quality of work going on in the undergraduate science education.

Technology, in the broadest sense of finding reliable solutions to education problems, solutions that are exportable, that do not depend upon rare persons--who are in short supply, must be encouraged and supported at greater funding levels. The advantage of such technology is that it is inheritable. Most of the bright new solutions in education are not really so new but have been reported in the history books as having been tried and worked and then were subsequently reinvented. Somehow, problems do not stay solved unless explicit procedures and materials are developed that take the mystery out of the intrinsic, intuitive process and permit it to be passed on from one generation to the next. I support the work in applying technology to education, but I believe we should be modest about it. A new technology will not solve all the problems of education, no matter how clever we are. Education is a person-to-person process, and people in education are not likely to be replaced by machines. Technology can enrich the role of the human; it can give him freedom from space time; it can supplement and broaden the experience of the student and the family; but the family, the business world, the peer group, the school environment will remain primary determinants of education success.

Technology can reinstate individuality. It can carry education outside the school, and developments in this area are likely to be sufficiently well along to promote implementation on a cost-feasible base at the university level. At the lower levels we are in a much more primitive state. Technology requirements are more simple; for example,

how to schedule the schoolday, how to handle the logistics of moving kids in and out of the playground, or in and out of the cafeteria, or how to effectively distribute a network of material centers or teacher centers to support local education agencies, and so on.

In summary, I think we should be cautious about thinking about technology. We must examine the social, economic, psychological, and moral consequences of what we develop. The Federal Government must find and support the creative educational inventor, the developer, the engineer. But we must also review his work for side effects so that we can be sure that technological change is governed by policies that are compatible with our pluralistic values and goals for education.