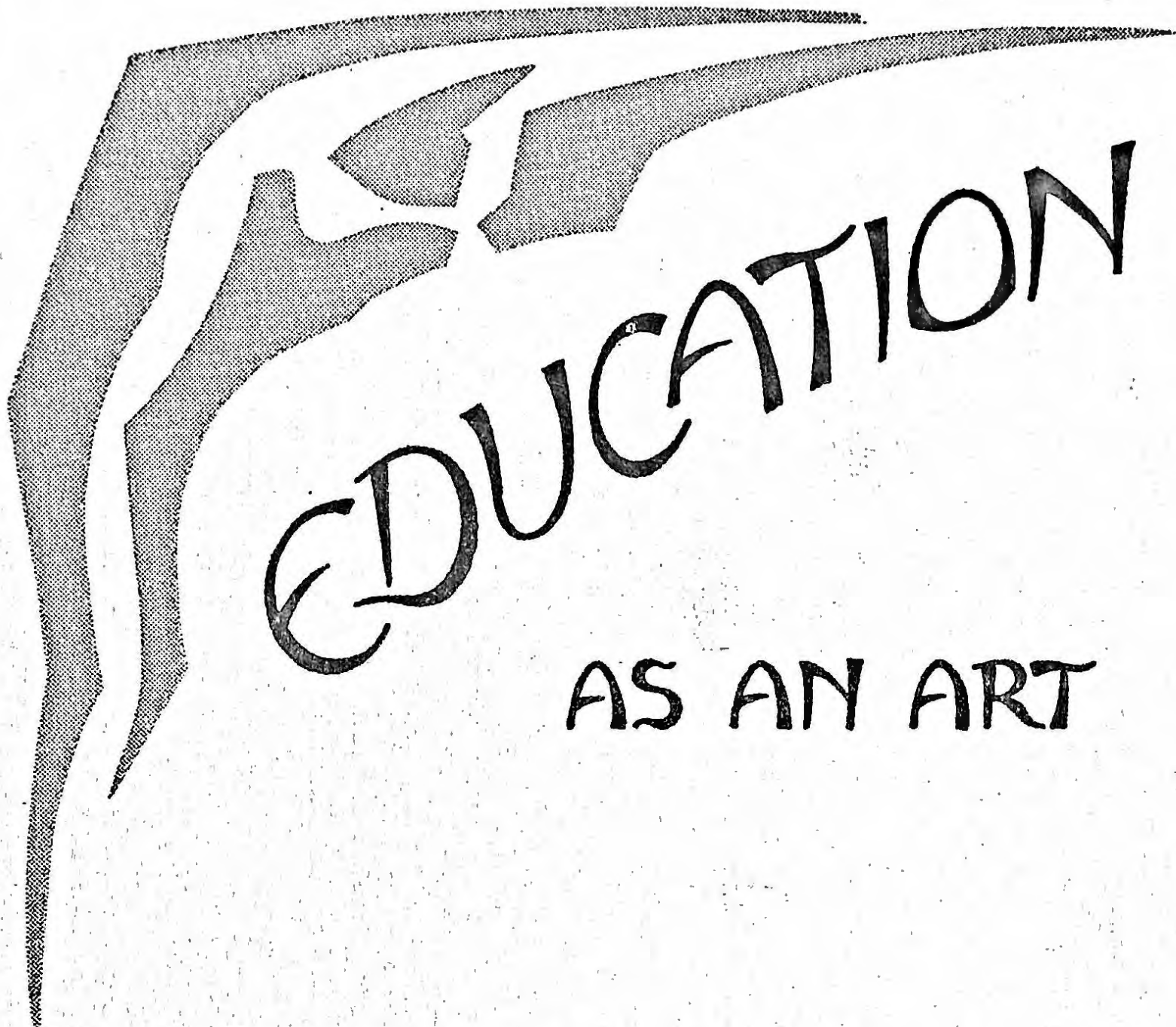




EDUCATION

AS AN ART

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MACHINE TEACHING

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At the ripe age of twenty-eight, EDUCATION AS AN ART is striding out into the world: the American Waldorf Schools have taken over the challenging responsibility of publishing it. Looking back, we must think of and thank Nancy Laughlin, Jeanette Eaton, Arvia Mackaye Ege, and Mary Cross for the beginning of the Bulletin of the Rudolf Steiner School Association, in April, 1940, during World War II, and for its early life. In its 'school years,' from the age of six to eighteen, its guide was Christy Barnes, the editor who — in the words of Sonia Tomara Clark (for many years now the president of the Association) — "made the Bulletin alive with ideas and pictures, and brought to it the delightful imagination of a born writer." Now the editing will be shared by a faculty member from each school; we hope that a rich variety of thoughts and experiences will bring EDUCATION AS AN ART to spirited maturity. R.P.

OF MACHINES AND MEN

When Plato likened man's task in life to that of a charioteer driving a chariot drawn by a white and a black horse of different inclinations and temperaments, he presented to mankind an archetypal image which is still full of vital significance for our times. And when Sir C. P. Snow signaled that humanity is dividing into two cultures, one humanistic and one technological, without mediation, he was, in fact, describing Plato's white and black horse. Unfortunately, Snow was insufficiently aware of the third force, which can and must take charge as a charioteer at all times: the wisdom of man, "anthropos-sophia."

Our time tends to be dominated by problems which arise from an awareness in terms of absolute contrasts. Issues are defined in terms of:

pleasing others	versus	pleasing oneself
black power	versus	white power
public schools	versus	private schools
fundamentalists	versus	evolutionists,

to name merely a few examples.

Our national examining and testing effort admits only answers of 'true' or 'false,' though not rarely are 'wrong' answers merely proof of a superior insight on the student's part*). Indeed, it may become necessary to impart to bright students, along with a real education, a special course in test-taking, the skill of interpreting questions without profundity or originality.

*) See for example the humorous article by A. Calandra: 'Angels on a Pin', *Scientific Research*, p. 60, Dec. 21, 1968, McGraw-Hill Co.

Thinking in terms of true or false, make or break, fail or safe, etc. is justified in the realm of technology. Our digital computers operate merely on the often repeated alternatives of zero or one.

Thus a conceptual climate is generated in which also man tends to be regarded in similar terms: You are 'turned on' or 'turned off.' When this kind of thinking penetrates into education there is cause for concern.

In educational psychology today the country listens in the main to two schools of thought. A more or less humanistic school, usually with strong Freudian overtones, of which J. S. Bruner may be viewed as a prominent representative, versus a mechanistic school, usually with a strongly behavioristic outlook, of which B. F. Skinner is probably the best known exponent. Looking at this state of affairs one is reminded again and again of Plato's white and black horses, and one wonders: Where is the charioteer, the truly wise human guidance?

Here Waldorf Schools, based on the educational psychology of Rudolf Steiner, have a real contribution to make. Their entire effort is permeated by a striving to recognize in each child and in each issue the charioteer. His growth is fostered; his integrity, his freedom, and his creativity are cultivated, so that he may find his way through life not only with skill and understanding but also with deep joy.

* * *

In our country with its high standard of living, children as well as adults are constantly surrounded by machines and technology. Seldom do we give serious thought to the question whether and how these affect man. Machines are thought of as instruments for affecting man's environment so as to suit his needs, not as affecting man himself. And yet they do tend to affect men of all ages profoundly and often adversely, and children even more so than adults. What are these effects? And how can one neutralize them?

My primary concern is not with effects which stem from faulty technology, such as: impairment of hearing due to industrial noise; diseases and deaths caused by air pollution or by the addition of unsuitable chemicals to food; or cancer or genetic damage caused by an accumulation in time of the effects of small doses of ionizing radiation emitted by TV sets. Much well-documented research has been published about such effects — and is widely ignored. The causes for this type of effect can be recognized on a purely technical level. By designing machines better, with more sophisticated insight into human physiology, these causes can, in principle, be eliminated. It is true that many casualties will probably have to occur before enough pressure is built up to force industry to reckon more conscientiously with the well-being of the population; but my primary concern is with problems that are *inherent* in the human use of machines, problems which, by their very nature, cannot be eliminated by technical improvements.

Man's organism has evolved through long ages under relatively stable environmental conditions on earth. His bodily functions as well as the

functions of his mind have become attuned to these conditions. He has developed internal biological clocks which more or less synchronize his waking-sleeping cycle to the diurnal period of twenty-four hours. His physiology makes profound adjustments to the seasons. Man could not live on earth in his present form if the average temperature were a mere hundred degrees hotter or colder. He could not survive if the flow of sense impressions ('signals') that goes with his normal activities were many times greater than it is at present. Nor could he properly survive if his internal and external bodily movements were subjected to severe restrictions.

It is part of the nature of man's journey on earth that his body and mind are attuned so as to operate, within certain tolerances, around a certain balance between meaningful bodily activity and corresponding sense impressions: a balance between motor and sense activity. The circulatory system functions prominently in maintaining this balance, and our entire life of feelings is closely connected with this balance. Indeed, happiness and health are rarely found where this balance is upset.

The crux of the problem of our machine age is that machines tend to upset this balance, by reducing the bodily activity that corresponds to certain sensory impressions. How little do we move our body while riding in a car, and how many 'signals' do we receive during such a ride! How much do we feed into our senses when watching TV while our body is completely inactive!

How does human nature react to this type of imbalance? The senses become dulled, the person becomes inattentive, restless, and nervous. He finds it more and more difficult to concentrate, consequently he achieves little, yet he never has time nor interest for undertaking anything. He may become apathetic, and often develops circulatory or heart trouble after a while. Teachers with some experience in these matters can easily tell the TV addicts from those who do not watch TV habitually, by their different attention in class. The 'hectic' pace of life that kills so many adult hearts is not hectic because so much bodily activity is required but because so much immobility, coupled with sensory overload, is imposed upon us.

The Amish communities live practically without machines, but to advocate a return to this mode of life for all of us would set the clocks back. No amount of persuasion in some such direction can hope for more than fringe support. We may admire from a distance people like Rousseau or Thoreau for their feeling for nature and for their strong individualism, but we cannot honestly expect that a majority of our contemporaries in the Western world will follow their example. The question is rather: What can be done so as to keep the real benefits which our technological age affords, while eliminating its adverse effects?

The Rudolf Steiner Schools have directed themselves for decades to such questions and have some very significant answers to offer.

* * *

Rudolf Steiner built his educational philosophy on his own extensive teaching experience as an educator working under a wide variety

of circumstances, as well as on an encompassing fund of knowledge of earlier educational ideas before him. He concludes that the learning experiences of a child must always provide a balance between the sense-pole and the action-pole of man. And this balance can only be attained if all school activities are permeated by the arts. Not only the audio- and visual arts, but also, and especially, the art of movement known as 'eurythmy.' The arts should be integrated with all other subjects, so as to permeate these with creativity and beauty. In this sense all of education must literally become an art.

This type of education awakens and strengthens the 'charioteer' in the child. It allows the inner life to unfold in its own way and to draw enrichment from experience. It leads to purposeful self-control, and thus to the control of one's environment. Whatever is learned in an artistic way will not become rigid like a bouquet of plastic flowers. It should be flexible and subject to growth and further development throughout life. This kind of learning rests on 'empathy' of the child towards what is being learned, and on a teacher-child relation that is sustained by mutual empathy.

Here we touch a sensitive nerve of current educational psychology. Responses to stimuli, such as are required for tests of all kinds, *can* be acquired without affecting that deep inner life-level from which empathy springs. I doubt whether empathy, the complete surrender (for a short time) to what one observes, the identification with another person or being, can be tested. It is infinitely varied and subtle. It can only be observed again by means of empathy.

Empathy lies at the root of the student's capability for true learning, as well as of the teacher's ability to judge the results. And the artistic, playfully-serious teaching techniques tend to release this faculty of empathy. When learning is pursued at this depth, it can meet life successfully, because it is alive within the student; it leads to inner freedom and integrity.

The human spirit would not choose to live on earth if this life were not meaningful to him. And in this world he encounters today the domain of machines, man-made to be sure, but ruled by an order which is essentially foreign to him. He can learn to understand and to control this domain. In fact, only in this context can he grow towards freedom and integrity. In each one of us the human spirit longs and hopes to partake in this growth. This growth is meaningful.

Just as it is possible to nourish the artistic, creative, empathic in the child, so is it also possible to starve these faculties. Turn a child over to all sorts of teaching machines instead of to a human teacher with a heart in the right place, and you will find that gradually such a child will, as it were, turn into a machine himself. He will unlearn to see things in any other way than in a mechanical order.

It is true that computer-based teaching machines, if carried to the extreme which technology permits today, are at present still prohibitively expensive. Consider, for example, the program of the Waterford School, Oakland County, Michigan, under subsidy from the Government Program for Educational Innovation, Title III. The acquisition of machines with

the high degree of versatility and flexibility, such as used there, requires a capital outlay of more than a million dollars; operating costs run close to a million dollars annually. But these prohibiting costs are only superficial flaws, which may be overcome in time. My concern is with basic issues of what is desirable, rather than what is within one's budget.*)

With regard to judgments concerning the long-range benefit or harm of the machine-world, a child is rather helpless and usually depends on its teachers and parents. In time the direction which these adults provide for such judgments becomes decisive for the question whether a child will live his conscious life essentially at the level of the machine domain — or at a higher level which permits real control of this domain. In order to provide here the right kind of setting for a child, adults should understand and be sensitive to the meaning of technology and its relations to man and to his environment. One should understand the services but also the pollutions and dislocations caused by technology in man and in nature. With every decision to operate a machine, be it a car, a TV or radio set, or a computer, a feeling of heightened responsibility for one's inner human state should be aroused. This is especially important in regard to decisions to use machines for pure amusement.

If parents and teachers do not hold the reins, the child's empathy tends to be drawn down to the machine level. Raising and maintaining oneself above the world of machines requires, in addition to an *understanding* of the functions of machines, an attitude of *restraint* in their use, a kind of esthetic taste for the conduct of life. Let me elaborate this important point.

Suppose a good dinner is scheduled for six o'clock and the children come home at five. Some can control their appetite; others grab a whole box of cookies and whatever other edibles come within their reach. The latter spoil for themselves the full benefit and enjoyment of the good food when dinnertime comes around. Moreover, they tend to overeat, with consequent damage to their health. Likewise one can ask: Can the need for 'amusement' not be better satisfied in many instances by activities other than the passive stare at the TV screen? Must we ride for our Sunday-amusement — could we not drive to a place where one can safely go for a walk in the woods or on the beach?

Parents and teachers face a tremendous responsibility for their children in regard to upholding control of this sort. By their own actions they set the example which will become decisive. A good rule is: *What is worth doing is worth doing well*. And 'well' implies: taking into account the

*) Skinner's philosophy of teaching purports to provide ideas and methods for the management of education. These ideas and methods do not necessarily imply the use of teaching-machine-hardware and the investment of funds therein. Skinner himself takes a dim view of the effectiveness of the trend towards extensive teaching by means of machines. See, for example, his book: *The Technology of Teaching* (McGraw-Hill, 1968). It is, however, a fact that those who favor—or sell—teaching-machine-hardware take the view that, in so doing, they are implementing Skinner's philosophy: one of the many contradictions which life so often presents.

need for balanced activities, which are much more invigorating than the seemingly restful overloading of the senses, just as a well-balanced meal is more nourishing than a pound of sweets.

Never should a child — nor his adult companion — be permitted to indulge in a sloppy, passive, only half-attentive way in technological forms of amusement, such as TV watching or listening to the radio. These acts should be strictly limited in time so as not to exceed the span of really active attention, which rarely exceeds half an hour. During the time of watching or listening no other activity should be pursued; concentrated observation should be insisted upon. The content of what was observed should be made a subject for subsequent conversation, for painting, or for some other personal creative reaction. If one insists on this principle from the start, one will discover that many healthy children require relatively little (but consistent!) coaching, and soon lose interest in these forms of amusement, of themselves, except for some especially appealing programs. Of course, good habits tend to erode in the company of friends who don't have them, and thus they may need reinforcement from time to time. Many other children, however, have already been sufficiently weakened in regard to their inner activity, so that they crave for the trance which mechanical amusement tends to induce. Their continually disturbed motor-sensory balance will gradually turn them into people who lack initiative, are alternately bored or frustrated, and explosively compelled to acts of violence or destruction. They enter on a path of life devoid of deep feelings and deep joys.

That is a high price to pay for the cheap 'amusement' received. The educational philosophy of Rudolf Steiner has a great deal to say about the connections between man and his environment. It is not necessary that all parents become experts in education, and Steiner Schools can often clear up questions for parents when they arise. But as a general rule I would like to urge every adult who has responsibility for our generation of children, to do one good deed every day for their sake, by attempting responsible, fully conscious judgment as to when to use the services of technology, and when to restrain oneself in its use.

Beneficial control of our overabundant environment can only be achieved through active, sensitive control, from within, of our own inner life.

—ERNST KATZ

AN EXPERIENCE WITH MACHINES

A few years ago, new at teaching and eager to work, I was asked by the head of Educational Departments of the Edgewood Arsenal U.S. Army base to teach a speed-reading course to young people and adults. The classes consisted of civilian and Army personnel. I was delighted with the offer and curious about the Army's reading program.

I'll refrain from naming the specific program, for I don't want to criticize it or the Army's choice and also because the program may now have changed. However, the experience was interesting as well as amusing.

The program was directed through machines. Each pupil was equipped with a machine and a reading workbook. Long, plastic slides of reading material were fed into the machine at a certain speed. Some had stories, some had word exercises, others were exercises to broaden eye expansion. The workbooks had questions that related to the reading on the slides, and they dealt with comprehension, vocabulary, and speed calculation.

Our class ran for two and a half hours. The first class meeting was used to introduce the machines and hopefully establish a beginning point. This starting point was a combination of speed (words per minute) and comprehension. The machines proved difficult. Threading the slides into them, setting the speed for testing, and establishing rate of speed was nightmarish.

First, the student started at what he thought was approximately his rate of speed. The machines were equipped with timers, on and off buttons, repeat and still buttons. The trick was to "play around" with the machine to find out a comfortable speed. The sentences or line of writing appeared as the slide clicked on until finished. (Each time a line went by all of the machines clicked *loudly* and no two machines "clicked" at the same time.) After the test frame was finished, the student recorded the time which was written on the "rate of speed" dial. Then the pupil turned to the workbook and took the comprehension test for that particular story. If the student got a perfect score, he concluded that he read well but perhaps too slowly. So he would proceed to another test story and "up" his speed. At the end, he again would take a comprehension test. If his score was perfect, he repeated the process; but if his score was too low, he must back-track, take another test at a slower speed until he finally arrived at the best estimated speed/comprehension level. From here, he begins his work.

I took this space to illustrate the time necessary for these people to arrive at a *beginning*. Needless to say, it took more than the first period, and, for some, more than a second one, to be able to start. One class was made up of captains, privates and secretaries. The Army allowed these people only eleven weeks to complete the course, meeting once a week. I might add that no miracles were performed.

The machines were difficult. Some nights they didn't work and parts were impossible to get. Since the class was large, two people sat immediately beside each other and some had to face one another. The noise level was high. Some found this distracting during reading and testing.

If a question occurred that needed a verbal answer, I often had to write the answer down to keep from disturbing the others. The program had little freedom. The student sat for those two and a half hours without moving. If something happened which required them to leave, time was lost and, depending on the length of that time, perhaps a lesson was also lost.

My role as a teacher was not functional. I sat and read or walked around the room. Rarely was I needed. The workbooks contained tests, vocabulary drill, and answers. The student didn't need motivation or prodding. He had to force himself to read faster and faster and keep the highest percent of comprehension. If he vacillated, he was not concentrating. If he didn't keep up with the vocabulary, he lost time and speed.

Some students, old and young, barely improved at all. Either they didn't push themselves hard enough or would not be pushed. Those who made progress did so (by their admission) because of the eye expansion exercises. The object of these was to train the eye to take in more than one word at a time and eventually a whole line at a time; they also trained diagonal reading and line by line reading. If the student was adept enough in this, he could vastly increase speed. However, the older ones found this difficult and only the brightest in both groups were at all successful in these techniques. The theory was that even though one couldn't develop the eye expansion, one could develop a faster rate of word by word reading.

To do this, the machines served as instructor and tester. The student read so much and was asked questions. The answers were placed in the workbook. No trouble arose until the student's pencil broke and while he was picking up a new one, the machine ticked on. If he had to wait for a new pencil, he had to turn off the machine and lost time.

Many of the students were frustrated. They thought that the teacher, after assigning some paragraph to be read in a certain time, should then test the group collectively for comprehension. I pointed out that individual instruction was the only method since all of them read differently. The machine did afford each pupil the opportunity to start at his highest point and, if careful and determined, he could increase speed and maintain comprehension. Some agreed, but many went away feeling cheated and those were the ones who didn't greatly improve. After eleven weeks, one understood why they felt cheated. In my final evaluation report to the Army, I stated that my role was negligible and not fulfilling.

To state that machine teaching is impersonal is by now a cliché. The machine masters the students. It is omnipresent and somewhat forbidding. One student remarked at the end of the session, "I felt that I was processed. The machine took too much attention and seemed to divert my attention. I'm not too happy with the results." This student started at about 380 words per minute with perfect comprehension and ended with about 1,200 words per minute with ninety six per cent comprehension. I was happy with the results. Still others showed slighter gains. *All* students improved. The demand that each student keep up with the vocabulary helped them immensely. Yet faster reading is a skill and it can be taught through the machine because it is a skill. Other things may not fare as well. The drawback was that the students tired of the machines, and the students and I missed the verbal exchange.

It is interesting to note that the students with the high I.Q.'s didn't make the most progress. The secretaries did the best. The females did better than the males and the young did better than the old.

It interested me to observe the machine teaching and I realized that much research and planning were needed just to develop the complex work and testing. The program was extensive and was well coordinated. The cost of this particular program is high and it bothered me that those machines were used only two and a half hours a week. Even now, as I reflect back, I was not a teacher, but merely an aide to help with the machines. That thought bothered me, too.

—JOHN F. GOSS

And then there was the up-to-date college professor, who — because of more important duties — put his whole lecture-course on tape. In the middle of the semester he decided to check on his students. There was perfect attendance! . . . twenty tape recorders, one on each desk, busily taking down the professor's every word.

PROGRAMMED LEARNING

The difference between the text of programmed instruction and the drama of real teaching is the difference between death and life. For students, the difference is a big one. And for society and the natural life of the earth that supports human society, one cannot exaggerate the difference it makes whether students are deadened or enlivened by the education we give them!

Programs are based on logical analysis. They suppose that any subject is composed of factual parts, that these parts are related to one another in a logical way, and that systematic presentation will therefore succeed in conveying the truth of a matter. Such programs are certainly possible, and they do convey information. But their information falls short of truth. It is of a mechanical nature. When the logical parts of a program are put together, the machine-like result is related to integral truth as the corpse is related to a previously living body.

No assemblage of limbs and organs ever adds up to a living body. No merely logical presentation of 'facts' will conjure up the active unity, the entelechy, of bird or flower, of landscape or social group. Unless and until programmed instruction is written as full-fledged art — as poem, drama and story, really — seeking to convey in every phrase the pulse of life, students will be receiving stones instead of bread. Atomism and materialism will come to obsess their minds. They will have been set by their very schooling upon the road that leads in the end to decay and despair. At the least, they will become dry in the joints and prosaic in the mind, boring to others as well as to themselves.

The augury for the civilization that confides any major part of the task of education to programs and teaching machines is bleak.

There may be a time for methodical analysis, even to the point of dissecting corpses, even to the point of learning from life-processes how to make better machines. But is that time childhood and youth, when all should be growth and becoming? Perhaps middle age and after would be more appropriate, when life's forces have died into form, and the augury for the physical organism is the slow breaking down of that form!

The difference between 'the living word' and dead words is well known to the creative writer. He confronts at every step the danger that life will be lost in the detail of writing, since he can obviously express the inspiring idea, mood, scene or character only through a multiplicity of words. The art of the artist, therefore, consists precisely in his striving to animate every detail with the spirit of the whole. It is for this reason that each syllable becomes for him a matter of conscience. His words must have just the right movement, tempo, and shaping force — quite beside the right meaning. He tries to let his subject choose its necessary form and accent, because he wants the life of his subject to flow without loss into his lines; and he wants these lifted to full reality.

What is a matter of conscience for an artist of whatever kind should be felt even more by the teacher. The duty to preserve life is for him a sacred obligation, since his is the responsibility of seeing to it that real men and women, men and women alive in themselves and tuned to the full reality of existence, are being prepared to take up the world's work.

If we say that the proper task of a teacher is to awaken and strengthen the life of thought in his students, it should be obvious that to impart life he must start from life. Hence his duty will not be to transmit bundles of hollow fact, however well packaged, but to set an example of fully felt, freshly motivated inquiry. To switch metaphors: far less the passive dough of information, far more the vital style of handling should be his concern. The style is the yeast. The leaven he can add may be trifling in quantity; if it is a true leaven, it will grow. Once the student's thought has been quickened, his achievements will be limited by neither teacher nor text; for life transcends its first conditions, bringing forth higher stages, with new powers, out of itself.

What is lacking in programmed instruction is precisely the leavening, quickening element of style.

If, on the other hand, we regard it as the teacher's proper task to awaken and strengthen the *will* in the individual student, so that this may flow with the force of single purpose and inexhaustible creativeness, we must again observe that will responds to will. Individuality awakens individuality: the smallest match ignites the largest bonfire. But the words a teacher uses must issue from the center of his personal reality if they are to touch the core of will in his students. The occasion does not matter, so long as the teacher responds to it honestly and with his whole force.

It is fair to ask what presence of mind, what personal force of feeling, what actual will, is to be found in a program conceived far away, at another time, under other conditions, by unknown teachers, and designed for the non-existent 'average' student. All this is not of the present, but of the past. Despite admitted small successes, such a concoction does little to arouse the will and much to put the will to sleep. One cannot escape the conclusion that *programs* of any kind in education, whether they be old-fashioned textbooks or new-fashioned, computer-assisted machine operations, obviously work to produce unreal people. One trouble is that the further course of the lives of such people is dangerously easy to control, by social programming.

—JOHN F. GARDNER