

## EVALUATION OF EDUCATIONAL MEDIA: SOME ISSUES\*

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Given the enormous educational problems that the governments of Unesco's Member States have to solve, the millions of illiterates they have to teach to read and write, and the urgency of finding solutions to these problems, I would recommend those responsible for education at the highest level to study the following pages in order to become acquainted with the experience gained in including the new techniques in plans for development of education. True, the new media will not bring about a miracle in educational systems, but if used efficiently, they are certain to help education "go further, do more and do it better". More important still, the new techniques may weld education and society together more closely.

Réné Maheu, Director General, Unesco in Foreword of Wilbur Schramm, et al., *The New Media: Memo to Educational Planners*, (Paris: Unesco, IIEP, 1967).

Formal lessons, in so far as they exist, will be conducted by means of the cinema or the radio, so that one teacher can give simultaneous lessons in all the classes throughout a whole country. The giving of these lessons will, of course, be recognized as a highly skilled undertaking, reserved for the members of the governing class. All that will be required locally to replace the present-day school-teacher will be a lady to keep order, though it is hoped that the children will be so well-behaved that they will seldom require this estimable person's services.

Bertrand Russell, *The Scientific Outlook*, (New York: W. W. Norton, 1962), p. 244. [written in 1931]

As these two quotations attest, beauty is so often in the eye of the beholder. The same phenomena when filtered through different lenses provide contradictory visions. In this volume, six studies are presented on

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the uses, costs, and effectiveness of educational media. The specific media include educational radio and television (Hornik; Jamison and Klees; Lumsden and Ritchie; Mayo, McAnany and Klees), computer-assisted instruction (Suppes, Fletcher and Zanotti), and video-tape instructional systems (Wagner). Each of these papers treats its subject in a thoughtful and (generally) competent manner, and the compendium is well above the average level of literature that has proliferated on these subjects. Clearly the essays tend to reflect the optimism of Maheu rather than the skepticism of Russell. In order to redress this imbalance, we have been asked to provide a critical review of the presentations.

While the papers are diverse on such dimensions as the nature of the media, applications, and even types of analysis, they do share one common factor. All of them tend to build a favorable case for the specific approach that is being explored. This is not to say that the authors are overtly partisan towards the media that they review. Rather, their advocacy is part of the very modes of analysis with which they look at their subjects. In this short discussion we will attempt to provide a systematic presentation of the implicit biases which lead to such favorable results. We will not argue that a more balanced evaluation would lead to different conclusions, for we do not know that to be the case. Nevertheless, we will assert that most of the concerns that we raise are ones that tend to elevate the relative performance of the technologies in comparison with the more traditional alternatives.

Before proceeding, it is important to note a source of differences between our viewpoint and those of the authors of the papers. All of the authors have been closely associated with the implementation and evaluation of one or more forms of educational technology, and in most cases this focus represents their dominant professional concern. Within this context they have been able to experience close contacts with both the phenomena that they are reporting on and the agencies that fund research on these matters such as the Agency for International Development (AID) and the International Institute for Educational Planning (IIEP) of UNESCO. They have worked directly with the progenitors of the projects that they have evaluated, and often their evaluations have been sponsored directly by the agencies and personnel who have planned, funded, and implemented the particular educational technology that is being reviewed.

This close association has several advantages. First, the evaluator is likely to have a highly refined knowledge of the origins of the project and its actual workings. Second, his close association with the project and its personnel will enable him to obtain information more easily than where he is considered an "outsider." Finally, it provides both continuity of experience and a comparative perspective since the evaluator is likely to have continuing experience with the different applications of similar technologies in different

settings as well as comparative technologies. That is, since a relatively limited number of funding and planning agencies dominate the educational technology sphere, they tend to call on the same evaluators to review their plans and applications. The authors who are represented in this volume are well known in this respect, and almost all of them have a diverse range of evaluation experiences in different countries.

But such an intimate relation also creates possible handicaps for a balanced evaluation. First, the close professional and personal association with personnel can lead to an evaluator's self-identification with the project and a subconscious unwillingness to be critical or negative about the project's performance. Second, the close relation with the sponsoring agencies can further hinder a truly critical perspective and limit the evaluation only to those issues which are important to the agency footing the bill. Neither of these risks is peculiar to evaluators of instructional technology, since virtually all evaluators are influenced by such factors. In contrast, we admit to some skepticism about the claims of instructional technologies by their advocates, and we believe that our skepticism is well reinforced by analysis of the data (Carnoy, 1975).

We will argue that these studies as well as many other evaluations of instructional technology are characterized by two types of biases. The first is called the "benefit of the doubt" or BOD aspects of the analysis which tend to accept and utilize very deficient data when they favor the instructional technology over traditional alternatives. We will give some illustrations in the next section. The second bias is that which is reflected in the narrowing of the scope of the analysis to those items on the agenda of the sponsoring agency while ignoring other effects. This aspect will also be discussed below.

### Benefit of the Doubt

The benefit of the doubt bias is really best described as one of different standards of evidence. James Q. Wilson (1973) has set out two laws that he believes apply to all cases of social science evaluation of public policy:

First Law: All policy interventions in social problems produce the intended effect – *if* the research is carried out by those implementing the policy or their friends.

Second Law: No policy intervention in social problems produces the intended effect – *if* the research is carried out by independent third parties, especially those skeptical of the policy.

These laws may strike the reader as a bit cynical, but they are not meant to be. Rarely does anyone deliberately fudge the results of a study to conform to pre-existing opinions. What is frequently done is to apply very different standards of evidence and method. Studies that conform to the First Law will accept an agency's own data about what it is doing and with what effect; adopt a time frame (long or short) that maximizes the probability of observing the desired effect; and minimize the search for other variables that might account for the effect observed (Wilson: 138).

It is Wilson's first law that reflects the benefit-of-the-doubt bias that we believe characterizes these studies in that a variety of assumptions that favor the results of the instructional technology as well as differential standards for data collection on costs seem to permeate the studies.

It is only fair to point out that Wilson's second law may be applicable to us as the reviewers of these studies. According to this law skeptics will find other interpretations of the observed phenomena and will question the data that are employed (Wilson: 138). Certainly this is the stance that we are taking, and the reader should be so informed in order to assess the basis of the difference in view.

We believe that in almost every case *the reported costs of instructional technologies are understated relative to their true costs*. Moreover, the standards for measuring costs of instruction are different between the instructional technologies and the traditional approaches, so that the costs of the former will be particularly understated relative to the latter. We will argue that these downward biases in reported costs are systematically related to the methodologies employed for cost estimation.

What are the methodological treatments that create these biases? First, the estimated costs of the instructional technologies are often based upon "drawing-board approaches" to what costs might be rather than actual cost experience. Both the expansion of the Mexican Telesecundaria (Mayo, McAnany, and Klees) and the Ivory Coast cost estimates are based upon a variety of untested assumptions. Such an approach invariably imparts a downward bias because various cost components are omitted — although later experience will show that they are required — and cost estimates of future implementation of instructional technologies are invariably understated. This latter rule is true whether we talk about the development of weapons systems, instructional systems, or supersonic aircraft such as the Concorde. Careful assessment of costs is impossible without experience, and experience shows that the drawing-board estimates are *invariably* lower than actual costs when the project is implemented. Fortunately, there is direct evidence on this point. After Klees and Jamison wrote the paper included in this collection, Jamison had an opportunity to review the actual cost experiences for the Ivory Coast for the first years of the project. He found

that not only were his reported costs drastically understated, but that they were *rising* considerably over time.

Even when cost data based upon experience are available, only in very few cases is any serious attempt made to use careful cost accounting procedures. Again, this factor tends to understate estimated costs since crucial ingredients are not included in the estimates or their true costs are understated. Improper costing, for example, is reflected in a study done for the AID on the El Salvador system of educational television (Speagle, 1972), whereby he assumes that the cost of capital is zero and ignores other cost items as reflected in the present reanalysis by Jamison and Klees. When these components are costed out, one finds that the original estimate of average costs is understated by almost fifty percent.<sup>1</sup>

But costs are also understated for other reasons. First, several of the studies do not include all project ingredients when they calculate costs. In particular, the values of contributed inputs, such as contributed facilities (Mayo, McAnany and Klees; Lumsden and Ritchie; and Wagner), are often ignored. In virtually all of the AID funded studies the costs of technical assistance and advisement tend to be ignored or understated. These deficiencies in costing are especially widespread, and they are conceptually unsound. The issue of who pays for particular project components and the true costs of a project should be separated. An evaluation of costs should attempt to measure the full cost of implementing the instructional technology regardless of how the costs are distributed among countries, government agencies, private contributions, and so on (Levin, 1974). Once knowing the total cost of the project, the burden may be shown according to who pays. But to assume that cost components that are supported by other entities should not be treated in a cost analysis is not correct either conceptually or in a policy framework.

Compare this treatment of costs of instructional technologies with those of the traditional alternatives. First, the latter costs are based upon *actual* experience rather than on drawing-board assessments. Accordingly, the difference in methodologies of cost assessment alone will tend to understate the costs of educational technologies relative to the more accurate measures for their traditional counterpart. In contrast with the actual cost experience of traditional instruction, we have only the invariably optimistic “projected” costs of the technological alternative. Thus, the difference in methodology of estimating costs in itself will be the source of an erroneous comparison that will favor technology.

<sup>1</sup> Even these adjustments do not guarantee the accuracy of the adjusted cost figures since Jamison and Klees were not able to check the validity of the other cost estimations in the Speagle report. We have argued that any omissions in the original study are likely to bias the cost estimates downward.

Second, the omission of contributed inputs such as facilities and technologies also biases their cost assessments downward relative to the costs of traditional approaches. The latter are likely to have far smaller components of contributed inputs by virtue of the fact that they have long been an institutionalized offering of the government. Thus, even if cost estimates of both educational alternatives and the existing practices ignore contributed inputs (those resources provided by other governments, agencies, industry, or families), the effect will be to understate the costs of the instructional technology by a larger factor than those of the existing approach.

But giving the benefit of the doubt in cost estimation is only one way in which these studies tend to overstate the attractiveness of the educational technologies that they evaluate. The BOD bias is also reflected in their statements of effectiveness. Consider that in almost all cases a narrow measure of educational attainment is used to assess educational outcomes or no measure of effectiveness is used at all. Is it appropriate to assume that students receiving video tape instruction in factories are receiving the same education as those on campus who have regular access to faculty, other students, or libraries? Is it correct to assume that the value of an Open University degree will be similar to one from Oxbridge or the "Red Bricks"? Such a presumption simply ignores the credentialing effect of higher educational institutions as well as the fact that Open University students are not being socialized in the same way as their counterparts in traditional universities. The latter students are spending most of their time in contact with fellow students, faculty, and academic facilities that go far beyond the short exposure to course instruction and required instructional materials.

Is the Mexican secondary student in the Telesecundaria receiving the same inputs with respect to nontelevised material as his counterpart in the traditional school? Consider that the teachers in the Telesecundaria are themselves the product of only a primary education with a secondary training for teaching primary children. That is, the Telesecundaria teachers themselves lack secondary training in many of the subjects that they are teaching since such subjects are not part of the curriculum for "Normalistas." In contrast the regular secondary classes (ED) are staffed by teachers with academic training at the secondary level and pedagogic training at the postsecondary level. But, a few test scores on conventional subjects are probably not adequate to reflect the greater teaching inputs of the latter teachers. Rather, we do not find it surprising that a larger portion of the students in the traditional schools desired university-level training and professional careers than those in the Telesecundaria. Unfortunately, the emphasis on test scores may obscure what may be a far more important finding in evaluating the two alternatives.

Of course, the BOD assumptions on benefits are widespread throughout the literature. These are based upon the assertion that comparisons of newer educational technologies with the more traditional alternatives show no significant differences between the two approaches on student test scores. Generally such evidence is based upon testing a relatively narrow domain and generalizing this to all educational impacts (Chu and Schramm 1968; Schramm 1973; and Jamison, Suppes and Wells 1974). Indeed, Jamison and Klees rely upon these studies in their global statement that “. . . these media (educational TV and radio) are good substitutes for conventional instruction of reasonably high quality.” Yet, none of these studies considers the other factors that are evident in traditional instructional systems that affect both cognitive and socialization outcomes. Further, recent analyses of the determinants of earnings suggest that cognitive factors are not very strong predictors of income and other measures of lifetime success; and that the non-cognitive aspects of school socialization seem far more important factors in determining such outcomes (Gintis, 1971; Bowles, 1973; Bowles and Nelson, 1974).

By omitting these other factors, the claims of “equal success” in educational results is unsupported and derives from a narrowing of what constitutes success to the specific test instrument used to assess instruction rather than to assessing the wide range of outcomes that schooling contributes to. This is an especially serious problem in a cost-effectiveness study because the evaluation instruments are invariably designed to compare the instructional approaches on the basis of what the instructional technology is designed to achieve rather than the far larger range of outcomes that the traditional systems of instruction focus on. Yet the cost comparison is one that includes cost components of traditional instruction that contribute not only to the narrower output, but also to the other goals of the traditional instructional process.

Consider that the appropriate cost comparison of educational television or radio for mathematics and reading proficiencies should be one which compares the cost of these technologies only with the costs of alternative or traditional costs of teaching mathematics and reading. That is, only the pro-rated costs of teacher time, instructional materials, facilities and so on that are devoted to these subjects should be compared with the costs of traditional instruction. Yet, the tacit assumption is that the cost per hour of instruction, per subject, or per degree is appropriate comparison between the two forms of instruction as evidenced by the papers by Jamison and Klees, Wagner, and Lumsden and Ritchie. Such a comparison will overstate the costs of traditional instruction that is utilized to meet only these objectives since some of the cost of traditional instruction is used to fulfill other educational and socialization functions.

While we have referred to some of the individual studies that are published in this volume to illustrate our general points, it is useful to mention briefly some aspects of each study which might be reviewed in the BOD context. We will tend to be critical in order to bring out the issues that we believe are important within the context of this review. We hope that the reader does not lose sight of the general quality of the papers we are considering, and the lack of detailed praise is due to the critical mission of our assignment.

#### HORNIK

The Hornik paper on the introduction of educational television in El Salvador is based upon the much larger study that he and his colleagues carried out (Hornik et al., 1973). In this presentation Hornik concentrates on the apparent success of educational television compared to the more traditional instructional approach, in reducing the relation between student background and learning. In our view he makes some misleading interpretations of his data. First, he never acknowledges the fact that the dropout or non-participation rate in education in El Salvador is so high that only about one-third of the children reach the seventh grade. Accordingly, any comparison of the correlation between socioeconomic background and test performance among that select group with that for the U.S. which has almost complete educational participation of its young at grade seven is inappropriate.

Second, Hornik's comparison with the U.S. is erroneous. According to the Coleman Report (as reviewed in Mosteller and Moynihan, 1972, pp. 14–15), there was a relatively constant standardized difference between the test performance of white children and children of other races over the different grade levels. Typically the mean test score of blacks was between 1 and 1.1 standard deviations below that of whites at all grade levels that were tested. Of course, a standard deviation represents a larger difference in "grade equivalent scores" at higher grades than at lower ones. However, this has nothing to do with the correlation between race or background and test scores. Rather, it is an artifact of the test measure. Even with the slight reduction in the correlation between background and test scores of students between grades seven and nine in El Salvador, the difference in "grade equivalent scores" from grade seven to nine between students with low socioeconomic backgrounds and those from higher origins is likely to have "grown" over that time. Accordingly, Hornik has used two different standards in making the comparison between the U.S. and El Salvador, and his conclusion of differences between the two with respect to changes in the relation between socioeconomic background and achievement at different



grade levels is not supported by the evidence that he cites.

While there is some evidence of a statistically significant difference in favor of the instructional television, we know nothing about differences in treatments nor the educational significance of the differences. The BOD aspect is reflected in Hornik's assertion that "... the amount of change (in the performance of ITV classes) was large and significant." Since the metric of test results that the author used was only a rank ordering, it is impossible to make such a statement. That is, we have no way of knowing how large the relative gains in cognitive achievement were from a statistical analysis of rank orderings. Further, Hornik does not even consider that changes in rank orderings can be due to other factors such as Hawthorne effects and non-random assignment that might surround instructional television. Certainly, Hornik's footnote on the latter point is not reassuring in pointing out the biases in favor of the ITV classrooms even though he tends to minimize the differences.

#### WAGNER

Leslie Wagner reviews a T.V. videotape system that provides off-campus education for persons in the work place. While the Wagner paper is a most thoughtful analysis of the project, it has certain BOD implications in its relatively favorable conclusions. First, questions are not raised about the quality of experiences and results under the videotape approach in contrast with the on-campus instruction. The lack of faculty, library facilities and a university environment would suggest that different experiences and outcomes might be evident between the off-campus and on-campus approaches. However, these possible differences are ignored, and the analysis is restricted to a comparison of costs between the videotape classes and conventional instruction.

But, again there are different systems of accounting for costs between the two alternatives. Only the direct costs of producing the videotapes are included in the cost of the off-campus classes. It is not even clear that the courier costs for delivering the tapes to the outlying setting are included in the estimates provided by Wagner. More serious, all the costs of facilities at the firms for showing the tapes are ignored because Colorado State University is not paying for them. Further, the extra time required of faculty for preparing the videotaped lectures and for periodic visits to classes is not included. Thus, the comparison of costs for offering the course at the University with that of the off-campus instruction tends to understate, relatively, the costs of the off-campus instruction. As we noted before, a more appropriate approach is to estimate all the costs of each alternative, and only subsequently to allocate the cost burdens to each of the payers.

While the off-campus classes may save Colorado State University some money — and that is not clear from the analysis — the total costs that are borne by all the participants together seem to be greater in the off-campus case. (Even the opportunity costs of instruction in the two settings should not differ for part-time students, but the other costs appear to be higher in the off-campus case once all costs are accounted for.)

In favor of the video-tape system is the possibility that it is the most cost-effective method of providing small group instruction for students who reside in out-lying areas. That is, perhaps the comparison with the costs and benefits of conventional instruction is inappropriate since it is unlikely that a Colorado State University would be constructed in out-lying areas given the sparse demand for instruction. It would seem that the more relevant comparison, then, would be one that contrasts the video-tape approach with other feasible technologies for students in such locations. We suspect that this type of comparison would show rather favorable results for the video-tape alternative because of its high flexibility and low fixed-cost requirement in conjunction with its reasonable variable costs.

#### JAMISON AND KLEES

The Jamison and Klees paper is a useful survey of both methodology and some actual cost estimates. Yet, we believe that the apparent precision embodied in showing how cost functions are derived and applying them to existing data also tend to give an air of greater validity to the data than they deserve. Much of the cost data that they review are “drawing-board estimates” rather than information based upon experience, and we have asserted that such costs are *always* understated by the advocates of instructional technology systems. The Ivory Coast case is a useful example in this context because the actual costs are considerably higher than those utilized by Jamison and Klees.

Even when cost figures are derived from ongoing projects, they have not been based upon careful cost-accounting procedures. Indeed, the procedures of costing out different factors are not even consistent across studies. While Jamison and Klees are able to make some adjustments in the data for El Salvador by adding other costs that were neglected in the original cost study, they are unable to review the cost analysis in any detail for the other countries.<sup>2</sup> An examination of the sources that they note for several of the

<sup>2</sup> Engineers who design instructional systems typically overstate the utilization capability, and planners typically overstate the utilization demand. An example of the former is the PLATO computer instructional system at the University of Illinois which was originally designed to service about 4,000 user terminals simultaneously. In fact, a maximum utilization rate of less than 500 terminals seems to be the actual capacity of the system.

countries (Colombia, Thailand, and El Salvador for example) is very disconcerting with respect to the exact methodology, thoroughness, and accuracy of the cost estimates.

Finally, we must note that the use of a cost-per-hour figure may be very misleading as a comparison metric for two reasons. First, such a figure is highly susceptible to utilization rates, and we believe that the history of such projects indicates that utilization rates are often overestimated. To the degree that the rates are based upon actual usage, this criticism does not hold. The second problem is a more subtle one. By using a cost-per-hour figure, the impression is given that this is the appropriate measure for comparing new instructional technologies with more traditional instructional approaches. What is lost in such a comparison is the fact that the more traditional technologies are oriented towards a much wider spectrum of educational goals than are such approaches as educational radio and television with their subject-specific programming. Accordingly, the comparison should be made only between the cost of an hour of intensive mathematics instruction or reading instruction and their relative impacts and an hour of typical classroom time spent on mathematics which may provide a much more integrated learning framework with respect to other subjects than the comparable television or radio offerings. Probably much more mathematics and reading instruction could be crammed into a period of time if teachers were to concentrate on those subjects to the exclusion of all other goals; and essentially this is the set of conditions that should be compared with most educational radio or television instruction of those particular subjects.

#### LUMSDEN AND RITCHIE

The Open University is one of the most interesting developments in the use of educational technology. Therefore a cost-effectiveness analysis or cost-benefit analysis is very instructive when considering the Open University as an alternative to the more conventional post-secondary instruction situations. There are at least two sets of BOD assumptions that are implicit in this study that tend to favor the Open University. First, the authors ignore the costs of local libraries, college- and other facilities that are utilized by the Open University students for study, and reference, and also the tutorial component of the curriculum, all of which are subsidized by other units of government. The fact that the average cost to the Open University of such facilities is only about £2 per student suggests that the subsidy is substantial. Again, we believe that *all* the social costs of the Open University should be compared with those of conventional universities, and that the sources of support should be allocated as a separate exercise. It is the former that should be considered with respect to comparing the social costs of the two

endeavors. Even so, the authors find that the cost differential is surprisingly small, from 9–27% depending upon assumptions.

Yet, is it possible that even these cost savings are obliterated by a smaller educational product? Consider that the average university student receives not only instruction and instructional materials, but he receives substantially more tutorial services, contact with fellow students, access to libraries, computers and campus lectures than does his Open University counterpart. Indeed, much of the value of a university education is probably reflected in its socialization content that is not captured by the exams per se (Feldman and Newcomb, 1969). Lumsden and Ritchie simply assume that degrees from the Open University are comaprable to those of other universities, and the issue is tacitly dropped. We believe that a more realistic premise is that the limited nature of the Open University education as well as the credential effect of particular institutions on earnings and occupational attainments would suggest that the Open University graduate is not as likely to receive either consumption or income benefits from his education that are as high as those of the person from the more conventional university setting (Solmon and Taubman, 1973). Even a relatively small difference in the impact of the degree (e.g. 10% lower earnings than comparable graduates of other universities) would tend to obliterate a 9% cost saving.

#### MAYO, McANANY AND KLEES

In this very useful study we also see several instances of the BOD bias that makes the Telesecundaria look relatively more favorable than is actually the case. In an earlier version of this paper prepared for the AID (Mayo, McAnany and Klees, 1973) it was assumed that an expansion of the conventional schools into rural areas would require relatively greater expenditures than the expansion of Telesecundaria. In fact, this was the result of using different methods of estimating costs where it was assumed that Telesecundaria would use portions of existing buildings such as churches while the conventional secondary school would require regular school facilities; administrative cost differences were also based upon standards that would favor the Telesecundaria. Essentially the authors used the actual costs of urban secondary schools to estimate the costs for rural expansion under a traditional system; but for the expansion of Telesecundaria they used the costs of the *experimental* Telesecundaria schools set up in buildings used for other purposes and having low administrative costs. Yet, obviously there is nothing intrinsic about the Telesecundaria that enables it to use available buildings and low administrative inputs that does not also pertain to the expansion of conventional secondary schools into rural areas. The numbers of students served and the locations would be comparable, and if anything

one would suspect that the Telesecundaria would have higher administrative and facility costs by virtue of the technological requirements of the equipment and its usage.

The version of the study that is printed in this volume eliminates the assumed difference in costs associated with facilities and administration and focuses on the cost savings attributable to the fact that the Telesecundaria utilizes teachers with regular schooling only to the primary level and pedagogical training at the secondary level. In contrast, the conventional secondary schools require teachers who receive a more conventional secondary education with pedagogical training at the secondary level. The question that immediately comes to mind is that of how adequate the teacher preparation is for addressing material or student needs which are *not* reflected in the televised instruction. It seems peculiar to us that the authors argue for no difference in educational results on the basis of the relatively narrow test results, given that many of the Telesecundaria teachers have probably had no more contact with the academic secondary subjects than the students themselves. Indeed, the fact that the test scores are relatively similar in the Telesecundaria and the conventional secondary schools seems to be less important than the rather substantial differences in desire for university-level training and professional careers that favour students in traditional schools. The relatively passive approach characterized by television programming and undertrained teachers in the Telesecundaria may not prepare students as well for further training and higher level careers as the more interactive mode of conventional instruction. The fact that these educational attributes are not necessarily reflected in test scores is indicated by the findings that only a small portion of differences in earnings associated with schooling seems to result from test score differences in cognitive knowledge (Gintis, 1971).

But further, even the cost differences associated with the less-trained teachers may be misleading. Recently, the Telesecundaria teachers went out on strike in demands for higher salaries, partially in response to their understanding of the cost savings represented by the Telesecundaria. The government yielded to their demands so that at least part and perhaps most of the cost gap has been closed. This phenomenon has not only reduced the cost advantages of expansion of Telesecundaria, but consider the future increase in political impact of the additional teachers required to service one million pupils rather than the 29,000 who are presently enrolled. Certainly, any cost savings that still exist according to present estimates will appear very tenuous with a thirty-fold increase in the political power of teachers of the Telesecundaria to strike and demand even greater salaries to reflect their allegedly higher productivity.

But even the small differences in the test score results are suspect: the *starting* scores indicate either that the tests are poor measures of cognitive

knowledge, or that the student population in the urban traditional seventh grade is very different from that attending the Telesecundaria classes. The pre-treatment results show rural students scoring higher on Spanish language than urban students, an unusual result unless the rural students who were tested come from a higher social background than the urban students, are older, or are more highly motivated toward school learning in other ways. Mayo, McAnany and Klees argue that the educational attainment of fathers of the rural students is lower, but educational attainment (which is the most valid of the measures used) is a poor indicator of social class background in rural areas, particularly in comparison with urban areas. Furthermore, a student reaching the seventh grade in rural Mexico is a member of a much more select group than a seventh-grade student in urban Mexico. In 1970, only 18% of the population in the 6–14 year-old age group in all Mexico (both urban and rural) completed the sixth grade as compared with 33% in the Federal District. Both of these factors would tend to make the rural pupils in the sample better learners than the urban sample with or without instructional television. On the other hand, the rural sample might be older than the urban sample, which could also explain higher initial Spanish scores. But this factor might make the Telesecundaria pupils poorer learners than the urban pupils sampled. All of this indicates just how complex measuring the relative effectiveness of two alternatives is. Certainly in this case, there is no justification in assuming that a system with 29,000 pupils – not chosen at random from the rural population – can be projected into a rural system with a million pupils without a much more circumspect understanding of representativeness and generalizability of results.

We have not reviewed the BOD aspects of the Suppes, Fletcher, and Zanotti paper because no comparative claims are made with respect to either costs or effects. Rather, the authors examine the use of a particular learning paradigm with respect to a specific technology applied to American Indians.

In the preceding discussion we show that “benefits of the doubt” tend to favor newer educational technologies in comparative evaluations with more conventional instruction. We also illustrate these BOD’s by noting examples in the papers in this volume. In the final section of this critique we would like to suggest other effects of some of the instructional technologies treated in this volume which are not considered by the authors.

## Ignoring Other Effects

Up to this point, we have been critical of the papers within their own scope; we have taken the measures of effectiveness and costs as these evaluators have defined them and discussed their shortcomings and possible biases. But the “benefit of the doubt” problem is just the tip of the iceberg. Implicit in each of these evaluations is a choice of objectives, generally defined as minimizing the cost of teaching certain cognitive skills or minimizing the cost of providing formal schooling to a greatly expanded number of school children. The evaluator of a particular instructional technology project who is asked to do no more than to provide a comparison with other forms of instructing children or adults in these skills can legitimately limit the investigation to such objectives. Even more, he or she can argue that supplying increased schooling to the young is a national objective of most countries; thus it is worthwhile to find the lowest cost method of increasing schooling.

However, from the broader, social viewpoint, we cannot limit our judgments about instructional technology to such objectives. First, we must question the role of expanding formal education through instructional technology in contributing to the economic and social welfare of the population. The corollary of this question is to ask: what are the economic and social objectives for which educational media have been most effective, and how do these compare with societal objectives which evaluators consider important and just?

We can raise these questions more specifically by applying them to the papers presented in this volume:

1. In the McAnany, Mayo, and Klees study of Telesecundaria, it is apparent that the appeal to planners of instructional television in rural Mexico is based on the notion of economies of scale. That is, since there are relatively few secondary school students in each of many widely dispersed rural towns, it would be expensive to provide traditional secondary education for 30–50 students in each place. Instructional television allows these small groups of students to receive urban-quality instruction — at least in the formal cognitive aspects of secondary education — at a lower cost (according to the study) than if the education were provided in the traditional manner. Intuitively, it is the *scale* advantage which makes the strongest argument in this case. It seems reasonable that a centrally-run televised secondary program will be cheaper than many underutilized secondary institutions spread around the countryside.

But the scale argument only makes sense if it is assumed that all, or many, of the pupils in rural areas *should* have the same curriculum, and that a curriculum should be provided by a central, urban-based, educational

media program. To answer our earlier question, in this case, the logical effectiveness of the proposed system relies on an assumption of homogeneity of needs among widely-spaced communities with highly varied development problems, levels of income, and social milieus. Furthermore, Telesecundaria in Mexico, according to the description provided by McAnany, Mayo, and Klees, implicitly (or perhaps even explicitly) assumes that the role of the secondary school is to turn rural teenagers into potential workers in the *urban* labor force. There is nothing in the Telesecundaria curriculum that indicates a concern with rural problems or with rural development. Indeed, we can speculate that the cost-effectiveness of Telesecundaria would be much lower if rural development were its goal, since rural development problems are much more *area-specific*. A secondary school training program that addresses basic education *plus* the solution of area-specific problems would require highly trained teachers in addition to television sets, increasing the cost of secondary schooling in rural areas considerably over what the Telesecundaria planners envisage

We have evidence that rural development has not been an objective of the Mexican government since the mid-1930s (Barkin, 1972); thus, it is not unusual that an instructional media effort in rural areas would be geared to preparing people to leave rural areas to join the mass of urban workers. On the purported advantage side, secondary-trained workers from rural areas might be in a better competitive position to secure jobs than their urban primary-trained competitors. This assumes that cognitive knowledge determines job selection – a highly questionable assumption, as we have noted above. Further, once they come into the cities en masse (for example, if Telesecundaria is extended to 500,000 pupils), they will inflate vastly the marginal and underemployed populations that already surround every one of these cities, and they will be no better off than their poverty-stricken urban competitors.

The point is that simply extending additional education to Mexico's rural young does not, in itself, lead to an increase in their economic and social welfare. Indeed, the Telesecundaria program as it is described seems to have advantages over traditional education primarily in the case that the extension of secondary education into rural areas will produce a mass of urban workers better trained than if they migrate to cities without that additional cognitive knowledge. The promotion of rural development in Mexico would not only require a commitment of the Mexican government to such development (at the expense of urban development) but would also require a different type of education for rural young people and even urban dwellers. We have to ask ourselves whether the type of development to which Telesecundaria is contributing is consistent with our desires for the resultant welfare of people living in rural Mexico.



2. Hornik's study presents a similar problem: in his evaluation of educational television in El Salvador, he limits his discussion of success or failure to the test scores of pupils in schools with television and without. Indeed, all evaluations done of ETV in El Salvador have concentrated on cost-effectiveness in these terms, ultimately showing that it is possible to maintain or even increase test scores with television, at the same time lowering cost per pupil of instruction at the secondary level (Jamison, 1973).

The expansion of schooling in Salvador is based on a government objective to provide increased schooling for the population. An important aspect of the reform accompanying the introduction of ETV is brought out in a film about the project: much of the new curriculum in the seventh to ninth grades (where ETV is used) is oriented toward industrial arts subjects, preparing a better qualified labor force for industrial development. However, the Salvadorean government has been reluctant to allow a cost-benefit study of educational expansion at this grade level, primarily because – from our understanding of the situation – many signs indicate that the newly educated are having difficulty finding work. Again, as in the Mexican case, the introduction of television may be well suited to preparing people for work which does not exist.

In reality, expanded education by means of ETV has not been shown to improve a country's potential economic and social capability or distribution of income; rather, such technological innovations seem to be utilized in places like Salvador, Samoa, Ivory Coast, and Korea to increase the number of years of schooling in a potential urban labor force. In our view, the most important result of this "strategy" is to increase the cognitive skills of the reserve army of the unemployed, putting downward pressure on the wages of both skilled and semi-skilled labor. In the Salvadorian case – since there is little domestic investment that can utilize this increased schooling – the strategy also implies economic development based on foreign investment, investment in the assembly of goods for re-export to the high income countries. We do not have time here to go into an analysis of the implications of this type of economic development for economic growth and income distribution, but suffice it to say that evidence indicates that an increasing dependence on foreign investment is associated with lower economic growth rates and more unequal income distribution (Chase-Dunn, 1974; Baran, 1957), while increasing the income of the local elites and upper income professionals.

3. Our final example illustrating the broader aspects of the economic and social context of instructional technology concerns the Open University. The Open University is purportedly a relatively inexpensive solution for providing university-level training for large numbers of people previously denied such training. On the surface, this seems to contribute to increased

growth (on the assumption that increasing schooling in the population increases the growth rate) and to economic justice, since now a larger portion of the population will have higher education, and particularly children of lower income families will now have access to jobs requiring university training.

However, some insight into this “opening” of the university through television indicates that there is no reason to believe that it will either contribute to growth or to a more equal income distribution or the reducing inequalities from generation to generation. The type of training given by the Open University, while it may produce equal test performance in certain subjects, does not, as we have discussed above, produce the same experience as Oxbridge or the Redbricks, nor the same certification effect, since those latter university situations represent a certification of social class as well as cognitive skills. Indeed, there is a puzzling trend reflected by the Open University concept that seems to be missed in the Lumsden-Ritchie article. Why should the latecomers to the university system – the children of working class parents – receive lower cost university education than the children of higher class parents? If Open University through television is so cost-effective, why have an Oxford or Cambridge or Sussex or University of London train any students at all? Simply taxing such inefficient institutions out of existence or cutting off state aid would force everyone to take their training in the same low-cost, televised manner.

The Open University seems to be the solution to pressures for university training for working class youths, but only for a university training which increases some competencies without necessarily providing credentials for higher paying jobs which are reserved for graduates from the “real” universities. We think that if a study were done following up on the Open University graduates, the results would show that they are in a relatively similar position to that of the graduates of *educación básica* in Salvador and that of the graduates of Telesecundaria schools in Mexico once that system expands: the kinds of jobs which have been available to university (or secondary) graduates in the past are not the kinds of jobs the graduates of television education are getting. Their pay will be lower, and their unemployment rate will be higher. This is not because their cognitive knowledge in certain subjects will be less than that of their counterparts; it is because they have not had the same social experience as the others, and it is because educational television has done nothing to counteract the class system which governs these societies. At the same time the increase in the supply of persons with these educational attainments will far exceed the increases in job openings for these levels.

The three examples we have discussed above only serve to illustrate the essential point: educational media can be evaluated in terms of narrow

educational objectives, but this ignores the overall role that educational media will play in affecting the welfare of the people subjected to it. If the educational objectives used to evaluate the effectiveness of media have little relationship to economic and social welfare, the evaluations are meaningful only in that they obscure the more significant effect that media may have in maintaining an economic or social system which is unjust and inefficient in terms of people's basic economic and political needs (Carnoy, 1975). This is not to say that teaching cognitive skills as effectively for less resource cost is not a worthwhile objective, but the economic and social effects of producing more of these cognitive skills will tend to be very small in societies which are not geared to utilize them in the economic and social system. To the contrary, the introduction of media (with all the fanfare which surrounds educational expansion through media) may serve to temporarily quell legitimate demands for social change and thus forestall that change. It is no accident that the largest ETV projects to date – in El Salvador and Ivory Coast – are located in countries which have very unequal income distributions; and that neither of these projects is, in practice, distributing schooling any more equally than it has been in the past. Furthermore, both societies are archetypes of dependent economic and social systems; indeed, for the most part, educational television has been organized to provide the types of skills which will foster even greater dependence through the increased need for foreign investment to employ the new workers produced by the expanded school system (Carnoy, 1975).<sup>3</sup>

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<sup>3</sup> In the Ivory Coast the top 5% of income recipients receives about as large a share of the national income as the bottom 60%, about 29% of total national income for the former and 30% for the latter. For Mexico the concentration of income is even more disproportionate with the bottom 60% of income recipients obtaining only about 22% of national income while the top 5% receive almost 29%. For El Salvador the comparable figures are 24% for the bottom 60% of the population and 33% for the top 50%. (See Adelman and Morris [1973]: 152.) An even more ambitious educational media project is planned for Brazil: that country is planning to adopt a fixed satellite system of educational radio in order to expand further its educational enrollment. Brazil's recent development, like that of Ivory Coast and El Salvador, is based on increased foreign investment dependence. And, despite an already rapid rate of schooling expansion and a large increase in national income, Brazil has experienced rising income *inequality*. According to Adelman and Morris (1973: 152) the bottom 60% of income recipients in Brazil in 1960 received only 23% of the national income while the top 5% received over 38%. The distribution became even more unequal by 1970 (Langoni, 1973; Fishlow, 1972). The real income of the poor is said to have dropped by over half in the last decade as the result of inflation far outstripping the minimum wage (Howe, 1974). Moreover, there is some indication that in recent years the proportion of the national budget devoted to social services – including education – has shrunk.

The question that we wish to raise is how low-cost educational expansion is going

Finally, we feel that evaluators have totally ignored the effect that centrally controlled educational television, radio systems and video-cassettes (with classroom teachers trained only to dovetail into the media package) will have on the *diversity* of student experience and institutional exposure. Is it possible that such centrally controlled education systems are particularly appealing to authoritarian societies who wish to extend their control over the school curriculum and the school age population? We do not deny that schools are probably limited in their effect on political attitudes and even social values, but to the extent that teachers are given more freedom to teach what they wish and the way they wish, there is a possibility of reducing authoritarianism by increasing participation and the possibility for democratic social change. This is likely to be especially true in countries where a few powerful people seem to feel that they have a greater claim to the country's resources than the mass of people living on the land or in urban slums. If educational media contribute to inhibiting that social change, then evaluators must certainly rate that alongside increasing test scores for fewer dollars.

Rather than limiting our analysis of the media's impact on society to narrow cost-cognitive learning studies, we must understand the total role of the media in the educational/social systems which they serve. For it is this total role that will determine whether governments adopt instructional media or not. Cost-effectiveness studies of the kind presented here will only act to *legitimize* these choices on the basis of criteria acceptable to those funding agencies and governments that have a vested interest in avoiding discussion of the larger agenda.

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to compensate for national policies that have created a decline in the real income of the poor in a country already characterized by profound income inequities and with one of the highest economic growth rates in the world. Is it possible that the advent of educational technology in Brazil has greater implications for the political socialization of marginal populations under the present military dictatorship than for either economic growth or more equal income distribution? Certainly, there is no indication that the present regime favors improvements in the distribution of income (Fishlow, 1972; Carnoy, 1974b).

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