Margaret Gillett

Hard, Soft, or Medium?

Hard, soft, or medium? The issue involved here is not, as you might have hoped, "How do you like your eggs?" but it has to do with the equipment, content, and form of education technology. *Hard*ware is the name in the trade for the mechanical or electronic tools and equipment; *soft*ware is the material or the programs that are fed into, or beamed out of, the machines; *medium* is the agency or form by which images, sounds and other components of communication are transmitted. Thus, a TV set is the hardware where "Sesame Street" is the software and television is the medium.

Now that the title is explained so simply, is that the end of the issue? Hardly. The whole question of educational technology is full of controversy and fed by extremists, with the proponents of humanism on one side and the technocrats on the other. Both groups have their zealots and their radicals, their accepters and their questioners, their good guys and their bad. *Within* the two camps there are gradations of opinion but, *between* them, there is a real issue to quarrel about. The humanists accuse the technocrats of breeding mechanical monsters, of leading mankind into a computerized society devoid of human spirit and will, of engineering life into a frankenstein nightmare. The technocrats accuse the humanists of suffering from limited vision, of clinging fearfully to the past, of being irrational in their objection to progress, of adhering to programs and values that are irrelevant to the present and hopelessly inadequate for the future.

The place of technology in education is a matter that has far-reaching political, financial, and pedagogic consequences. Decisions in this area affect the fundamental nature of school-

ing. They might even help answer that currently recurring question about whether or not institutions called schools still need to exist. Decisions concerning educational technology will certainly influence what kinds of schools or learning centers are built, how these are equipped, how they are staffed, and what kinds of activities are carried on there. They will help determine how much money is required and will be related to such mundane but important matters as where do the dollars come from, who spends them, who gets them. The stakes are high, for the dollars can reach into the millions. But most important of all, decisions concerning the nature and extent of educational technology will affect the lives and future livelihoods of the nation's children.

The issue, then, has to be clarified. It cannot be left at the name-calling stage. Both sides must be brought into the open so that we can see whether there has to be a mortal battle between the technocrats and the humanists or whether a reconciliation is possible. To do this, we should try to find out what we can about sides and examine the validity of their arguments.

introducing the protagonists

The *technologists* (as they would prefer to be called) are disarming. They offer us utopia. Their arguments are exciting. For the first time in history, they say, mankind is free to make of himself and his environment what he will. He is free because he has the power, the power of technology.

Technology is the application of scientific knowledge to human affairs. It is a constellation of interlocking systems and activities which enables us to get work done with a constantly diminishing input of human labor. It is based firmly on the rational analysis of the scientific method. Thus, by the reason, vision, and diligence of humankind, we now have the potential to achieve almost anything — as the journeys to the moon so dramatically symbolize. Only a few people have set foot in the lunar dust, but millions of others have done so vicariously through the technology of television. The achievements of Apollo demonstrate mankind's capability of constructing enormously complex communications and transportation systems and they reveal human ability to come to grips with the universe. They have left the world's imagination unbound, not only free but stimulated, charged up to create

new goals. However fantastic these new goals may be, they can become realities in the fullness of time through the application of technology. All that is required is for human beings to ask and technology will deliver.

Educational technologists offer tools for greater learning. Educational technology is concerned with the continuing changes in educational procedures which grow out of applied scientific research. In the broad sense, educational technology is a systematic way of designing, applying and evaluating the total process of teaching and learning. In general practice, it emphasizes all the newer media used for instructional purposes. The devotees of educational technology make an impressive list of claims for the media in education:

● Media can increase the realism, the dynamics, and the emotional impact of information and thus increase the student's interest in the subject and his motivation to learn.

● Media can extend the limits of learning situations by expanding the experience and background of both student and teacher; they can also expand the limits set by school plant and geographic location.

● Media can create learning situations which cannot otherwise be attained — for example, they can bring current events "live" into the classroom.

● Media contribute magnification, which enables an entire audience to have a front row seat at a demonstration; slow motion and stop-action which permit analysis of action; time-lapse photography which provides rapid viewing of processes which actually occur during an extended period of time.

● Media provide stimuli for creative activities as well as vehicles for the production of original works.

● Through media, information can be presented in a variety of ways to meet particular objectives.

● Media make information storage and retrieval efficient and convenient.

● Media make possible the presentation of programs to groups of different sizes, from individual to national audiences, with either delayed or simultaneous presentation.

● Media — television, for example — can make the best teachers available to greater numbers of students.

● Media allow students to work in many situations without teacher "interference" and thus free the teacher to give personal assistance as required.

● Media allow for individualization of curricula and for flexibility of programs.

● Media change the role of the teacher from that of instructor to that of resource person, guide, and helper.

As appealing and as convincing as these claims seem to be, they are not universally accepted. Humanists might grant some of them, but would reject many of them as wishful thinking.

The *humanists,* whether they are religious or secular in their outlook, want to know as much as possible about man, his origin, his mind, his endeavors, his failures, his possibilities. They have great respect for reason and for the scientific method, yet they are vitally concerned about the affective components of mankind. From a staunchly humanist point of view, technology, the pure sciences and even the behavioral sciences hold an increasingly depersonalized concept of mankind, a deterministic view of the universe. Humanists concede that technologists may design and build computers modelled on the human brain in order to supersede certain human intellectual activities, but they cannot duplicate human moods, attitudes and emotions. There is no love in a computer. There are plenty of jokes about the computer, but the computer has no sense of humor. There is no happy laughter in the computer. Yet computers are allowed to dictate more and more details of our daily lives. Humanists reject a determinism that deprives them of individual self-fulfilment and freedom of choice.

This position may be expressed in a number of ways. One formulation posits that human beings must move out willingly and voluntarily to be part of destiny, to meet their own needs, to fulfil their own promises to be significant and subjective beings amid the objective, determined events of the world. This subjective view of mankind is endorsed by psychotherapist, Carl Rogers.

> We cannot, without great peril, deny this subjective element in ourselves. It precedes our scientific activities, it is more all-encompassing than scientific knowledge. It is more important than any technological development. It is an essential part of being human, of being a person, and no present or future development of the behavioral sciences should be permitted to contradict this basic fact.[1]

The *educational humanist* (though he would not go around labeling himself in quite this way) would state his case in terms like these:

- The individual learner should have full opportunity to interact with other human beings, both peers and people from other age groups.

- The individual learner must develop sympathy, empathy for mankind.

- The individual learner should be exposed to the richness of our inherited culture or, as Matthew Arnold put it, "The best that has been thought and said in the world."

- The individual learner must be given an opportunity for all-round development; physical, intellectual, social and aesthetic appreciations and abilities must be fostered.

- The individual learner must acquire a love of books.

- The individual learner must be allowed to explore ideas wherever they lead him in his quest for excellence; he must not be constrained by pre-packaged programs nor dictated to by "objective" computer-scored tests which ignore the subleties of his thought, the creativity of his responses.

- The individual learner is unique and cannot be "processed" like a sausage.

- The individual does not need fads and gadgets in order to learn; he needs the warmth and understanding of another human being to show him the path to learning.

If you look at the two lists of claims, you will notice at once that the educational technologist and the educational humanist are talking past each other. The technologist focuses on media, equipment, programs, while the humanist emphasizes the individual learner. The technologist seems concerned with methods and means, while the humanist worries about ends. Is it possible that this whole issue is really a problem in communication? Let us examine some specific questions.

should the schools use educational technology?

As the papers by Paul Saettler and Glenn Cartwright in this issue clearly show, educational technology is not a contemporary innovation. Though modern media and electronic equipment are certainly new, the use of technology in instruction has a very long history indeed. We have to go right back to primitive man in order to find a situation where some form of technology was *not* used in the instructional process. In the oral tradition of pre-literate times, the main instruments for instruction were the teacher's voice and pupil's ear.

As mankind developed the use of symbolic forms of expression in art and writing, the *oral tradition* began to give way to the *scribal age*. What could probably be called the first technological instructional equipment has been unearthed by archeologists around Sumer. Of course, these are not electronic — they are merely thousands of fragments of clay tablets. Together with the styluses which were used to make inscriptions in the wet clay, they constitute the original workbooks and textbooks of the earliest formal schools, the earliest tools specifically used to aid learning.

Writing spread throughout the ancient world and variant techniques developed. Though teaching/learning tools were available from about 3,000 B.C., writing was not continuously and universally a part of instruction from that time forward. The oral tradition persisted. Great teachers such as Jesus and Mohammed got by without writing. They signify that one of the important elements in any educational situation is the teacher. The teacher, too, is a medium and, as it happens in the case of Jesus and Mohammed, the medium and the message. Another great teacher, Socrates of 5th century B.C. Athens, seemed to see a threat in the new technology. He thought it would lead to intellectual decadence if young people relied on external aids rather than their own memories. In one of his parables he says:

> ...this discovery of yours [writing] will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written character and will not remember of themselves. The specific which you have discovered is an aid not to memory, but to reminiscence, and you give your disciples not truth, but only the semblance of truth; they will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality.[2]

There is a striking resemblance in spirit between the argument Socrates advaneed and the concerns of contemporary humanists. They fear that mediated learning (mediated in the one case through writing, in the other through electronics) is neither as valid nor as worthy as learning through the old means. Ironically, the older means that the humanists would support is the written word, the very thing that Socrates questioned.

Despite Socrates' forebodings, the written word has played an inestimable role in human intellectual development since the

Golden Age of Greece. Much of this intellectual development has taken place in societies which were literate. People who could write have had access to power. Societies that did neither invent nor acquire some form of the technology of writing remained at the oral stage and are considered, by definition, to be "primitive." Writing has been a pre-requisite to social progress. From mid-20th century, literacy campaigns have generally been among the first projects undertaken by "developing" nations as they tried to catch up. But they may be deceived by history — the new technology with its television, videotape, radio and tape recorders could create a new aural/oral era. The new technology in education might make it possible to short circuit the traditional patterns of social development — just as the technology of transportation has enabled some societies to leap from the ox-cart age to the jet age without going through the intervening phases. The new literacy will be the ability to "read" the audiovisual media and it will be multi-sensory. This is what the guru of the electronic media, Marshall McLuhan, predicts. (Bruce Shore, in this issue, considers the matter of literacy and the computer.)

Contemporary critics, many of them middle-aged or better, find little to quarrel about in the pre-World War II level of educational technology. Whatever it was, it was the norm for when they went to school. What they attack, what they genuinely fear, are the newer technological forms — television, videotape, tape recorders, and computers. As far as the computer is concerned, traditionalists may be joined by the young who resent being herded through the hassle of registration, being treated by the mighty machine as an inferior, a number, a cypher whose principal function is to avoid spindling, folding or mutilating the IBM cards.

Yet the computer is necessitated by two major factors which even radical students could support: the great number of students and the complexity of course offerings. The large enrolments mean that more students have the opportunity for education; the expansion of courses, specialized programs, variations in options concerning both content and methodology all should offer greater flexibility, in other words, more individualization. This is a fairly plausible argument in favor of the computer as an administrative tool. In any event, registration is an ordeal suffered once a semester (sometimes only once a year) and then it is over. In time, the frustrations and

quixotic bunglings of the computer are forgotten. And whatever their present shortcomings, computers appear to have a future in higher education — as Gary Boyd and Bernard Sheehan suggest in their papers in this *Journal*.

While it is possible to accept a certain amount of electronic "efficiency" in the administration of mass education, the computer as instructor is quite another matter and the question remains whether electronic technology really aids learning. Caleb Gattegno, of Cuisenaire fame, puts it this way:

> The trend toward more equipment in schools is irreversible. I am not against it. But, if we are aware *now* that plant and equipment are not the only components of an educational situation, we shall include another innovation in our program and development. This innovation consists of taking into account that there are children in the schools and that teachers are persons.[3]

Gattegno would seem to be right — the schools have been using technology in many forms for very many years and there is every expectation that they will continue to do so. We could not banish educational technology if we wanted to. Technology is entrenched in the schools. This does not mean necessarily that the technocrats have won and that the humanists should give up. There are still other questions to be asked and the concern of contemporary educators of all persuasions should be whether or not the technological devices do what their supporters claim. Do children really learn through technology?

do children learn through technology?

It should surely be no *innovation* to take "into account that there are children in the school and that teachers are persons." Gattegno's sarcasm makes us reassess the school situation. We might see that, in theory, children are the primary concern of the educational enterprise but that, in practice, the human inhabitants of the school are often overlooked. The real ends of education get lost as the means — the methods, gadgets, media — become ends in themselves. We can see a tendency for equipment to be valued for its own sake. It becomes a status symbol so that a computer in the school is a sure way to keep up with the educational Jones' or, better yet, to one-up them. Some administrators, media specialists and

teachers, as if bewitched by the magic of media, give the hardware priority over the human.

With all the hard-sell publicity, too much has come to be expected of educational technology. The language lab, for example, was doomed to disappoint because it cannot *teach* languages as its promoters claimed. At best it can drill sounds and patterns, it can handle phonetic and structural elements but not the vital cultural components which are the heart of real language learning. (But see Jean-Marc Vary's paper in this issue.) Again, programmed learning devices may tend to be neat little packages of structured activities designed to take the uncertainties out of teaching and the joy out of learning. They are schemes organized for the convenience of adults rather than the stimulation of the children. The result is that both teachers and students only serve the system, they are molded by the program, subservient to the machine.

Marshall McLuhan does not see the situation in quite the same way. He does not separate the modern child from the modern media. He claims that the current generation brought up and nurtured on TV has become totally involved in a new kind of world. Technology, according to McLuhan, is the poetry of the modern child. Electric trains and racing cars are the fantasies of the North American child, they have replaced the fairy tale. The child watches, listens, handles the switches, feels the vibrations and is totally involved in a multi-sensory experience. This is the dawning of the Age of Aquarius, the beginning of the post-literate era. If the schools are going to be relevant for such children, to reach them where they are, then the schools must provide for total involvement. The problem lies not with having too many media forms, but with using 20th century technology in the 19th century environment of the school.

For a referee between a Gattegno-type position and a McLuhan-type position, we should be able to call upon impartial, empirical research. But the findings of research into the all-important question of whether or not children learn from modern media are disappointingly inconclusive. This is rather astounding in the light of the apparent power of commercial TV and the great popularity of "Sesame Street" and "The Electric Company." Yet a summary of approximately 400 quantitative studies in the U.S. shows that some students learn more from educational television, some learn less and, overall, classroom television makes no significant difference.[4]

In a survey of more than one hundred experiments in the use of educational television, Chu and Schramm showed that many of the studies were "not clean" methodologically and their results were therefore "uninterpretable."[5] Many experiments were not rigorously designed and the variables were not held constant. For example, when live and TV teaching situations were compared, different teachers were used in some cases so that the variations in the results obtained could be attributed to the differences in the teachers as well as to differences in the situations. Nevertheless, from an analysis of those studies considered valid, Chu and Schramm concluded that *children do learn from television.*

Chu and Schramm also came to the conclusion that educational television can be used more easily and effectively for primary and secondary school children than for college students. They suggest that, if this is the case, it is probably because young children are more receptive to television because they have grown up with it and are more comfortable with it than are older students. They also suggest that the school teacher is more receptive to television than the college professor. The elementary teacher, particularly, is more accustomed to flexible scheduling, less accustomed to lecturing, and more likely to be grateful for outside help with unfamiliar subject matter and demonstrations. These factors make for a positive approach to the medium which, in turn, reinforces the attitude of the children.

Another pair of researchers, Dubin and Hedley, analyzed 42 studies comparing face-to-face and televised instruction at the college level.[6] They cast doubt on the view that ETV is less effective in college than in the lower schools but came to the conclusion that *television is no better and no worse than live instruction.* They did not find college students especially hostile to the electronic medium, indeed, they supported an earlier comparative finding that, "When data are summarized across courses, it is clear that most students prefer the conditions under which they actually received the course lecture material."[7] That is to say, if students are taught by television, they approve of ETV; if they are taught by a live lecturer, they prefer a live lecturer. A majority of students considered they learned at least as much from television as from a live instructor and they thought they had a better chance of getting an instructor of high quality in a televised than a live course.

Perhaps the most interesting result of the Dubin-Hedley survey concerns two-way television. For a number of years it has been assumed that the common complaint against the impersonal, "dehumanized" aspect of ETV would be settled once two-way television was introduced and students could talk to the "prof. in the box," ask questions and have misunderstandings clarified either during the presentation or immediately afterwards.

> The expectation that television instruction would be improved by two-way communication in order to provide as nearly as possible the replication of the live lecturing situation is simply not realized. Two-way television so far has not worked and it is significantly inferior to face-to-face instruction.[8]

It would appear, then, that when television tries to be like face-to-face instruction, it merely becomes a poor substitute; when it is used as a medium in its own right, it is at least as good as live instruction. The efficacy of two-way TV seems to have been a myth.

Other researchers and other teachers have found still other myths about instructional media to explore and perhaps explode. Widely-held and generally unexamined notions about films in schools include beliefs that they are "not academic," "only give information," "mere entertainment," "suitable only for the lower grades," "bad show biz, worse pedagogy," "do not encourage creativity." The validity of the pros and cons appears to depend on how the films are used, what kind of preparation, the circumstances under which they are screened, what kind of follow-up, how they were related to the children's backgrounds and interests and, most important, whether the children are merely shown films or whether they are permitted or encouraged to *make* films. These are all areas of choice for the teacher. Some teachers choose not to use film, believing that the best way to encourage creativity in English, for example, is to have the children read books and write essays. Others choose to exploit the medium and have found that film can encourage creativity. In this issue, Alwynn Pollard, for one, recommends a "hands on" approach to media in the schools.

We seem to have reached another impasse. Research findings about how children learn from instructional technology are unclear, conflicting or indecisive. The only thing that seems certain is that more research is needed. And it is

likely that better or, at least, different questions need to be asked. It is possible that the researchers and testers, trapped by the "rear-view mirror effect," are seeking from electronic media responses which would be more appropriate to earlier technologies. It also seems clear that, whatever the medium, the teacher is still important — or ought to be. Why then, do so many teachers appear to resent and resist educational technology?

why do teachers resist the new media?

Some teachers do not resist. They succumb. Programmed instruction takes the worry out of being close to the educational firing line. Pre-packaged learning systems, multimedia kits, computer assisted instruction can be accepted as invitations to take tranquilizers and forget all pedagogic problems. After all, the School Board in its wisdom adopted these materials, the manufacturers guaranteed that students would learn if they worked their way at their own rates through the programs, and a distinguished panel of experts originally designed the questions. Why should an ordinary teacher with so many things to attend to every day challenge authority or quibble over details?

Other teachers protest. They question the questions on the programs with imagination and vigor. They reject the behaviorist stimulus-response theory of learning which underlies programmed instruction. They deplore the busy work of worksheets. They are prepared to take risks with less structured, more humanistic materials.

If some teachers accept blindly and some reject actively, others use the newer media only occasionally and then with reluctance. The "literature" is full of complaints that teacher resistance to change is one of the major causes for the indifferent results of modern educational technology and, indeed, for most efforts at educational reform.

In the view of certain critics and media zealots, teachers as a whole are conservative and suspicious of anything new. They are timid and unjustifiably afraid that TV and the computer will cause them to lose their jobs; they are overawed by the media specialists, confused by the rich plenitude of new hardware and software, inept at manipulating the equipment, and browbeaten by principals or politicians who foist tech-

nology upon them. Teachers do not seem to understand the potential of media, to realize what they can and cannot do. Teachers cling to their old roles of instructor and mentor when they should be adjusting to new tasks and new self-images, becoming "education executives" rather than "drill sergeants."[9]

Whether teachers want to become "education executives," or whether the criticisms of them are justified, it seems clear that educational technology is no panacea for all the school's ills. It is no wonder if teachers sound defensive. They make a ready target. The stereotype of the conservative, timid teacher is such a convenient scapegoat for anyone who has an axe to grind in the schools. All the same, research into teachers' attitudes toward educational technology does tend to support the critical view that teachers resist the newer media. Summaries of a number of studies show that, while few teachers were against the use of all media, about half seemed to reject the new technology by default — about 50% did not use modern media on any kind of regular basis.[10] In one sample group, 93 teachers rejected instructional technology after some experience with it — they tried it, but they did not like it. A survey of studies on the attitudes of college teachers found that professors approve of media such as ETV in a general way, but the closer the individual faculty member comes to being directly involved, the more likely he is to feel threatened and to adopt a neutral or negative attitude toward it.[11]

Note that one of the reasons given for teachers' failure to use educational technology was that they tried it, had a bad experience and quit. They can hardly be blamed for not wanting to have more lessons ruined and, in cold hard reality, educational technology in its present state of imperfection gives plenty of opportunity for disaster. The number of things that can go wrong is unimaginable, especially in an ordinary school where the equipment is possibly worn out and probably poorly maintained: the film comes late and then it is the wrong one, the projector breaks down, the tape tangles, the noise of the machine drowns out the soundtrack, the classroom cannot be darkened or the children will pass out from the heat, the computer can only be used after school hours when the administration is not using it, the television lessons inter-

fere with the gym schedule, the media specialist is sick and no one knows where to find the transparencies . . . .

The problem, then, is not just that teachers are timid conservatives, but that educational technology has let them down.

the decision?

In 1968, a national commission on instructional technology was set up in the U.S. Its mandate was to examine the whole range of software and hardware and all the media used for instruction and learning. The commissioners looked at the old, new and future; mechanical and electronic; automated and cybernated; from innovations in print technology to computers; from classrooms to multimedia centers. The outcome was a two-volume report[12] which included the recommendations of the commissioners and the excellent submissions of well-informed critics and supporters of instructional technology.

The commissioners came to the conclusion that, despite considerable discussion and much emotional expenditure on the issue of instructional technology, modern media at present play a very small part in the nation's total educational effort. They noted that systematic efforts to harness technology to improve learning had been attempted only rarely, even in the United States. Overall, they found the performance of education technology to be disappointing.

They reluctantly decided that "instructional technology is a mixed bag. It can be anything from an audiovisual graveyard in the basement of some school, to a successful computer assisted course in Russian, to the extensive instructional network in South Carolina."[13] In general, their conclusions were substantiated by a more recent Ford Foundation study and could, no doubt, be applied equally well to Canada.[14]

Mixed bag or mixed blessing, the members of the commission still did not give up on instructional technology. On the contrary, they remained fairly optimistic about it; if they did not have complete faith, at least they had hope. They considered that the best way for the potential to be realized would be through the thorough co-ordination of efforts to originate, support and fund programs in research, development, and application. The commission therefore recommended the establishment of the National Institutes of Edu-

cation (N.I.E.) within the Department of Health, Education and Welfare.

But the question is, can a super-organization reverse the dismal record of educational technology? Would the concerns of the humanists be safeguarded? Would the truly efficient distribution of technology give every child access to computer-stored data of every imaginable kind? Supporters of computer-assisted instruction have projected a vision of every child before a computer console and thus having advantages akin to those enjoyed by Alexander the Great whose private tutor was the illustrious philosopher, Aristotle. Every child with his own Aristotle? Is this too far out? Maybe. But at the turn of the 20th century, the thought of a telephone in every home was fantastic, a TV set in every house simply undreamed of. Today, of course, these are more or less realities — they are certainly well within the realm of technical possibility and even economic feasibility. Will a computer terminal offering instantaneous, thoroughly individualized instruction to every child in every home have become a commonplace by the turn of the 21st century? Can the software be programmed fast enough and be brought up to the standard of the hardware? What would be the social consequences of fully technological education? How would the technocrats provide for human love, warmth, and understanding?

Prediction is precarious. Even with the increasingly elaborate forecasting tools of the modern social scientist, the future remains enigmatic. It is now possible to establish precisely the number of facts a child acquires through programmed instruction, it is even possible to predict with some degree of accuracy what these might be — these are among the immediate or first-order consequences of instructional technology. The delayed or late-order effects cannot yet be measured, they cannot even be imagined. No one can yet scrutinize all the behavioral and emotional consequences of mediated instruction, we can only know that they are likely to be complex, compound, and far-out. Human beings do not all respond to the same stimuli in the same way with the same intensity; stimulus-response psychology and the specification of behavioral objectives, which underlie so much of educational technology, impose limits that humanists do not want to admit, yet humanists do not deny the need to know where we are going or, at least, where we would like to go. Realistically, we must have a détente between humanists and technologists; we must have the contributions of both. Shall we agree

that this is possible through technology with the good offices of something like N.I.E., or do we agree that:

> Only a free and constantly developing humanism can provide that synthesis between physics and metaphysics, science and religion, and empiricism and intuition which every culture needs in order to be complete.[15]

The decision is yours.

references

1. Carl Rogers, "A Humanistic Conception of Man," in Richard Farson, ed., *Science and Human Affairs*, Palo Alto, California: Science & Behavior Books, 1965, p. 29.
2. Plato, "Phaedrus," in *The Dialogues of Plato*, Benjamin Jowett, trans., Chicago: Encyclopaedia Britannica, Inc., 1952, pp. 138-39.
3. Caleb Gattegno, "*The Ideal School*," in *The Ideal School*, Gloria Kinney, ed., Wilmette, Illinois: Kagg Press, 1969, p. 29.
4. Paul Saettler, *A History of Instructional Technology*, New York: McGraw-Hill, 1968, pp. 339-43.
5. Godwin C. Chu and Wilbur Schramm, *Learning From Television: What the Research Says*, Stanford, California: Stanford University Institute for Communication Research, 1967.
6. Robert Dubin and R. Alan Hedley, *The Medium May Be Related to the Message*, Eugene, Oregon: University of Oregon, 1969.
7. Robert H. Davis and Craig F. Johnson, "Final Report: Evaluation of Regular Classroom Lectures Distributed by CCTV to Campus and Dormitory Classrooms," *Project Report* No. 202, East Lansing, Michigan: Michigan State University, 1966, p. 17.
8. Dubin and Hedley, *op. cit.*, p. 11.
9. See, John B. Haney and Eldon J. Ullmer, *Educational Media and the Teacher*, Dubuque, Iowa: Wm. C. Brown, 1970, p. 7.
10. See, Matthew Miles, ed., *Innovation in Education*, New York: Bureau of Publications, Teachers College, 1964 and Sidney G. Tickton, ed., *To Improve Learning — An Evaluation of Instructional Technology*, Vol. II, New York: R. R. Bowker, 1971.
11. Dubin and Hedley, *op. cit.*, pp. 30-31.
12. Sidney G. Tickton, ed., *To Improve Learning — An Evaluation of Instructional Technology*, New York: R. R. Bowker, Vol. 1 — 1970, Vol. II — 1971.
13. *Ibid.*, Vol. I, p. 24.
14. James W. Armsey and Norman C. Dahl, *An Inquiry into the Uses of Instructional Technology*, New York: Ford Foundation, 1973.
15. Robert Ulich, *Progress or Disaster?*, New York: New York University Press, 1971, pp. 197-98.