

9 / Multimedia Education

Many threads in this book lead up to the idea that we should incorporate the electronic media into education, expanding beyond the current orientation of schools toward print and oral language. First, each medium has its own strengths and weaknesses, and each emphasizes certain types of information, ways of thinking, and modes of perception. Thus, we need multimedia education as a way of developing all facets of the mind and teaching children to be open to different perspectives.

Second, the educational impact of a medium is enhanced when it becomes the subject of dialogue and discussion. School is the setting where such discussion can most easily take place. Print is now the most frequent object of classroom discussion; this adds greatly to its value as an educational tool. The other media could benefit as well. The other side of this coin is the school's potential for influencing the child's perception of and response to different media. As discussed earlier, curricula organized around television can give children a more sophisticated and critical approach to viewing. We already take this for granted with literature.

Third, a multimedia approach to a subject can be a more effective way of teaching than a single medium in isolation. I gave an instance of this in Chapter 8: high

school physics students learned more from a combination of laboratory work with computer-simulated experiments than from either technique alone.

Fourth, as seen in Chapter 5, the electronic media can be used to make education and even literacy more widely accessible, raising the educational level of whole groups and populations. From this point of view, multimedia education is a way of making education more democratic: it cannot eliminate differences among groups, but it can bring more people into the educational process and raise the average level of knowledge and skill.

GUIDING HOME VIEWING

Teachers can have a strong influence on what children watch in their homes. In the research on *Freestyle*, a program designed to counter sex and ethnic stereotypes about careers, teachers reminded one group of students to watch the show at home. This teacher guidance produced a rate of home viewing almost seven times higher than the national norm for the program.¹ This higher rate of viewing increased learning from the show, because, as is often the case, learning was proportional to exposure. Thus, teachers can influence both which programs children watch and how much they learn from them.

One of my children's junior high school teachers, Rick Takagaki, for a time prepared a weekly list of worthwhile shows for students to watch. The list, which ranged from old movies to talk shows, included far more challenging shows than those my children normally watched. They did occasionally watch programs from the list, sometimes writing an extra-credit paper on one (a problem was that the viewing was an optional part of the course, which was social studies). One thing that struck

me about the lists was that I, as a television-illiterate parent, could not possibly have created such a list, even if I had the time to try.

The *Freestyle* research indicates that children's viewing can be quite affected by suggestions from teachers. Takagaki's approach indicates the potential influence on children's viewing a thoughtful and television-literate teacher can have. Even wider possibilities might open up if such a list were made a central, required part of a course and if viewing were combined with classroom discussion.

Indeed, the school may be the *only* practical way to influence the way children watch TV and what they watch. Comparing school and home as sources of guidance for children's television viewing, Dorothy and Jerome Singer found that it was easier to influence what children watch on TV and how they watch it by working through the schools than by working through parents.² I can think of a number of reasons why it would be difficult to work through parents. Most parents work, and this is probably all the more true for the parents of children who watch large quantities of television. Parents who work and tend to need television as an electronic babysitter are just those who probably lack the time and energy to educate their children about television. In general, parents are at a disadvantage relative to teachers in the time, energy, and knowledge necessary to guide their children's TV watching.

This is certainly not to discourage parents from guiding their children's viewing. They should do all they possibly can. It is to say that their task can be very much helped by the schools. Parents are generally in a better position to know what they do *not* want their children to watch than what they do. It is in making positive suggestions that the school can be most important.

TELEVISION IN THE SCHOOL

We have seen that making a television show the focus of interaction with an adult enhances children's learning from that show. One reason for this is that such interaction makes children realize that mental effort is expected of them. Children tend to approach television as an "easy" medium, expend little mental effort on watching it, and therefore learn rather superficially from it.³ In contrast, they view print as more difficult, invest more mental effort, and learn more deeply from it. However, if children are told to look carefully and try to learn from television, the depth of learning becomes greater: television viewing comes to resemble reading in this respect. If television were part of school assignments, teachers would very naturally give just this type of instructional message.

Studying television. Television is treated as a serious object of study in an elementary school curriculum designed by Rosemary Lehman that takes as its subject the formal features of television, the medium's code and aesthetics.⁴ This curriculum takes the code that constitutes television literacy (see Chapter 2) and turns it into an object of study. As a class in English literature might talk about the techniques and style of Shakespeare and Dickens, children in Lehman's program talk about the techniques and style of television programs.

Lehman's curriculum is divided into different areas of television technique, such as light and shadow, color, forms, motion, and time/space. For example, in the area of motion, children learn to distinguish camera movement from person movement and to find times when both camera and person move together. In the area of time/space, they discuss the differences among objective time (clock time of the program), the illusion of time created by editing, and subjective time (whether time

moves quickly or slowly for the viewer). Whereas the techniques of print literature, based on verbal forms, are difficult for younger children to perceive and analyze, the forms of television make use of children's well-developed visual abilities: abilities which, as we have seen, television both exploits and fosters.

Lehman's curriculum was tested for a school year with eight- and nine-year-old children. These children were compared at the end of the year with another class taught by the same teacher without the television curriculum. In writing about a short television sequence, the children who had studied the forms and aesthetics of television commented on formal features such as color and composition; children in the other group wrote only about story line. Children in the first group were also much more able to think of questions they could ask themselves while watching television; they used more cues of shadow, perspective, simulated motion, and so forth in drawing a scene from a TV program; and they were better able to indicate sound to go with their picture.

The year of studying television also caused a shift in the children's television-viewing tastes: action and formula programs dropped from their lists of favorite shows and were replaced by more challenging programs. No such change took place in the other class. For example, among the children who had studied television, *Charlie's Angels* dropped from first to tenth place; it was replaced by the evening movies. Whereas no documentaries or docudramas were on the list of favorites before the course, *Holocaust* appeared in the top ten afterwards.

These results are important. They show that elementary school children can analyze the forms of television, much as we might expect older children to analyze the forms of literature. In so doing, children take a more active approach to the medium, becoming aware not

only of content but of how television's forms and techniques create that content. In short, they become aware of the message of their medium.

Equally important, treating television as a serious object of study makes children expend more effort in viewing television, so that they choose more challenging programs. If this type of television course could be widely taught in the schools, the level of popular taste might increase greatly and there might therefore be a public demand for higher-quality programming. This could have a tremendous impact on television in the United States, where audience ratings determine a program's fate on the commercial networks.

Note that this type of course does not depend upon the overall quality of program content that is available. It depends only on having a range of techniques on the air. Thus, it is a positive approach to television, and one that can make use of formula comedies, commercials, and action shows, as well as of more "educational" programming.

Critical skills. Another approach to teaching about television in the schools focuses on turning children into critical viewers. I mentioned such efforts in the area of commercials and the nature of television reality in Chapter 4. These curricula aim to counteract the bad effects of U.S. commercial television, rather than to use television in a constructive way. Camera techniques tend to be treated as devices for deception rather than for art. In fact, of course, the techniques have both sides to them. This type of curriculum does, however, contribute to children's awareness of the medium. Both approaches to the study of television have distinctive contributions to make, and children would benefit from being exposed to both approaches in elementary school.

It would also be useful to bring feature films into the schools as objects of study and analysis. Just as with

television, both an aesthetic and a critical approach to film could be developed in the classroom. In the United States certain feature films, such as *Star Wars*, are seen almost universally by children. Recall from Chapter 4 that seeing a film once can have a profound effect on social attitudes. Yet as of now the powerful images of film are assimilated by children automatically without any of the criticism, information, or analysis that would enable them to make choices about how to incorporate what they have seen into their own attitudes.

TELEVISION IN THE SERVICE OF PRINT

Many parents and teachers might worry that spending so much time on television in the classroom could further erode reading and writing skills. However, the electronic media can also be used in schools to help build print literacy. In Chapter 8, I discussed the positive effect of word processing on writing skills; Chapter 5 showed how schools have used *The Electric Company* to build basic reading skills.

Television and film can also be used to enhance the comprehension and enjoyment of literature, especially on the part of the less able students. Working with junior high school students, Elias Levinson looked at how their response to short stories (by authors such as O. Henry) differed depending on the medium of presentation. One group of students read the original story; another group both read the story and saw it on film. Levinson investigated their comprehension (including recall) and enjoyment (assessed by the desire to read more stories of the same type). Overall, he found that the addition of the film very much increased comprehension and enjoyment, especially for students with lower IQ's. The advantage added by the film was also greater for the more unfamiliar stories, indicating that film or television

could be particularly valuable for unfamiliar subjects or genres.⁵

It is interesting that the films stimulated not only comprehension and memory of the story but also a desire to read more similar stories. It is also important that the effect of film on reading is greatest for the children who tend to have more problems in school, that is, the low-IQ group. This study demonstrates the potential for using television to enhance reading. Contrary to popular opinion, books and television need not be two media at war with each other.

Indeed, movies tend to make certain books popular with children. A survey of sixth, seventh, and eighth graders in New Jersey showed that 40 percent of the books they chose to read were tied to television or movies. In England in the 1950s it was found that both television and radio dramatizations, some serialized, caused many children to read the dramatized books, many of which were classics.⁶

Some teachers are beginning to take advantage of television's ability to motivate reading. A flavor of the rather dramatic results that can be obtained is conveyed by Rosemary Lee Potter, a pioneer in the use of out-of-school television in school:

One day a sixth-grader named Clara came in with a paperback copy of *The Little House on the Prairie*. Clara was not a great reader. I had never seen her with an unassigned book. It was quite a surprise for me to see her bring in a rather thickish book and read it. No doubt noticing my surprise, she quickly explained to me that *she had seen it on TV!* . . . I scoured book shelves, libraries, and booklists . . . I found a bounty of television-related books for my students . . . I began to bring these books into the classroom. Students showed high interest. Most of the books soon fell apart with excessive wear. Students who had previously been nonreaders

read everything from the latest about Fonzie to well-known books like *Souther*.⁷

Another way of using television in the schools, one that has become increasingly common in the United States in recent years, is to read television scripts in the classroom. The television networks now release their scripts in advance; CBS distributes millions of scripts and coordinated teacher's guides each year. There is an organization, Capital Cities Television Reading Program, that distributes advance scripts, along with coordinated teacher's guides and student workbooks. Teachers in Philadelphia who used scripts from television programs reported improved reading scores and much more interest in reading. Scripts were even stolen from the classroom, the first known theft of reading material in that school.⁸

Television shows and films can also be treated as literature in school. Sharon Neuwirth, a fourth grade teacher, noticed that her children were retelling their favorite television shows in class in great detail, but that they were totally oblivious to the story line. (Her observation agrees with the experimental research on the subject.)⁹ She noticed the same tendency to focus on peripheral detail in discussing stories read in class and in book reports. To counteract this, Neuwirth developed a project to teach story comprehension, focusing on conflict as the key to a story's structure:

I explained to the students that a conflict is set up when a character has a problem to solve: he wants or needs something, but an obstacle stands in his way. For example, a new student wants to make friends, but he's shy. Or a teacher is determined to help a student who wants to drop out of school . . .

To tune the students into looking for the basic conflict, I gave them an unusual homework assignment: watch

anything you like on TV, and be prepared tomorrow to tell about your show in only three sentences—Who the show was about, what the main character wanted, and what stood in his or her way.¹⁰

From this assignment, Neuwirth had the class branch off into identifying conflict in other media: film, school plays, and short stories. One effect of learning to understand the basic structure of a story was that the children could, for the first time, read long novels. They had been unable to do so before because, lacking a sense of overall structure, they were simply overwhelmed by complex plots.

Neuwirth's project succeeded because she began with television. The medium was available to all the children, no matter what their reading level, and they were already highly motivated to watch and discuss television shows. Once concepts were learned in relation to this familiar medium, they could be transferred to more difficult and less familiar ones, notably print. Surely this program will make children more sophisticated and comprehending viewers, as well as making them better readers.

One reason why the transfer of skills from television to print works so well may be that children start at a higher level of expertise in the former medium. In England, Michael Scarborough has investigated the educational use of entertainment television with ten and eleven-year-old children, and has come to the following conclusions:

Perhaps the most significant outcome to emerge from this effort was the considerable depth and sophistication in the child's conceptualisation. Certainly they more readily articulated their understanding of programmes than they might have done had the exercise been based on written material of comparable content and difficulty.

It might be that this is an indication of the child's intelligence and scholastic achievement, from my work it is impossible to say clearly if this is so, but my opinion is that because there is a widespread familiarity with the medium of television, children of a wide range of abilities are at ease in expressing their understanding of what they have viewed.¹¹

THE CASE FOR MULTIMEDIA EDUCATION

These classroom techniques could all be interpreted as showing the value of multimedia education: in each case, television or film is an addition to print, not a substitute for it. Indeed, one of the most consistent findings in the literature on media in education is the superiority of multimedia over single-medium presentation.¹² In fact, in talking about media in schools, one is always talking about adding media to the original medium of face-to-face interaction with the teacher. And face-to-face interaction adds as much to the learning value of any medium as the medium adds to the classroom.

There are various reasons why it should be of value to have the same material presented through more than one medium. Each medium, because of its code of representation and its technical capabilities, must emphasize different kinds of information. For example, film or television emphasizes action and simultaneous events happening in parallel. Print, in contrast, emphasizes a linear, sequential relationship between ideas or events. Thus, to receive information on the same topic through different media is to learn about the topic from different points of view.¹³

Our present educational system is so print-oriented that we tend to think of an account in print as the "true" one. In education, print is truly a privileged medium of

communication. This is probably mainly a result of historical circumstance: print was there first. It is time to question this assumption, not thinking of replacing print, but of moving from domination by a single medium to an increasingly multimedia system.

Examples of multimedia education. In England important steps have been taken to incorporate television into schooling. An extensive system of school broadcasts, presented cooperatively by the BBC (public) and the ITV (private), includes series on a wide variety of subjects at every level of education from preschool through university. Teacher's booklets for each series provide ideas for preparation before a broadcast and follow-up afterwards. While these broadcasts are not perfectly integrated into the curriculum, they are very broadly used and widely accepted by teachers.

In Sweden, careful thought has been given to how best to combine media in schools. Rolf Lundgren, director of the instructional programming unit of the Swedish Broadcasting Corporation, gives an example of the complementary strengths of television and print in a multimedia package:

If it is a question of giving students facts and people, let the printed material give them the facts, and television the people. Suppose we want to give the students an idea of what the Swedish society does to take care of its alcoholics. Information on how many alcoholics there are, where in the country there are special clinics for them, how much they cost the taxpayers, etc., all those kinds of facts could be better given in printed form than in a program. In the program we could follow an alcoholic's normal day, thus giving the student a moving document of the seamy side of the welfare state. Let the printed material take care of the cognitive aspects and the program of the emotional aspects of the matter . . . In the example mentioned—which is part of a

multi-media project we produced a couple of years ago—the TV program gave the students the case of an unfortunate fellowman and they could not help being affected by what they saw; in the classroom discussions that followed they could generalize their program impressions with the help of the factual information given them in the pupil's pamphlet.¹⁴

Another Swedish technique was to use radio to give commentary on the case viewed in the film, presenting, for example, interviews with social workers and other people who come into contact with alcoholics. Radio is also used for purely verbal or aural material, including drill concerning material presented on television.

As we saw in Chapter 4, one of television's strengths is in conveying feelings. Print, in contrast, is good for facts. Finally, discussion not only provides the active element so essential for learning; it also helps transform the specifics observed on television into generalizations. I have the feeling that one limitation of television is its tendency to use concrete examples, easily shown in visual images, and to avoid generalizations. Print and discussion, however, lend themselves well to abstract generalization, precisely because they can be divorced from concrete images. Combining television with these other media can turn television's weakness into a strength, as it provides the concrete examples that make abstract generalizations meaningful.

In my experience teaching developmental psychology to university undergraduates, I have also found the various media to be complementary. I use audio recordings to present experiments that are primarily verbal in nature. I use film and video to show children's behavior and reactions at different ages and to show environmental settings that would not otherwise be accessible to most students. For example, it is virtually impossible to describe infant reflexes in a way that is meaning-

ful to someone who has never seen one. Film lets the students see it. Through film, my students are able to observe infant care on an Israeli kibbutz or to meet a family that has lost a child to Tay-Sachs disease.

Film can get students emotionally involved with the material, and I take advantage of that, using film as a basis for group discussion. But the lazy habits born of too much entertainment television can cause students to consider the films as breaks in the class, opportunities to "space out." It is necessary to establish a context for their active involvement with the film material. I do this primarily by telling the students that the films are integral to the course and they will be tested on them. I also introduce each film, embedding it thoroughly in the structure of the class—a technique that has been shown to enhance learning from a film. An informal survey in my classroom confirmed an experimental finding mentioned earlier: a film image makes a point from lecture or reading more memorable.

After showing a film, I use lecture to relate the concrete examples presented in film to general facts and theories. For example, following the film of the Tay-Sachs family, I might talk about the frequency and genetic mechanism of Tay-Sachs disease; after a film showing infant care on a kibbutz, I would talk about how infants who have been raised on a kibbutz tend to turn out. I also use textbooks, which have strengths similar to those of lectures but can cover a still larger range of fact and theory. Textbooks often provide general background and factual tie-ins for the films as well. Finally, I have the students observe children in order to test some facts and theories for themselves, to experience the methods from which facts are derived in the field, and to become personally involved in the material.

Thus, each medium—video or film, face-to-face com-

munication, print, and experiment—contributes a unique point of view on a common set of topics. Together they provide memorability, active learning, factual content, and generalizations about the field. While this example is simply based on my personal experience, it agrees with the facts that have been accumulating about each medium and about the value of multimedia learning.

Comparative media studies. If different media present different views on the same subject, then one interesting task which could be carried out in school is to compare these views in a systematic way: comparative media studies. Contrast is a major psychological mechanism for bringing something into awareness. I do not think it a coincidence that our first scientific knowledge of literacy began just when the electronic media became important. Before the advent of the newer media, print was considered a transparent carrier of information. The biases intrinsic to its form could not be imagined so long as it was the only medium of mass communication. When the electronic media revealed themselves as different from print, they furnished a contrasting background that made the qualities of the print medium "visible" for the first time. This idea of contrast can be applied to children's education. Comparative media studies could make children aware of the style, techniques, and biases of each medium.

New combinations of media. The newest electronic media, video games and computers, also have promising applications to education, as Chapters 7 and 8 revealed. Recall that the combination of computer simulations and real laboratory experiments is better than either medium alone for teaching physics. In France, computer simulations have been added to biology courses to enable students to do experiments in areas such as embryological development to which they would not

ordinarily have access.¹⁵ Simulation programs could be incorporated into the teaching of subjects from math to the social sciences, yielding multimedia combinations with computers for almost every subject area. Learning software is another application of computers to education, one that is a useful addition to instruction traditionally using other media.

There are a number of areas in which the computer can serve as a tool for another medium, rather than as a learning environment in itself.¹⁶ In word processing (discussed in Chapter 8), the computer is a tool for the print medium. Music is another such area; personal computers allow even novices to experiment with musical composition. In art, programs such as Color Sketch provide an electronic Etch-a-Sketch, in which it is possible to change colors at will, erase, and redraw. Other graphics programs provide more flexibility, even including the possibility of computer animation.

A brand-new development is the use of television and computer together. Samuel Gibbon, Cynthia Char, and their colleagues at the Bank Street College of Education are working on a science program, *The Voyage of the Mimi*, that will combine a television series with computer programs. In this program, two scientists and their teenage assistants study whales on a boat that has a computer on board. Computer programs are being developed for use in schools in conjunction with the television show. For example, one is a simulation of navigation techniques, which involves fairly complex mathematics; another involves graphing data, such as data on water temperature over time; a third uses the theme of a whale search to teach simple commands in the computer language LOGO. This project gives some idea of the combinations of media that will be possible in the education of the future.

As for video games, I have already mentioned that they can motivate children to do computer programming. Another example of the possibilities for video games in multimedia education is provided by Levin and Kareev, using a game called Roadrace. The game has potential learning value in itself: for hand-eye coordination, integrating information (speed and position), attention span, and reading numbers (speed, time, and points earned appear continuously on the screen). Roadrace can also supply motivation and information for other learning activities. In a fourth-grade classroom, Levin and Kareev had children who had played Roadrace for a while go on to keep track of their scores in writing, ultimately teaching them how to do so by plotting graphs. They present other ideas for extending Roadrace into mathematics, such as learning about averages by averaging scores, or learning about the design of experiments by trying to figure out the effects of different race courses.¹⁷

Multimedia combinations involving video games and computers are just beginning. Knowing what we know about computer technology, computers should have contributions to make to the other media in allowing individualization of instruction, active participation in learning, powerful tools, and experimentation with complex systems.

Videodisc. Videodisc is a new medium that in itself is a multimedia combination. It combines the ability of film or television to present images and sound with the ability of computers to individualize and allow interaction. For example, videodisc can allow the viewer to write his or her own story by presenting alternative choices as a story progresses. Once a choice is made, the outcome is shown on film. This simple example shows how videodisc can make television both more

individualized and more participatory. (A videodisc game, *Dragon's Lair*, was the hit of the summer of 1983 in U.S. video arcades.)

THE NEW VIDEO TECHNOLOGIES

Cable television. Cable television is changing the shape of our media environment in the United States. By multiplying the number of stations available, cable multiplies the choice of materials to use in all the ways I have suggested. By providing at least one network specialized for children's programming, it is greatly increasing the amount of suitable children's programming available.

In addition, some of the more specialized stations provide new kinds of content that could be very useful for instructional purposes. For example, the daily broadcasting of the congressional proceedings could be used in government classes. Recordings from the Spanish-language channels could be used in teaching Spanish as a foreign language. Also, community-access channels make it possible for students' work in video to be broadcast throughout the community, providing a greater motivation for children's television production. Cable broadcasting of student television has already begun to happen.

But all is not rosy with cable television. It is also multiplying the ills of over-the-air television. The violence of police shows has a new and pernicious relative in the "videos" shown continuously on MTV (Music Television) to accompany rock music. These surrealistic videos are generally sadomasochistic, with the rock stars in the leading roles. Because rock musicians are heroes to teenagers, these images are likely to have even more effect on social behavior than the images of a regular television program. Because kids listen to music for hours on end,

the existence of MTV will also increase time in front of the television for many pre-adolescents and adolescents.

Cable is still too new for us to know exactly what it will do or what its final shape will be. I mention it mainly to put across the idea that the media environment of children is in a constant state of change and development. Our notions about children and the media need to take this fact into account.

Video recording. The relatively recent availability of new technology for recording television shows and playing them back at will makes it feasible to use broadcast television during regular school hours. This technology overcomes the obstacle of fixed broadcast schedules, which had been a practical barrier to the use of broadcast television in the classroom.¹⁸ For the first time, broadcast television can be fitted to classroom time slots. But the implications of video recording are as much intellectual as practical. With video recordings, a bit of tape can be viewed again or slowed down, for the sort of active analysis that a few lines of poetry or other literature can be subjected to. James Hosney, a teacher teaching film to fourteen- and fifteen-year-olds, told me he could see a large difference in student writing on a film when they had viewed the film twice rather than once. This is something we take for granted in teaching literature.

Whereas playing a whole program or film at once can encourage teachers to be lazy, it is said, "video material used in slices forces the teacher to use it imaginatively and purposefully."¹⁹ Narrated instructional films sometimes do too much for both teacher and student; they present the lecture for the teacher and allow the student no time for reaction. A short piece of unnarrated video recorded by teacher or student can be embedded in the viewers' own structure, allowing more active participation by both student and teacher.

Video recorders make it possible to use television in

many ways that books are now used. Parents can make selective videotape libraries for children's use at home. When school libraries can have video players and collections of videotapes, teachers will be able to assign viewing as they now assign reading for later discussion in class. This is particularly important for film as literature, because feature films are often too long to be shown in class. Also, teachers can make collections of videotapes recorded off the air, as well as with a camera, for repeated use in instruction in various subjects.

Not the least of the uses of the video camera is for teaching sports. Filming people as they engage in a sport is already quite common in some sports, although little has been done with young children in this area. This technique permits the learner to see him or herself from an outsider's perspective, while also making use of television's facility with the portrayal of movement (discussed in Chapter 3).

THE CHILD AS PRODUCER

Recording with a camera also opens the way for the child to act as producer. In the medium of print, children are from the beginning both consumers and producers. They learn to write as well as to read. As computers are being introduced into educational settings, it is becoming increasingly accepted that children will learn how to program as well as to use software. When radio and then television came into existence, however, this producing role was left behind. Until recently, the expense and complexity of the technology put the production of video and audio materials out of the range of the overwhelming majority of children. It is time to rethink the child as producer of these media, because the technologies of production are now much more accessible. Audio recording is within reach of most children in industrial

countries, and video recording equipment is becoming increasingly small, cheap, and sophisticated.

Because production always involves more knowledge than does mere perception,²⁰ it seems likely that once children have had experience as producers they will be more sophisticated consumers. This seems to be true in the domain of computers; knowledge of basic computer programming makes children more knowledgeable about computers and their uses. There are other possible benefits of producing as well. Salomon reports on a study by Chava Tidhar in which children planned, shot, and edited eight-millimeter films: "The effects of each of these activities were measured against the mastery of such mental skills as imagery, spatial construction, story completion, and chunking. Filmmaking has profound cognitive effects. But the activity of greatest influence was editing, and the skills most strongly affected were the most general and least TV-specific ones (story completion, story construction, headline generation)."²¹ These results indicate great promise for film or video production in terms of general cognitive effects. Furthermore, television production can be exciting, and it is a valuable skill in its own right. No one feels the need to justify teaching children to write because it helps another skill. Why should our attitude toward television or film production be any different?

As for aural media, cassette recording could be widely used right now to give children experience as producers. Children could easily record and edit their own "radio" programs. Both video and audio could be used for documentary as well as artistic purposes. In this role, they would be a valuable adjunct to instruction in all the social sciences. Allowing children to act as producers helps overcome the limitations of the electronic media as relatively passive, one-way forms of communication.

Screenplays. Another way in which children, at least

older children, can take a producing role in the visual media, a way that also involves practice in writing, is by writing screenplays. James Hosney used this technique in a ninth-grade class dealing with both film and literature. The students were asked to take a story they had written earlier in the year and translate it into a screenplay, with accompanying story board. (The story-board presents a pictorial image of each individual camera shot.) In a very active way this involves the essence of comparative media studies: the translation of one medium into another. Students had to take something that was in words and translate it into visual images, an extremely demanding and involving activity. According to Hosney, the students learned a great deal about the nature of both media from doing this exercise in creative translation.

CONCLUSIONS

Bringing the electronic media into the schools could capitalize on the strong motivational qualities that these media have for children. Many children who are turned off by school are not turned off by one or another of the electronic media; quite the opposite. An educational system that capitalized on this motivation would have a chance of much greater success. I think it would also make education seem more tied to the "real world," where the importance of the electronic media relative to print, is probably the reverse of their relative importance in the world of the school.

Each medium has its own profile of cognitive advantages and disadvantages, and each medium can be used to enhance the impact of the others. In short, to return to Marshall McLuhan, each medium has its own message. The cognitive message of print is the opportunity for reflection. Print and radio share the messages of

imagination, articulateness, and serial processing. The messages of television and film are an audiovisual style of communication (similar to that of face-to-face communication) and skill in interpreting the two-dimensional representation of movement and space. It may be that television and video games share the cognitive message of parallel processing. Finally, video games and computers add the message of interactive learning and the experience of complex interacting variables. The computer is such an open-ended and flexible medium that it also shares messages with many of the media that preceded it. It is interactive like face-to-face communication; it can be a carrier for print, as in word-processing; it can be used to program the animated graphics of television or film. It seems too early to say what its final effect on human consciousness will be.

The set of cognitive messages delivered by a particular medium, is, in at least a metaphoric sense, the consciousness created by that medium. It would be a mistake, it seems to me, to become too entrenched in the messages of any one medium. Each cognitive message has its own special value.

Educators (myself included) have a tendency to be literary snobs, regretting the passing of an old order in which people *really* knew how to read and write. This attitude has prevented us from seeing the revolutionary promise of the electronic media: they give new cognitive possibilities to disadvantaged groups, and they have the potential to enrich and diversify educational experience for everyone.

Society is also in direct need of the skills that are developed through experience with the electronic media. Already most people receive most of their information from television, not from print. Feature films provide children's most universal cultural experiences. Thus the need for sophisticated viewing skills is great. Our au-

tomobiles are electronic audio environments. Video games are the most lucrative of all the entertainment industries. Computers are inside many items in our everyday environment, and are spreading into homes by leaps and bounds. Most of tomorrow's occupations will involve computers in one form or another, and video games will be most children's first experience in interacting with a computer.

It is not clear how helpful today's television viewing will be for tomorrow's jobs. But society does have a need for people with sophisticated visual skills. E. S. Ferguson, in a 1977 article in *Science*, pointed out that the language of technology is basically nonverbal, and that people involved in technology need to be able to think in terms of images.²² He said that engineering schools are biased toward educating students to analyze systems using numbers rather than visual images. This bias has produced a lack of people who have the skills to deal with the complexities of real machines and materials.

This bias toward the type of symbol systems used in the medium of print is not limited to engineering schools, but is rife in our entire educational system. The time has come to remove this bias and treat the various media as equal, so that our educational system will reflect the messages of those media with which children and adults spend a large part of their lives.

References Suggested Reading Index