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ABSTRACT

A comprehensive study of the role of television and technology was conducted among the Universities of Ontario in order to evaluate educational technology as a means of enhancing university level education. Television was the most controversial aspect of study because the associated costs required system-wide consideration. From this light, a case was made for instructional television by elucidating the variety of applications it offered, the advantages of inter-university cooperation, the sophistication of the hardware, and the costs relative to usage. The British Open University, the current forerunner in the field of educational technology in higher education, was structurally reviewed for comparison and support to the cause of television. A set of recommendations was developed generally supportive of the expansion of instructional technology, particularly television, efforts in the system. (MC)

Television and Technology in University Teaching

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BERNARD TROTTER

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FOREWORD

In the spring of 1970, the Committee on University Affairs and the Committee of Presidents of Universities of Ontario decided to arrange for the undertaking of a study of educational technology with the following terms of reference:

> To evaluate the use of educational technology as a means of enhancing university-level education. "Educational technology" should be broadly defined to include, but not necessarily be limited to:
> a) educational television (both closed-circuit and broadcast);
> b) other audio-visual media;
> c) programmed instruction (including computer-assisted).
> The study should focus on both benefits and costs in relation to benefits. The study should proceed by:
> 1) examination of significant literature;
> 2) investigation of notable experiments elsewhere;
> 3) investigation of past and current applications in Ontario universities.

A small steering committee was established representing both parent bodies. Mr. Bernard Trotter, Head, Office of Academic Planning, Queen's University, consented to undertake the study. The steering committee was fortunate in obtaining Mr. Trotter's services. He was admirably qualified for the task. In the first place he was thoroughly familiar with the university community in Ontario, having served for several years on two important subcommittees of the Committee of Presidents—the Subcommittee on Research and Planning and the Subcommittee on Operating Grants. In addition, his earlier background as general supervisor of public affairs for the English networks of the Canadian Broadcasting Corporation gave him first-hand knowledge of the potentials of the broadcasting media.

The report which follows is submitted "in partial fulfillment" of the terms of reference. The steering committee was anxious that a report be available by the

end of 1970, and it was agreed that the immediate purposes of the sponsoring bodies, the Committee on University Affairs and the Committee of Presidents of Universities of Ontario, would be served by a report focused mainly on television. This decision was not intended to minimize the potential importance of computer-aided instruction or the extent to which other forms of technology are already contributing to the instructional process in the universities of Ontario. On the other hand, considerable investment in television facilities had already been made, and the technology of television was entering a period of very rapid development and change. It was thought, therefore, that in the time available, the study should be concerned mainly with television within the wider framework set out in the original terms of reference.

The steering committee is convinced that Mr. Trotter's report is an important contribution to an understanding of the potential for innovation in university education through better use of educational technology. The concepts of a "systems approach" to general education, while relying heavily on the work of others, are set firmly into the context of the university scene in Ontario. The result is a report in which the ideas are philosophically and educationally sound. At the same time the report offers attractive specific proposals for new ventures in university education which have the dual assets of high quality and modest costs. The steering committee commends the report and urges all those concerned with university education in Ontario to give it their serious and sympathetic attention.

December, 1970

Members of the Steering Committee:

Committee of Presidents of Universities of Ontario

Dr. D. C. Williams
Dr. John B. Macdonald

Committee on University Affairs

Dr. D. T. Wright
Dr. J. G. Parr

PREFACE

For a largely eclectic study of this kind, it is difficult to acknowledge justly all of the help which has been received. I have profited immensely from discussion with a number of persons in Britain, Canada and the United States and am indebted to many of them for generous hospitality as well as information. Professor H. M. Good of Queen's University and Mr. Grant Clarke, Secretary and Research Associate of the Committee of Presidents of Universities of Ontario, were able to join me in visiting the headquarters of the Open University in Britain and broadened thereby the perspective of this report on that unusual and promising enterprise. Professor Good has, moreover, from the vantage-point of a pioneer in the application of television to university instruction in Canada and as a student of inter-university cooperation, made numerous suggestions and helpful criticisms at various stages in the development of the report. Needless to say, neither he nor others who were kind enough to examine preliminary drafts can be held responsible for its final form.

Particular thanks are due to Jim Schram who laboured with the collection and analysis of quantitative data and who is largely responsible for the detailed development of the cost models which appear in the appendices.

I am indebted finally to Queen's University for permitting me to undertake this stimulating assignment and to colleagues in the Office of Academic Planning who indulged my frequent absences of body and mind with uncommon cheer and patience.

The steering committee for the Study of Educational Technology has held the wheel lightly while providing at the same time the most positive kinds of support and encouragement. For these things I am duly grateful.

Kingston, Ontario
December, 1970

Bernard Trotter

CONTENTS

CHAPTER ONE

TECHNOLOGY AND EDUCATION

In approaching the subject of educational technology we must understand that we enter a no-man's land in the war we wage with ourselves to make the world of technology safe for human values. The benefits of technology are enormous and life in North America and Western Europe is inconceivable without them. But the prophets among us from the journalists at the turn of the century who railed against the foul exhausts of the first gasoline-powered automobiles through Lewis Mumford and Rachel Carson to Pollution Probers in 1970 have perceived that a state of hostilities exists between material ends and technical means. We at last begin to understand that every technical process reaches into and changes our environment and changes us in ways which cannot be predicted and which are not always for the better.

We are beginning to grasp the fact that short-term gains derived from conventional economic notions of "efficiency" may be more than offset by long-term costs in the quality of life. It is one of the contributions of the more sophisticated kinds of cost-benefit analysis that non-economic and non-quantifiable elements can be taken into account on both sides of the equation although balancing these is a matter of value and judgement rather than objective technique. It would help somewhat in considering the social, psychological and political implications of technological possibilities if substitute words could be found for "cost" and "benefit" which have overwhelming economic connotations. It might be more accurate, for instance, to speak of all of the positive consequences of a process or a course of action as advantages and negative consequences as disadvantages.

Whatever terminology is used, advantage-disadvantage or cost-benefit analysis offers the best chance we have of confounding technological determinists who tell us that technology has its own historical momentum, that no

choice is possible, and that our task is simply to understand the historical process and prepare ourselves for the inevitable. Although the balancing of positive and negative consequences depends in part on subjective value judgement, it offers the possibility of identifying choices where a deterministic view would hardly admit that effective choice exists. Of course the determinist is in one sense historically right. Man has always been the prisoner of expanding knowledge of his world. To act on knowledge is an immutable characteristic of human personality. This is not likely to change. But his knowledge now has a new dimension on which he can base choices among possible actions and between action and non-action. As understanding of the consequences of "can do-will do-must do" philosophy of action is grasped, man regains a small margin of freedom from scientific and technological tyranny. He may not have won the war but he has at least postponed complete capitulation.

Nowhere is the margin of freedom to consider the consequences of technological development more important than in education. Some writers, the French philosopher Jacques Ellul and the Canadian philosopher George Grant, for example, hold that the purpose of technology is to master man and dehumanize him. They present strong evidence in support of total pessimism. If the universities reject this view, as they must, then they must proclaim as their purpose, not the mastery of the individual, but mastery *by* the individual of learning opportunities of all kinds. If human values do not persist in the educational process, there is small hope for their survival in our other social enterprises.

If, above all, we value the instructional process in the university as a humane enterprise, then we must weigh carefully the advantages and disadvantages of the various means of instruction for the humanity as well as the learning that they add or subtract. It is not profitable to look at any single teaching/learning resource in isolation from others in use or in prospect. We must aim at nothing less than fundamental review of the instructional process. Nor must we flinch from the possibility that fundamental review will propel us towards fundamental reform. To admit such possibilities is to damn complacency. But it is not to take one side or the other in the persistent conflict of orthodoxies which confuses attempts at rational discussion. Before turning specifically to what is involved in review and reform of university instruction, it will be useful to explore the extremities of the conflicting positions.

The "new orthodoxy" is (to simplify) that most of the existing curriculum is irrelevant to contemporary needs and most traditional teaching methods (especially lectures) are obsolete, ineffective, confining to the student rather than liberating, stultifying rather than stimulating. Any innovation in teaching, tested or not, is preferable to anything established, tested or not. The university teacher should be a resource, part of the logistical support the university organizes for exploitation by students.

The "old orthodoxy," by contrast, rests fundamentally on notions of what universities have been over the centuries. Perhaps the central notion concerns the teacher-student relationship. Although it is not often compared with the doctor-patient relationship some of the same sacrosanct mystery attaches to it. Underlying this relationship is the assumption that the teacher chooses his students and students choose their teachers. Students, to a considerable extent, do choose their courses and, in the early years at least, may shop around from section to section for instructors they like. University teachers today, however, have little say about which students they will teach, at least in the early undergraduate years. Another underlying assumption is that the professor is a master of his scholarly craft, the student an apprentice. Once more there is some reality in the analogy for graduate students and senior honours or specialist students at the undergraduate level. As the curriculum becomes more "flexible," however, undergraduates, in general arts at least, are unlikely to think of themselves as apprentice scholars in most of the courses they take. It is not a realistic objective of any general arts program today to train "scholars" in any professional sense. At most, it is a reasonable objective to show general students what scholarship is all about, to give them a glimmer of understanding of the scholarly life.

A further dimension of the old orthodoxy is that ideally the relationship between teacher and student is essentially bilateral, private, and confidential. The teacher prescribes (curriculum, books, essays, experiments, reports). The student follows the regimen and gets points for his skill at performing the tasks set. The department decides what courses are to be given but the teacher develops *his* course for *his* students. There is group planning (sometimes) of large multi-section courses but each teacher normally retains wide latitude in handling his sections.

There is everything to be said for the old orthodoxy in its emphasis on the relationship between teacher and student as individuals. Such relationships are at the heart of worthwhile education. But the reality has, for many if not most students, ceased long since to correspond even remotely with the ideal. Paradoxically, the new orthodoxy has captured the idea of individualizing instruction. Insofar as technology can assist a real return to emphasis on the individual student, those on the side of the old orthodoxy should welcome it. The catch is that often mindless huckstering on behalf of the new machines has obscured real possibilities of achieving worthwhile individualization through their use.

More fundamentally, however, honest partisans of the old orthodoxy see that the real threat of the new technology is to the autonomy of the individual teacher and his right to privacy in a professional relationship with students. And, of course, they are right.

The overriding imperative of technology is system. Any discussion of educational technology must therefore be about the systematization of the educa-

tional process. Systematization in turn implies collaborative and collective effort—professionalism of a new and different kind. University professors are first of all professionals in their disciplines. Furthermore, they derive their status from research and writing in the discipline, judged by their peers. Within their own institutions they may gain recognition for their devotion to or their competence in instruction of students. But their international reputations within the discipline do not depend on their work in the classroom. Too rarely can it be said of the university teacher that he applies to the teaching process an intellectual apparatus as rigorous as that he applies to reading and research and writing in his subject specialty, or, if he does, that he receives the plaudits of his peers.

It is no longer good enough to assume that because knowledge is the prerequisite of good teaching it is also a guarantee. A systematic approach to effective university instruction requires teamwork throughout a rigorous examination of objectives, assessment of possible methods, trial, evaluation, reassessment, fresh trial, etc. The faculty member is concerned with teaching. The student is concerned with learning. He too has objectives, he has methods, he has his own way of evaluating experience. It is fashionable today to speak of the teacher as manager of a learning system. At university, the student is also critically involved in managing his own learning process. Different students with the same objectives may require different sets of resources for effective learning. It is the purpose of reviewing the instructional process in a fundamental way to discover how each student can be served most effectively. There is a professional challenge here for faculty to match the most intractable research problem in a subject discipline. The professionalization of instruction is not an alternative to the profession of a discipline. It is something extra to be achieved by faculty members who would identify themselves as university teachers, and it is necessary if teachers and students are to reinforce their mutual humanity in a technological world.

CHAPTER TWO

PERSPECTIVE ON THE INSTRUCTIONAL PROCESS

The perspective of this report owes much to the recent milestone publication entitled *Teaching and Learning: an introduction to new methods and resources in higher education*, by Norman MacKenzie, Michael Eraut and Hywel C. Jones. Their enquiry grew out of the Joint UNESCO-International Association of Universities' Research Programme in Higher Education, established in 1959, which led to a meeting of Experts on Teaching and Learning Methods in University Institutions in Paris in September 1968.

No summary can do justice to this extraordinarily comprehensive statement which compresses into a scant two hundred pages a wide-ranging synthesis of recent experience and thinking about the instructional process in many fields and in many countries. The central point of the book is that, in spite of widespread applications of technology of various kinds to the instructional process in recent years, their potential for effectiveness and economy cannot be realized until university education is looked at as a whole.

> If the introduction of media on any large scale is to continue, for motives other than faith or fashion, it seems necessary for much more serious work to be done to investigate their contribution in cost-benefit terms, though with the proviso that this will only reveal significant results if this is undertaken as part of a general review of an institutions' operations, rather than in isolation. . . . all the evidence points to the need to regard the university as a system, rather than an aggregation of discrete activities. (p. 88)

There will be strong and no doubt irreconcilable differences of opinion about whether it is possible or desirable to view the university institution as a system. The instructional process, however, as a major responsibility and activity

of the university can be looked at as a system and, indeed, must be looked at this way in any useful discussion of educational technology.

From this central thrust several subsidiary emphases emerge. First, that evaluation is the key to developing successful and effective learning processes in each institution.

> For the administrator, evaluation is the key to the optimum use of teaching resources. For the student, evaluation is the key to self-evaluation. For the teacher, evaluation is the key to professionalism, for applying the same intellectual standards to his teaching as he applies to his research. (p. 122)

Second, that since the instructional process exists for the student,

> more progress towards effective learning may be made by concentrating attention on the needs and activities of the learner than by approaching the problem from the standpoint of the teacher. (p. 30)

Third, that a systematic approach to university teaching and learning involves teamwork in establishing objectives, developing courses to meet those objectives, evaluating the results of instructional process and modifying methods in the light of that evaluation.

Fourth, that there is a need to develop a new breed of experts—the course-development consultant whose job might be described as "coach" of the course-development team. One of his responsibilities would be to bring "other consultants to the group whenever their advice and expertise seem likely to be advantageous" and to make sure "that when they do come they are properly briefed and address themselves to the problems of the course-development team and not their own special interests." The authors of the report are very clear about their reasons for a single "coach" for each course-team rather than a number of outside experts competing for attention.

> (a) it keeps the team as a reasonably small working group in which roles can be clearly defined; (b) it keeps the subject-matter experts dominant, and it is they who teach the course; (c) it is highly economical in its use of consultant time; (d) it helps develop a special breed of consultants, whose prior commitment is to the success of the course and not to the advancement of any particular theory and who have to use a language that can be readily understood by teachers; (e) such consultants can be trained by an apprenticeship scheme without necessarily having had formal training in the social sciences; (f) it ought to be possible in the future to use course-development consultants who were originally trained in the discipline of the course being developed. (p. 166)

THE PROBLEM OF OBJECTIVES

We will return to these and other concepts developed by MacKenzie and his colleagues in the course of this report. Before proceeding with more specific

discussion of educational technology, however, we need to be fully aware of the most critical and at the same time most difficult aspect of the integrated, systematic approach to university education—the setting of objectives. In their chapter on "the clarification of objectives," MacKenzie *et al* make it clear that, while a great deal of useful work has already gone into classifying objectives under broad headings such as "skills," "knowledge and understanding," and "attitudes," no method so far developed is altogether satisfactory. They make a convincing case, nevertheless, that examining classification schemes such as those of Bloom and Scriven "leads to a deeper understanding of the problems involved" (p. 113). And they emphasize "that if evaluation is to contribute to problems of teaching and learning and not to remain merely an administrative convenience for disciplining and grading students it will have to be based on precisely formulated statements of objectives" (p. 114).

"Precision" must be a relative term. Even where objectives can be stated precisely, the measurement of achievement must often be subjective in relation to such skills as "arguing effectively" or such understanding factors as "an appreciation of the place of the subject in the general social and cultural context." On the other hand, when objectives are narrowly defined in terms of precise attitudinal and behavioural change, and where these objectives are agreed by the student and the institution, it is quite possible that meaningful, objective measures of effectiveness can be devised. One such attempt is underway at the Sloan School of Business at M.I.T. In such cases the student presumably enters the program because he shares its objectives—i.e. to acquire the attitudes, knowledge and skills of an effective manager. But this example also highlights the opposite case: the student who enters a program with a set of personal objectives or expectations at variance with those of his professors or the institution. In this context the articulation of objectives as a vital form of communication with the student becomes apparent—whether or not the degree of success in meeting the objectives can be quantitatively assessed. In other words it has to be recognized that the objectives of students are crucial to the success of the instructional process. In some cases students can articulate objectives when they enter university. More often the student may need help in understanding his objectives and relating them realistically to alternative academic programs. Then again many students lack even latent objectives to be articulated. In these cases the formulation of objectives on the part of the student becomes one of the objectives of the freshman program itself.

It is perhaps important at this juncture to remind ourselves that, for all students, university attendance is voluntary so far as the state and the university are concerned. Whether students attend universities under social and parental pressures is beside the point. Many qualified young people resist such pressures and postpone university attendance or avoid it altogether. Most of those who attend and feel coerced doing so follow a path of least resistance and make a

mockery of such idealistic university aims as assisting each individual to fulfill his or her potential, unless the university manages to strike a nerve and prods the reluctant student into recognizing and then exploiting the opportunities which the university provides. As we have suggested, it is an essential aim of the university to help such students discover objectives they find worthwhile.

A handful of less passive "coerced" students finds a kind of fulfillment in rejecting all of the explicit and implicit objectives of the university and making it into an emotional punching bag. Clarifying the objectives of particular courses is not likely to free such students of their sense of oppression since it is the institutional form which they react against rather than the substance of what the institution does.

The majority of students, however, no doubt accepts a voluntary status in the educational process at university. Most are, to be sure, working for a credential which will be of value to them in finding a job and making a living. But what beyond that is a student without a specialist goal looking for? Does he in fact seek a "general" education? Or does he enrol in a "general" course in order to avoid the apparent rigours of specialization? If his reasons are positive because his interests are broad or not yet certainly focussed, what specific skills does he expect to acquire, what knowledge of himself and others and the way in which the world works?

Whatever the answer to these questions the further question remains. Suppose the student enters with or persists in objectives and expectations very different from those which the faculty and the institution are prepared to help him achieve? Must, indeed, student and faculty objectives coincide if there is to be effective learning? Where professionalism or specialization is involved there must no doubt be a large degree of coincidence if neither student nor faculty member is to suffer eventually a feeling of frustration. If a student aims to become a physicist or an historian, then he needs to be shown how the specific objectives of each course he takes in physics or history will contribute to his ultimate purpose. If, on the other hand, a student enrols in a course in history or physics because he wants to pursue lines of enquiry about man and the natural world which have started in a course in philosophy or religion, or out of natural curiosity about these subjects, then the instructor must help the student to meet that objective rather than some other—or not allow the student to take the course.

In fact, the matter of objectives is very much simpler for students and teachers engaged in education for specialization. If a student aims to be a specialist then he must master the methods of the subject, its core content and at least enough of the methods and content of related subjects to maintain his specialty at a professional level after he leaves university. The student aiming at specialist qualifications has no choice but to adapt his own learning skills to the methods most appropriate to his subject. He may have a wide area of choice

within his subject but the choices he makes will be based only in part on his personal interests. The advice of his specialist mentors will weigh heavily in choosing the combination of instructional units most effective for him. The instructor must remain the senior partner in managing the student's university experience. As we have implied, a very different picture presents itself when we turn to the student in the general degree course. Not only is he probably less certain about what he hopes to achieve, there is likely also to be more difficulty in matching his objectives to course offerings than in the case of the specialist student.

GENERAL EDUCATION—THE UNIVERSITY ROLE

It has been suggested that the function of general education at the university level is to provide the student with a "sound model of how the world operates."[1] How many students would accept the understanding of such a model as their purpose in attending university? Suppose that universities accept this as the aim of general education and try to translate it into the objectives of specific courses. There are difficulties. For example, how can even a simplified model of the world be complete without a broad understanding of science and technology and mathematics and how these impinge on individual man and man in society? Yet the prevailing trend towards permissiveness in choice of courses makes it increasingly possible for students to avoid science, technology, and mathematics altogether. The idea of required courses is anathema. Yet surely one of the reasons for student pressure to remove requirements for "a science" results from the failure of universities to provide science courses specifically designed for the non-specialist student. Attempts to do this have been made, but without notable success and generally without success at all. When the attack on required courses came most faculties were prepared to yield rather than say, "No. The requirement is essential, but we will now design multi-disciplinary courses especially for the non-specialist student who may not want but who *needs* basic understanding of the principles which underlie man's scientific and technological activity past and present."

It is hardly overstating the case to say that general education in our universities is in a state of crisis. We have alluded to a crisis of purpose. There is also a closely related crisis of numbers since by far the largest portion of rapidly expanding university enrolments in recent years has entered general programs in arts and science. (Let us ignore for the moment the question as to whether substantial numbers of students enter undergraduate engineering programs in search of general education.) As more of the population participates in univer-

[1] J. A. Kershaw and A. M. Wood, "Resources allocation in higher education," in *The American Economic Review*, May 1970, p. 342.

sity work it is reasonable to assume that the proportion of students entering general arts and science will mount still further. Thus far this is only a crisis in the sense that the means of accommodating the possible demand is unsettled.

It may no longer be either possible or desirable to multiply opportunities on the pattern of existing universities. Increasing numbers may therefore make it necessary and possible to design new, fundamentally different patterns of instruction and so help in a way to resolve the crisis in purpose. In other words, further additional enrolments may offer an opportunity to re-define the objectives of the general curriculum in relation to the personal development of the student, to the real world and particular skills (ability to solve problems, to evaluate information and to reason from it) required to live and work in such a world. The systematic approach to defining objectives, choosing appropriate methods, and evaluating the result may be particularly effective in responding to such an opportunity and we will develop this approach in later sections of this report.

In the meantime, we are faced with the same perennial questions. What do universities think they are providing for general students? What do students expect? What are the benefits of the process? Without attempting comprehensive answers it is relevant to note some of the factors upon which answers depend and which bear particularly on future possibilities for using technology in the instructional process. Some of these which we shall touch on in the rest of this chapter are admission standards, particularly relating to functional literacy, the capacities of individual students and the way in which teaching methods and objectives may interact.

The major question is "Who will be admitted to university and what resources and capacities can he be expected to bring with him?" It is obvious that students in primary and secondary schools are becoming increasingly familiar at first hand with audio and video tape, with film and with various combinations of audio-visual presentation. Many of them will be more competent in using such media to express themselves (mediacy) than in the use of the written word (literacy). In view of such developments will the university require functional literacy as a condition of admission? "Functional literacy" as used here means more than a simple capacity to read and write. It means the ability "to absorb knowledge through the printed word."[2]

Is the question about functional literacy as an admission requirement as ridiculous as it looks at first glance? Functional literacy is far from universal in our present society or even among students now in our universities. Furthermore, it is at least questionable whether the achievement of functional literacy in this special sense will remain for much longer (if it is now) a first priority goal of primary and secondary education. And, if functional literacy does re-

[2]George Taylor, *The teacher as manager* (London: National Council for Educational Technology, 1970), p. 8.

main a primary goal of the educational system, it may be less frequently achieved. Even in pre-television times success was only partial. By no means every graduate of high school was functionally literate. There is no denying, however, that television may be a powerful conditioning factor in the future. "This generation finds it a chore to read, because for them television is everything."[8] Such gross overstatement by responsible adults, fed back into the educational system, could become self-validating.

Assuming nevertheless that learning at levels substantially above those of high-school graduation is possible for students without the ability to absorb knowledge through the printed word, where are such students to find post-secondary educational opportunities? Perhaps at other kinds of post-secondary institutions. As alternatives to university are developed it may then be possible to re-define the university as the institution of higher education which requires for admission a high order of functional literacy as determined by appropriate tests. This is not to suggest that universities may not use every available method of instruction including the most elaborate audio-visual or computer-assisted methods. It does mean, however, that every student in the university has a proven capacity for effective study with printed materials *and that this capacity can be assumed as one of the resources to be considered when methods appropriate to the fulfillment of specific educational objectives are being considered.*

The student of course brings much more to the university learning process than an ability to absorb knowledge from the printed page. The student is the most important "input" to the educational process. His energy, aptitudes and sense of purpose determine first the choice and then successful exploitation of the opportunities presented by the university. He is basically responsible, as an active agent of the educational process as well as the material acted upon, for the additional skills, understanding, knowledge of self and others, ability to solve problems, to reason, to evaluate information—for all that he takes with him as "output."

For the individual, university experience is a "value-adding" process. Of course, much of what is added is not consciously sought, nor is it measurable. There must be many important by-products in any successful educational process. Yet the major "product" remains the values successfully added by conscious choice and effort. This choice of values and the methods of performing the addition involves the partnership of teacher and learner.

Once the objectives are chosen the result depends on the quality of the instructional process which in turn depends on both the student and the university. For the university's part quality depends on the ways the things to be learned are presented through organized "instruction" and made available through library and laboratory facilities. The "climate" of the university and

[8]Peter C. Goldmark, President, CBS Laboratories, quoted in *The innovators*, staff of the *Wall Street Journal*, p. 11.

opportunities for interaction with other students and unscheduled contact with faculty are included here.

IMPLICATIONS OF STUDENT-CENTRED INSTRUCTION

The net effects of the university's "instructional input," whatever its quality, may vary widely from student to student. In the case of student A with the best possible educational preparation, intellectual endowment and motivation, the instructional inputs may be expected to have only a marginal effect. Student A, turned loose in a reasonably good library should conceivably add much "value" to himself without any formal "instruction." Student B, less well prepared, with less of the kind of intellectual equipment suited to the work, perhaps as well motivated will depend to a large extent of the quality of the organized instruction provided. Left to his own devices he might still add as much value as Student A but from a lower starting point. On the other hand, if the quality of instruction is high *for him*, he may add, proportionately, greater value than Student A, who may find the formal instruction offered a drag on his emotional and creative energies. The example is rough and ready but illustrates the point—that output in the sense of "value added" will depend in widely varying degree on the quality of the instructional process and where it is aimed. The same "organized instruction" may be of a high quality for one student and low quality for another. The thirst for curriculum reform in our universities and the growing emphasis on greater flexibility and opportunity for individual study recognize these differences among students. There is a real danger, however, that reforms themselves will create new kinds of straight-jackets for students. It is widely assumed that the "lecture method" is not only obsolete, but reprehensible. Yet there are certainly many students who will freely choose it and benefit from it if given the chance. There is therefore every reason to continue efforts to improve the quality of conventional lectures.

Curriculum reform in our universities has so far emphasized the removal of restrictions in choosing courses and in broadening the spectrum of courses from which choices may be made. It has also placed new emphasis on small-group discussion and seminar work in place of formal lectures. In general there is a reduction in the number of formal contact hours per week for students in the humanities and social sciences and in some professional schools as well. Reducing the number of formal hours does, to be sure, throw more responsibility on the student. There have always been many students who accepted such responsibility and placed small importance on attendance at those lectures which offered little beyond the material easily available in books. Now, however, all students, even those who might find a greater number of lecture presentations helpful, are left increasingly to fend for themselves. Although any

specific reform may offer benefits to many students, it may also penalize others unless it broadens rather than narrows the range of choice open to the individual.

Individualized instruction is an unexceptionable ideal. But it cannot be realized unless its implications are fully understood. The most important of these is that each student will learn most effectively through varying combinations of instructional resources. Some will be self-sufficient in a library. Others need constant guidance in using the library effectively. Others require dialogue with other students and instructors. Others require a degree of competition to spur performance. Some need almost constant feedback and assurance. Others may be self-confident enough to follow an entire course of study without formal evaluation. In concrete terms, individualized instruction means strengthening the student's own learning capacity by the optimum mix of instructional resources, and encouraging him to proceed at the optimum pace for him. The administrative and logistical implications of truly individualized instruction are mind-boggling. Even providing limited opportunity for the pursuit of instructional objectives by a variety of routes could impose impossible burdens on universities with limited resources. We shall return to these problems later in this report and examine the possibilities of technological solutions.

It must be acknowledged immediately, however, that technological solutions to the problems of individualizing instruction at reasonable cost may not always be appropriate or, by themselves, sufficient. Small numbers of students in some specialized and professional programs may limit the variety of instructional resources which can be provided economically. This limitation may be less important because, as we have noted, there is more likely to be a close faculty-student relationship in these programs. On the other hand, the possibility of individualizing instruction in general programs may depend, paradoxically, on narrowing drastically the range of formal course offerings.

So far, then, as general education is concerned, the major question becomes whether individual choices are to be made among a wide variety of course offerings, with the student left to his own devices in integrating what he learns and relating it to a "model of the world" as best he can, or whether individual choices are to be made among a variety of possible emphases within a very small number of broadly conceived multi-disciplinary courses designed to realize the integrative, overview function of general education. The first approach is the one generally followed in Ontario to date. Yet maintaining costs within reasonable bounds and achieving objectives effectively may depend on exploring the possibilities of the second approach more widely and on a larger scale than past and present experiments have yet attempted. The second approach does not depend on technology but perhaps opens greater possibilities of cost-effective technological applications than the first. A forthcoming report of the Organization for Economic Cooperation and Development on inter-disciplinary studies in higher education will describe experimental curricula on this model at Green

Bay and elsewhere. Later in this report we shall examine the British Open University which combines the multi-disciplinary approach with large-scale use of technologically packaged materials.

A further key question related to clarifying the objectives of general education is to what degree exposure to various methods of learning should be a compulsory element in the curriculum. We have already noted the paradox which permits universities to give degrees to students who have studiously avoided any exposure to science or technology. If alternative learning resources are developed sufficiently so that a student may, in theory, avoid all lectures, or avoid all discussion situations, or completely avoid television or computer-assisted presentations, will he be permitted to do so? Obviously he would have to test various kinds of instructional resources in order to make choices about those best suited to him. There is a further case, however, for requiring every student to work with each kind of resource throughout his university experience on the ground that when he finishes he should be qualified to continue the learning process in all of the various situations which may present themselves throughout his life.[4]

The justification for public support of higher education continues to rest substantially on the conception of human capital and the responsibility of the university for producing trained and educated manpower as a capital good, as investment for the future. This conception assumes that part of the "value added" is a trained capacity to continue the learning process throughout life and to participate constructively in the process of change. Such capacity may be the main social value in providing opportunities for general education. It is nowadays common enough to talk about the university's responsibility for "retooling" specialists in the professions, the "half-life" of technological skills, etc. Yet problems of updating the "generalist" are possibly more complex. Unless his formal education has exposed the strengths and weaknesses of his own learning methods and capacities it will have denied him the most essential piece of equipment needed for a lifetime of continuous further education and reorientation for effective work and successful living in a world where nothing stands still. So "individualized" instruction may have to involve more than tuning instructional resources to individual needs and capacities. It may mean remedying weaknesses in styles of learning as well as building on strengths.

If then, certain important objectives are to be realized, may the university properly *require* certain studies of those voluntarily enrolled in a general degree program? Because students are volunteers, not conscripts, perhaps the challenge remains to make such offerings so attractive and so self-recommending that compulsion becomes an anachronism.

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[4]Norman MacKenzie *et al, op. cit.*, p. 152.

In this chapter the attempt has been to explore and put into perspective some of the basic dilemmas which confront the university as it attempts to order the instructional process. How, above all, are the various parties to the educational transaction (the volunteer student, the faculty, the institution) to reconcile objectives and select methods? We have emphasized the importance of the student's own resources and identified some of the implications of student-centred and individualized instruction. While these matters are relevant to all of the university's educational activities, we have indicated that they may be especially important in relation to the purposes of general education and the ways in which technology can be used to assist the individualization of general programs. This discussion will underlie much of what follows.

CHAPTER THREE

THE USES OF TELEVISION

In the preceding introductory chapters we established a general perspective on educational technology, seen as one sector in an array of resources available to the instructional process in higher education, and we examined the essential elements of a systematic approach to that process. We turn now to consideration of specific kinds of hardware which can be placed at the service of instruction. This report will be concerned mainly with television, in part because television is the most controversial of the so-called media, and partly because in its most sophisticated applications the associated costs require system-wide consideration.

CONTROVERSY

Why is television controversial? Many university teachers are indifferent to it because it takes time and trouble and they feel that they cannot use it effectively. Others are actively hostile because it threatens notions of the autonomy of the individual teacher and his right to privacy in a professional teaching relationship with students. Television may also be resented for making explicit a separation between student and teacher which already exists in very large classes.

Television in all but its simplest applications (e.g. self-contained single-camera demonstration in a classroom or laboratory) involves "outsiders." As soon as a lecture is transmitted outside of the classroom it passes through master control; it is seen by non-students. If it is recorded for later playback, it is even more exposed. In fact, precautions can be and frequently are taken to protect the privacy of the student/professor relationship when closed-circuit television

is used. No precautions, however, can make it as private as a conventional lecture. Then again, some professors may be unconcerned about privacy but reluctant to share control of a teaching situation. Even if the production is simple the professor must accept minimum advice about controlling his movements and mannerisms, how much blackboard he will use, and how large he will write. If he wishes to be more elaborate he will perhaps use an overhead projector and integrate slides, graphics and perhaps film into his presentation. This will involve collaboration with the producer and a graphics artist. Such collaboration requires teamwork and a kind of preparation probably more time-consuming than he is used to. He is probably used to spending more of his time selecting and organizing content than on the "how" of presenting it to students. With television the emphasis shifts markedly towards the "how." If the instructor watches himself on video tape, he begins a process of self-evaluation which includes assessing his communications skills as well as the intellectual content of his presentation and its organization as the student sees it. He may find video recording a useful diagnostic tool and still remain unconvinced that it can contribute directly to classroom instruction. And, indeed, it is understandable that many professors see no advantages in using television which clearly offset loss of privacy, loss of control, and time consumed by technical problems.

These objections arise less often in connection with other audio-visual aids. If we think of such aids as a hierarchy on a continuum from the very simple, very cheap (chalk and a blackboard) to the very complex, very expensive,[1] then it is not until we get to the more elaborate uses of television that the team approach to instructional problems becomes mandatory. The professor does, to be sure, often get assistance in preparing slide, tape-slide, or film presentations—but the result is used by him in the classroom situation under his control or by individual students in a carrel. He is not on public view even potentially.

Furthermore, the potential uses of the other media can be accepted or rejected on a common-sense basis without taking sides in the intense debate which obscures as much as it illuminates the usefulness of the "electronic" media in education. Missionary salesmen for television as an educational instrument are inclined, in their zeal, to get feverish about what they view as "misuses" of the medium. They are convinced that television has intrinsic values which, if transgressed, will bring down the wrath of a technological Jehovah on the transgressor. Academics who are content to stand in front of a television camera and do what they would normally do lead the parade of sinners. The "talking face" is not a "permitted use." Such dogmatism is nonsense. It would assume that technology is misapplied if it is not fully exploited at all times. A

[1]A useful idea elaborated in considerable detail by John Duncan of the University of Newcastle in *Media and methods: instructional technology in higher education*, ed. D. Unwin (McGraw-Hill, 1969).

car should never be driven at less than top speed and a stove should never cook less than a gourmet dinner. Assumptions underlying such views about the proper uses of television in education must, however, be examined because they are widely held. The first of these assumptions is that, because television is normally perceived as a medium of entertainment, anything less than the highest Toronto or Hollywood production standards will be unacceptable to students who have been conditioned from infancy to the technical gloss of broadcast television. The concern about "acceptability" of any teaching method to students is of course entirely legitimate. But acceptability is a relative matter and must not be confused with effectiveness. There is substantial evidence that students may learn from teachers and methods which they do not like. The second questionable assumption, recently reinforced by the Hall-Dennis Report,[2] is that learning must be a pleasurable experience. No doubt much of it can and should be. The pleasure principle in education, however, becomes altogether insidious when it intersects with the entertainment medium—television. It simply has to be accepted that, if television is to be effective in the university teaching process, it will often convey material which is difficult for the student and perhaps even disagreeable and distasteful.

The skeptical faculty member, even if he has not been put off by the claptrap of media fanatics, still has good reason to ask "Why television?" Fifteen years of evaluation have demonstrated that televised instruction (whether the production is simple or elaborate) is usually as effective as conventional methods of instruction. If this is the highest claim to be made then the only argument for using television is to save money where student numbers are large enough to eliminate duplication of faculty effort in giving the same course more than once. And if a talking face on television is effective at one institution why not use the same talking face at other institutions? The answer is that the talking face (lecturer A, is not likely to want to expose himself widely beyond his own campus in a technically imperfect presentation (talking face is by definition technically imperfect). Furthermore, a presentation of this kind (except in the rare case of the "great" lecturer) will not be acceptable to leturer B in charge of a similar course at another university. He has his own ideas about the content and presentation he wants for his students. As long as he is working in a system where he sees his major role as a classroom teacher rather than as co-manager with the student of the student's learning experience, the instructor will find it difficult to use material originating elsewhere. The possibility of developing shared material in cooperation with scholars in the same discipline at other institutions exists under the present system. But it is unlikely to be widely exploited until the benefits of such cooperative effort are convincingly demonstrated.

[2]*Living and Learning: The Report of the Provincial Committee on Aims and of Objectives of Education in the Schools of Ontario* (Toronto: Newton, 1968).

This has not yet been done. Highly organized and elaborately produced television presentations are effective, but apparently no more so than conventional patterns of instruction with or without the use of television. They can be produced economically if the scale of use is large enough. The problem is that they have been tested for effectiveness only against conventional standards of effectiveness in a teacher-centred institutional context. The potential of such material developed in an integrated way within a student-centred instructional process has not been tested. The important thing to note is that, when a systems approach to curriculum development is tested, it will not be television or any other technology which is on trial. It will be the systems concept itself.

In the meantime, until there is a rationale for the development of widely shared materials which exploit the full technical potential of the television medium, there is nothing to prevent local use within a single institution of television which may be technically primitive by the standards of widely shared production. The question to be asked at every stage is whether additional time, effort and materials which go into improving a presentation are, in fact, going to make it more effective "for the audience intended" in relation to the overall resources available for that purpose. The talking face recorded on video tape and thus allowing students a chance to repeat viewing of lectures they have either missed or earlier attended may be a low-cost and very effective use of television. An exchange of lectures of visiting professors and special lectures in this unsophisticated format may also be a low-cost and effective method of sharing materials among universities where there is a will and wish to do so. One might ask whether indeed the picture of the talking face is necessary at all and whether a simple sound recording would not do as well. Apparently there is evidence to show that students do by and large prefer to see the talking face as well as hear it.[3] Nevertheless, the "preference" may be a marginal one and in terms of total cost effectiveness the audio tape may be by far the most efficient use of resources. Just because students like to see the professor talking doesn't mean that they would not get as much or more from an audio tape. When a scarcity of funds does not dictate choice, there will often be difficult judgements to make as to whether the visual element is worth the extra money involved. It could be argued, for instance, that a lecture given by a major international figure for undergraduates should be recorded on video tape if it is to be widely used at several other institutions. A more specialized lecture for senior and graduate students might well be just as useful on audio-tape—or the money otherwise spent on video recording might be more effectively applied to the purchase of telephone conference circuits at the time of the original lecture thus permitting questioning and discussion with the lecturer by students and faculty from several institutions. The important point here is that faculty should always

[3]MacKenzie, *op. cit.*, p. 80.

ask—is this the *best* use of available resources for what I want to achieve?

In any case, for many kinds of university lectures, audio recording would seem to be ideal, at least for purposes of playback, repeat and individual student use. The storage and playback facilities required cost a fraction of the comparable hardware for television. Furthermore, the audio cassette offers obvious efficiencies to the student who wishes to use to good advantage the hour or two he spends commuting by automobile or other transport. (Study and driving may be a dangerous mixture. Passenger students would, however, run no risks.)

APPLICATIONS

Up to this point we have been discussing television (and sound) in general terms taking note of some of the controversy which surrounds television in the university. It is now time to sound a more positive note (even at some risk of sounding like one of the media salesmen previously scorned!) and to stress the potential benefits of applying television to the instructional process. Some of these are cost benefits, others are quality benefits, and some a combination. These can be discussed under several headings:

(a) new dimensions in instruction—opportunities otherwise non-existent
(b) demonstration—storage
(c) integrating materials—prepackaging
(d) extending the classroom
(e) student expression
(f) improving accessibility through broadcast uses.

(a) New dimensions in instruction—opportunities otherwise non-existent

Instructors using television can show things to students that have otherwise not been accessible. Students can watch professionals conducting psychiatric interviews, conducting psychological tests with all kinds of subjects. One-way glass makes observation of such events possible, but only video tape offers the opportunity of immediate and repeatable playback for analysis. Television offers the same unique capacity for self-evaluation as the student learns any technique involving interaction with people (interviews, administering tests) or physical performance (acting, legal advocacy, and athletics). Television as a tool for self-evaluation is available to the professor who wishes to study his own conventional classroom teaching. There is no cost saving in such applications. Both the costs and effectiveness are additional. In teacher training, however, the use of video-tape for micro-teaching and analysis has been successfully substituted for part of the classroom teaching experience at some saving in total cost. (Although, as explained in the foreword, this report does not deal with computer-assisted instruction, it should be mentioned here that closed-circuit

television can contribute uniquely to the effectiveness of simulation exercises. Such exercises have considerable potential for reducing "live" laboratory experience with significant savings as a result.)

(b) Demonstration—Storage

Television and video tape can provide every student with a closeup view of a demonstration or experiment either in the classroom or preliminary to the student's own work in a laboratory. Here there can be substantial cost savings in demonstration time, cost of laboratory animals and other materials. There is also added effectiveness in the closeup view and in easy repeatability. In the life sciences colour is required to realize the fullest potential but the additional effectiveness gained may not be worth the additional cost if still photographic material is made available so that the student has a colour key to the black-and-white video picture.

(c) Integrating materials—prepackaging

The television studio with its capacity to integrate film, still pictures, graphics and previously videotaped inserts is a unique tool for the instructor who wants to prepackage a classroom presentation and eliminate the hitches which so often beset projectors in the live classroom. Mixing media in the live classroom can be time-consuming and frustrating for the instructor unless he has access to an especially well-equipped lecture room and skilled assistance. In many universities such rooms are in short supply. Television packaging in such circumstances is likely to improve quality and reduce costs as well if the presentation is to be used several times.

(d) Extending the classroom

Television can be used to extend the classroom in two senses. With the use of mobile facilities the instructor can take the class "on location" to an industrial plant, a building site, a conservation area, a geological formation, an operating room or a patient's bedside. Film also offers this capacity but sound film on location is more expensive and less reliable than mobile video tape. Immediate playback of video tape makes it possible to check quality of the result on the spot. More conventionally, television can simply multiply the image and voice of the classroom event any number of times in any number of locations within the precincts of the university or beyond.

(e) Student expression

Television can be used as a medium of expression by the student in the instructional framework. This already occurs in the self-evaluation process noted

in section (a). But students may also organize their findings in a class assignment by using film, audio presentation, tape/slide or television. Much will depend on how far resources are made available for student use. In Chapter 2 we speculated that increasing numbers of students will see competence in the use of media (mediacy) as an equally or more important goal than competence in the use of the written word (literacy). Little has so far developed in this area at the university level except for students in journalism, film, communications, etc., where television is directly related to the course. It has to be acknowledged, however, that students in primary and secondary schools are becoming increasingly "mediate" and will wish to use and further develop these skills in relation to their general courses of study at university. This may very well be a legitimate extension of media use as it improves the relevance and therefore the effectiveness of the learning experience. It has, however, substantial cost implications and universities will have to begin to discuss these with their students. Students are now, of course, responsible for typing or having typed their written essays and exercises. They may also have to accept responsibility for the cost of other forms of presentation at least where these are optional.

(f) Improving accessibility through broadcast uses

Television broadcasting facilities offer unique possibilities for extending university opportunities into the community to reach and motivate people who would otherwise not participate in university-level instruction. Broadcast television is, however, potentially more important as a medium for advertising higher education than as a primary medium of instruction. In very few jurisdictions has it ever been possible to take a full university degree program via television, and where the possibility existed, very few persons have done so. Course offerings have often, however, made it possible for students to get started who might otherwise never have attended university. There is no doubt that television can stimulate interest and provide motivation where it might otherwise not exist. It is this "shop window" aspect of broadcast television which has been emphasized by Dr. Walter Perry, Vice-Chancellor of Britain's Open University. (For full discussion of the Open University see Chapter 5.) In that radically new extension program television and radio broadcasts will require barely a tenth of the student's time, and as technology develops and makes possible widespread decentralization of playback facilities, it would be possible to eliminate broadcasts, as such, from the instructional delivery system. It is also perhaps doubtful whether enough air time will be available for the full range of courses which will eventually be developed. Nevertheless the "shop window" function remains vital and it is intended to broadcast the television and radio materials of some courses each year in order to keep the Open University in the public eye and so advertize the opportunities it offers. Similarly, in Chicago, the City TV Col-

lege captures the interest of many persons who never formally enrol but whose perceptions and understanding of higher education are certainly widened.

It is clear by now (Professor Pike's study for The Association of Universities and Colleges of Canada, *Who Doesn't Get to University—and Why*,[4] is the latest evidence) that accessibility to higher education depends on family attitudes and expectations and that when these are indifferent or negative towards the possibility of university education they may be at least as important as economic barriers in excluding talented children from the educational system before they reach university level. In these circumstances universities should surely collaborate with public and commercial as well as educational broadcast authorities in communicating as widely as possible an understanding of what higher education is and what it offers. We have yet to see an education-centred soap opera in Canada. Perhaps this is what is required. Children, whatever their family circumstances, can be reached through school broadcasts. Somehow their parents must be reached through an expanded awareness of educational opportunity. The universities cannot afford to leave this job to others. Neither can they assume that simply presenting the occasional university extension course on television is a sufficient contribution. In short, if it is policy to attempt to increase demand for higher education from particular sectors of the society, broadcast television appears to be a potentially powerful instrument for the purpose.

THE DEVELOPING HARDWARE

If, in future, broadcast television will be of marginal importance as a university instructional medium *per se* it is because two other delivery systems are rapidly being developed both of which are decidedly relevant to the individual student interested in home study and the campus-centred institutions alike. These systems are (a) cable television and (b) low-cost video playback and/or recording through a conventional home television viewing set. Very large financial investments are at stake in each of these systems, and it is much too early to guess the outcome with any certainty. The Sloan Commission on Cable Television has just started work in the United States on a study which is expected to parallel the Carnegie Commission's study on public broadcasting. The ultimate shape of cable television facilities in Canada will not be clear either until the impact of recent rulings of the Canadian Radio and Television Commission on priority service and restricting multiple holdings of broadcasting and cable television undertakings is discernible. A further critical uncertainty is whether broadband cable systems carrying several dozen channels will be licensed. The economic and political implications of such decisions are far-reaching and quick action is not to be expected. It is technically feasible through a cable

[4] R. Pike. Ottawa: Association of Universities and Colleges of Canada, 1970.

system to provide dial access on an automatic or semi-automatic basis to a large library of video material. Whether the economics of such a system turn out to be viable for general purposes, it is wishful thinking to suppose that any more than a small fraction of university-level library material could be delivered in this way. Such a development on any scale is in any case several years in the future. It would not be rash to conclude, therefore, that cable television, like broadcast television, will be an important shop-window for university course materials but as an instructional medium *per se* will perform only marginal service in the foreseeable future.

The low-cost video recorder and playback unit is altogether another matter. For the first time the individual will have, in theory, at least as much control over video materials for study purposes as he now has over his use of print. Assuming that there are in almost every course of study some portions of the material which can be taught more effectively with a combination of picture and sound, these segments can now be prepared, distributed and *used at will* by students using institutionally provided playback facilities or their own facilities at home. Audio-tape/photographic-slide presentations may often be the most effective and low-cost combination of sound and visual materials for instructional purposes. These can be packaged on video-tape just as easily as more elaborate productions. Video-tape does not have to be used only for full-blown television studio productions.

Yet several catches mar this utopian picture, at least temporarily, so far as the home user is concerned. The first is that there is not one system, but several. There are five basic types of system each based on totally different materials and electronic methods. One type uses a magnetic video-tape system and within this type there are half a dozen competitors, although there appears to be some possibility that a group of these will work together to establish a common standard for half-inch video-tape cassettes.

Already entering the industrial and educational market is a second type developed by CBS and called electronic video recording (EVR). This system relies on 8.75 mm film and a flying spot scanner to transfer the film information into a video picture. The industrial version of the EVR playback machine costs between $700 and $800, although a discount is offered for educational uses. It is expected that models for home use will be available eventually at a substantially lower price. Preliminary price lists for the material to be played indicate that a user wanting 50 copies of 50 minutes worth of black-and-white material would pay about $2,500. This is the minimum cost of transferring copies of material to the system. If 2,000 copies are ordered the unit cost drops from almost $50.00 to less than $25.00. EVR playback can deliver directly into any video distribution system and is therefore more convenient than film where tele-cine equipment is not available. On the other hand, EVR film has a double track and, in black and white, must be rewound in the middle of a fifty-minute

program before the second part can be played. This minor disadvantage is more than offset by the capacity to switch from one track to the other while the frame is stopped. This offers great flexibility in combining still pictures, print, moving pictures and sound for instructional purposes. In colour the program time is limited to 25 minutes since the second picture track is used to provide colour information. EVR film appears to have an incredibly long life in comparison with regular video-tape which shows marked deterioration after a few dozen playbacks and normally has a limit of 100 playbacks (although more durable video-tape is in prospect). EVR is also more durable than regular film since there are no sprocket holes, and the driving mechanism produces a minimum of wear and tear. The major disadvantage of EVR is that EVR film, unlike tape, cannot be wiped and used for any other purpose, and the playing unit has no recording capacity. It is a single-purpose unit. The decision as to which system is preferable will depend on the purposes foreseen for particular pieces of material. Instructional units subject to repeated use over long periods of time may logically be stored on EVR. The fact that the National Film Board of Canada has decided to use EVR as a major (though by no means exclusive) medium for non-theatrical distribution suggests that educational television systems may wish to equip themselves for convenient access to this wide range of Canadian material. A substantial volume of materials produced outside of Canada is also likely to become available in this form.

RCA is in the process of developing another unique system called Selectavision. It will not have playback units on the market for at least another year. Information available in the fall of 1970 suggests that its playback units will be in the same price range as EVR and that the unit cost of its cassette may be considerably cheaper. A video disc system (Teldec) is being developed in Germany by Decca and Telefunken. It could potentially be the cheapest of all the systems for mass production of home recordings. But whether it will be at all competitive with other systems remains to be seen.

Telerecording on 8 millimeter film would offer some attractive cost savings assuming the availability of satisfactory commercial playback units. The Open University is experimenting with such a system which may very well provide an economical answer when relatively small numbers of copies of a particular instructional presentation are required.

It may well turn out that any major university audio-visual centre will need to acquire several of these competing hardware units in order to get access to worthwhile instructional material. Given the probable price range of playback units (about $400), half a dozen of them would in total cost no more than the last generation of helical scan recorders. It is hardly visionary to suggest that playback units and cassette libraries be provided in central or branch libraries in universities or wherever suitable control of the cassette library can be maintained.

Universities will have little difficulty meeting the cost of substantial installations of such facilities. For most students, however, a home playback unit will be at best a marginal investment for the foreseeable future—unless a continuing flow of materials compatible with a particular model is assured. There is no reason, however, why universities should be the only institutions to provide playback facilities for students. "Study Centres" could easily be established in public libraries, colleges of applied arts and technology or in high schools—wherever machines used for classes during the day could be used by adults individually or in groups at night. The hardware revolution is on us. We have stressed repeatedly the need for a software, or program, revolution to match. Before trying to see how these actual and potential revolutions might intersect in Ontario in the future, we shall in the next section of this report examine television in the Ontario universities today.

CHAPTER FOUR

TELEVISION IN ONTARIO UNIVERSITIES

This chapter is intended to provide an overall factual summary of the extent of television facilities in the Ontario universities in the year 1969/70, the uses to which these facilities were put, and the order of expenditures involved. We shall also examine in general terms organizational patterns within the universities as well as inter-university machinery for cooperation.

USE AND COST

The broad-brush analysis offered here depends on data provided by the universities in response to an information survey conducted in the summer of 1970 covering television expenditures and activities in the academic and fiscal year 1969/70. As it turned out, a number of universities were reorganizing their television and/or audio-visual services, or changing key personnel, or for other reasons found it difficult to provide the information requested in the form hoped for. In spite of this, cooperation was excellent. In those cases where information gaps persisted, it was not difficult to adjust the aggregation of related data before drawing conclusions. In only two cases did institutions have to be left out of major calculations and these omissions do not alter the picture presented in any substantial way.

Since time was short and the purpose was to establish relationships between use and cost on a province-wide basis, no attempt was made to collect data with enough care to permit detailed comparisons between universities. Because of differences in size, internal organization and budgeting methods, it is difficult in any case to make valid cost comparisons between individual institutions. When problems of defining use, and the varied scale of television operations are added

to these other difficulties, it becomes next to impossible to compare television costs and use from institution to institution with any accuracy. However great the effort, the result would remain dubious. On the other hand, data which are manifestly inadequate for detailed comparative analysis can be satisfactory, when aggregated, for the purpose of establishing an overall picture of the sort attempted here.

The purpose of collecting the data was first to establish overall cost and then relate cost to use. Overall expenditures on television services were established by aggregating operating budgets for television service in 1969/70. This amount was approximately $1.2 million for the universities included. Total expenditures over the previous five-year period for major equipment installations totalled about $5 million. There is general agreement that it is reasonable to depreciate equipment at an average rate of twenty percent per annum. We therefore added $1 million for equipment rental making a total cost of $2.2 million for 1969/70. This represents about .7% of the operating budgets for these universities. We calculated theoretical rental charges for space dedicated to television use, but since space charges are not covered in normal university budgets, they have not been included in the $2.2 million total. As a matter of interest, the space used for television is approximately .33% of total inventory.

In order to relate cost to use it was necessary to select a measurable unit of use. Since our main concern was with the delivery of instructional material to students, we decided to estimate the number of student viewing hours, i.e. one student watching television for one hour. While it was impossible to determine the number of student viewing hours precisely, the estimates as shown in Table 1 will serve as a rough indicator of use.

TABLE 1

TELEVISION USAGE, 1969–70

Use	Estimated total student viewing hours	% of total viewing hours in all uses
(1) Regularly scheduled lecture		
Live overflow	76,125	7%
Classroom origination	183,672	18%
Studio origination	344,083	34%
(2) Regularly scheduled lab	119,647	12%
(3) Other uses	264,891	29%
Total	988,418	100%

The figures shown are based on registered enrolments in courses or estimated audiences at non-credit events where television was used. The first category in Table 1 covers those instances in which television is scheduled for use in a

course at least once a week. A total of 79 courses falls in this category, and the 24,000 students registered could be said to have "taken" these courses in whole or in part by television. Individual students may, of course, have registered in more than one of these courses. Including "other uses" where television is used occasionally on an *ad hoc* basis for "enrichment" and allowing for duplication, we have estimated that about 40% of the students at all universities have been exposed to at least one classroom viewing experience.

Using the total number of student viewing hours shown in Table 1 and dividing this into the total cost, we find that the average cost of such an hour for the whole province is a little over $2.00. The heavy capital investment in Scarborough College distorts this figure considerably. If it is left out of the calculation, the average cost figure comes down to about $1.25. Possible savings attributable to use of television in 1969/70 have been calculated below and when these are subtracted the average net cost per viewing hour drops below $1.00.[1]

This average, of course, conceals a wide variation of quality in the material viewed, and in the circumstances of viewing. It also conceals wide cost variations among the different universities. The "cost per student viewing hour" varies from $.43 to $12.00. The first figure represents cheap, large-number usage of television, and the second, expensive "teaching aid" material which was being prepared for small groups of specialist students. If multiple installations within single institutions are aggregated, then student viewing hour costs range from $.75 to $12.00. The latter case, it should be noted, represents a very small new installation with hardly any use in 1969/70. It is clearly evident that if output can be increased, cost per student viewing hour will fall. Often, installations have a much larger capacity to produce television material than is effectively used. Media-centre directors complain of insufficient use in the summer time, and the thornier problem of selling their "services" to the faculty. The services are worthwhile and no one is at fault in this situation. What is required is a much more systematic approach to the problem of curriculum and course development. Objectives must be defined, all possible methods must be canvassed and evaluated, including solitary study in the library as well as applications of technology, and then courses must be designed and evaluated every step of the way. In the absence of disinterested advice, and a structure within which that advice can be effective, the television and media people will continue

[1]Student viewing-hour costs are not all additional to normal instruction. It was estimated that television saved approximately fifty professors in Ontario during 1969/70. Deducting 15% for research activities from an average salary of $15,000, and assuming separate instruction for each course section taught by television at a normal load of 2.5 courses per year this would represent a cost saving of about $600,000. If this figure were subtracted from television operating costs, the additional cost of television would only be $1,400,000 or $1.37 per student instructional hour. If Scarborough is left out of the calculation the saving is reduced to forty-six professors, representing a saving of $586,500. Subtracting this figure from the operating costs of all universities studied except Scarborough the additional cost of T.V. would be $825,260 or $.93 per student viewing hour.

to be frustrated, and faculty will continue to resist being oversold. We shall return to the problem of the faculty/media interface later in this report.

For purposes of establishing the relative cost of a student viewing hour an attempt was made to calculate a province-wide average cost of one student hour of formal instruction. With television costs subtracted from the budget, the cost of a student instructional hour works out to about $6.00.[2] This figure must be treated with a great deal of caution. The average cost conceals a great range of student instructional costs all the way from relatively inexpensive instruction in first year undergraduate courses to very expensive graduate courses. It is therefore clear that undergraduate student instructional hours would cost on the average considerably less than $6.00. The net cost of a viewing hour is about ninety-three cents. It is clear therefore, on the basis of these admittedly rough calculations, that the application of television to any particular course adds on the average upwards of twenty percent to hourly instructional costs per student. As a cross-check on this rough estimate, the incremental cost of television was also examined in relation to the courses offered by a single department in one of the universities. In this case, use of television added about 16% to instructional costs. It is worth noting, however, that additional costs of television are sensitive to differences in salary levels and course loads. When the television teaching activity of the example department is costed using a more usual average salary of $15,000 (instead of $19,000) and an average course load of 2.5 (instead of 2.3) the additional cost of television amounts to more than 30% of the costs of conventional instruction. (For the calculations on which these figures are based see Appendix F.)

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[2]Average Cost per Student Instructional Hour:

Assume (a) an average of 19.3 instructional hours per student per week;
(b) an average of 25 weeks of instruction per year.

An estimate of the average cost per student instructional hour can be arrived at as follows:

$$\frac{85\% \text{ of operating budgets}}{\text{number of instructional hours } (19.3 \times 25 \times \text{student population})}$$

It is assumed that 85% of operating budgets covers costs of all formal scheduled instruction—lectures, laboratories, tutorials, seminars.

This assumption rests on the further assumptions

(a) that an average 35% of assisted and sponsored research funds will represent roughly 7½% of the operating budget,
and
(b) that it is reasonable to assume a similar percentage attributable to non-scheduled informal supervision, mainly of graduate work.

It is, of course, clear that such estimates are no more than rough approximations. Much undergraduate instruction occurs informally in non-scheduled circumstances. In view of the major teaching function of the university, however, it is reasonable to attribute all costs to formal instruction *except* those attributable to overhead on assisted and sponsored research and supervision of graduate theses. If a larger proportion of total costs is attributed to these activities, then the average cost of a student instructional hour will drop and the *relative* cost of a student television viewing hour will rise.

There are many circumstances in which increased effectiveness may well be worth more than a 20% or even 30% net additional cost. Such results are particularly probable in uses of television described under heading (a) in Chapter 3 when television and video-tape provide a dimension of instruction not hitherto available. In other applications effectiveness may be substantially increased if faculty have been stimulated by the demands of television production to organize course material and present it more carefully. In other cases, however, the effectiveness gained may not justify the increased expense if this is truly "additional." If, however, the facility exists, and is underused, then the increased expense of using it in a given application may be hypothetical.

Most universities have made the decision that television service should be provided along with other instructional aids. They are probably correct in assuming that a modern university should possess at least a modest television capability. But when capacity is fully used it may be advisable to examine the *cost* of T.V. in relation to additional effectiveness in order to establish priorities among users and as a basis for rationing scarce resources. Once the minimum facility is provided, expansion should be based on careful estimates of the additional effectiveness to be achieved by the increased cost. Conversely, it should not be assumed that in every case television can be used to reduce costs by simple large-scale applications without loss in effectiveness of the teaching program. All of these considerations point once more to the need for comprehensive review of costs associated with all kinds of teaching resources and alternative methods of applying resources to achieve well-considered objectives.

Not all the use of television is reflected in student viewing hours. Small but significant numbers of students and faculty were actively involved in using television, i.e. either appearing themselves or helping in the preparation of programming. It is safe to say that students and faculty involved in preparing course material for television presentations are thinking about their subject in new ways and therefore, on the whole, learning more about it than those who are not so involved. The following table gives this breakdown of participation:

TABLE 2
SUMMARY OF ACTIVE USERS

Type and activity of users	No. of users	Users as a % of total (1) faculty membership or (2) student enrolment
(1) Faculty		
(a) teaching on TV	306	4.8
(b) appearing for self evaluation	96	1.52
(c) preparing TV courses	137	2.18
(2) Students		
(a) appearing on TV	3,182	3.8
(b) preparing courses	320	.28

ORGANIZATIONAL AND ADMINISTRATIVE PATTERNS

Although it was not the purpose to attempt a comprehensive survey of audio-visual or instructional media facilities other than television, the information obtained shows clearly that (a) a number of universities have now centralized the administration of these services[3] and (b) there are widely varying patterns of emphasis on the various campuses. The portion of expenditure devoted to closed-circuit television appears to vary from a tenth to more than one half of the whole. At universities where such services are not administratively centralized, it was not profitable to attempt to compare television spending with spending on other instructional media. It was observable, however, that the level of television activity varies widely among these campuses also.

Financial arrangements also vary. Most frequently academic departments are not charged for services and materials used for instruction in a regular course, but all other users are charged. In other cases there is a schedule of charges for all services so that the media centre is, in effect, wholly supported by real dollar transfers from users' budgets. It is observable, however, that whatever the theoretical advantages of centralization it is nowhere complete. On almost every campus there appear to be some audio-visual facilities which remain under the control of departments or research units and are not centrally inventoried or serviced.

INTERUNIVERSITY COOPERATION

We have already noted extensive interchange of materials on an informal, bilateral basis among universities in Ontario. Since 1965 the Ontario Universities' Television Council (OUTC) has existed as an affiliated organization of the Committee of Presidents: "On request to advise and assist universities, and to make recommendations to universities or to the Province or both, on the development and use of television teaching in Ontario universities." In 1967 a modest central office was established to serve as a centre from which advice and information could be obtained. At first the office undertook to provide similar services on behalf of the Association of Universities and Colleges of Canada for all English-speaking universities in Canada and to cooperate with the Commission interuniversitaire des cours télévisés et radiodiffusés, organized by the French-language universities in Canada. During 1970, some clearinghouse activities, formerly the responsibility of the OUTC office, have been transferred to the Learning-Media Office newly established by the Association of Univer-

[3]Such services typically include the preparation of slides, transparencies, 8 mm and 16 mm film, black and white and colour, audio recording and playback, public address systems, language laboratories and, in some cases, the supply of projection equipment of all kinds.

sities and Colleges of Canada in Ottawa. The OUTC office has been disbanded as a separate establishment and continuing responsibilities, such as the management of the universities' cooperative film-purchase plan, have been transferred to the office of the Chairman of the Council at McMaster University.

In addition to promoting exchanges of materials and information, the Council has sponsored a two-day conference on "Television in the University" in December 1967 and has been active throughout in the preparation of briefs on behalf of Ontario universities about the policies of the Provincial and Federal governments relating to educational broadcasting. Most recently the Council, on the authority of CPUO, has established the first regional committee for university-level educational broadcasting. The Ontario Universities' Regional Committee for Channel 19 (or the Channel 19 Committee, as it is called) is responsible for establishing working relationships with the Ontario Educational Communications Authority and the universities within the Channel 19 reception area (greater metropolitan Toronto) covering 39% of the population of Ontario.[4]

By the end of October 1970, the Channel 19 Committee had met five times and has now under discussion with the Educational Communications Authority a proposal to establish an Advisory Committee on university-level programming. The Committee believes that it cannot discharge its mandate fully until universities have gained some experience with the offering of degree credit courses via broadcast television and is bending every effort to have some degree programs scheduled in 1971-72. Two member universities are prepared to offer such courses, and two others are interested in recognizing the courses for credit by registering students and evaluating achievement at the end of the course. The report of the Channel 19 Committee to the OUTC qualifies the progress made as follows: "It must be appreciated that Senate approvals are required, financing uncertainties must be removed and details of cooperation are to be negotiated, and none of these actions is easy or straightforward." Further comment on some of these matters will be found in the following section of this report.

There is one matter, however, on which general confusion prevails in the minds of almost everyone involved with "educational television." To avoid such confusion a distinction has to be made between education in the general and in the more narrow, "instructional" sense. This is not the place to attempt to resolve all of the semantic and conceptual problems involved. But it should be clear that the term "university level" has no meaning except in relation to formal courses of instruction offered for credit within a university degree or diploma program.

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[4]J. Miedzinski, "Telecommunications in Canada" (in *Telecommunications Journal*, Vol. 37, VII, 1970), p. 338.

The difficulty becomes obvious when the same terminology is applied to newspaper or popular magazine articles by teachers and scholars. Many such popular presentations in the press and from the public platform are based on scholarly research. This does not make them "university level" in any meaningful sense. The confusion arises because many universities have for many years offered non-credit adult-education courses in many fields—law for the layman, small-business management, creative writing, art appreciation, painting and drawing, and a host of other subjects. The fact that such courses were and are offered under the auspices of a university does nothing to certify the level at which they are pitched. In most cases no prerequisite experience or other qualification is required of students except an interest in the subject and an ability to pay the fee. Universities have provided a valuable service to the community in this way, as have many other institutions: the YM-YWCA's, local school boards, and colleges of applied arts and technology. The view taken here is that, so far as broadcast television is concerned, the universities should concentrate their efforts as much as possible on the difficult task of extending opportunities to take degree credit courses through television. Where demand is apparent, courses for updating professional accreditation may also be an appropriate university activity, although in general it is better that the institutional responsibility for such courses should rest with the accrediting agency. Credit courses, the universities and only the universities can do. They should then as institutions leave full responsibility for general adult-education programming to others. This view should not be misunderstood as opposing the participation of individual faculty members in general programming of the sort mentioned. University people are a prime resource for general programmers in the CBC and elsewhere. But the university as an institution does not and should not attempt to take responsibility for the content or presentation of such programs. Universities as institutions should, however, accept full responsibility for the academic standards of content and presentation of broadcast credit courses. Such a clarification of the university's function would appear too obvious to require emphasis. But confusion on the point seems to persist wherever two or three educational broadcasting enthusiasts are gathered together.

The one exception to the rule just stated, where the university has an obvious responsibility, is in general programming aimed at informing a wider public about the nature of universities and the opportunities they offer and the accessibility of those offerings. This point is important enough to find a place in recommendation IV of this report.

Community outreach is tremendously important for the university and for the community. Television offers major opportunities for wider service. But universities must also seriously and systematically think through their objectives in this respect and not try to accomplish what can better be done by other institutions with other responsibilities.

CHAPTER FIVE

POSSIBLE DIRECTIONS FOR ONTARIO

THE EXISTING UNIVERSITIES

In this section there will be no attempt to prescribe for individual institutions. We have already seen that development of television facilities in our universities has been, on the whole, prudent. If it has generally proceeded on inadequate assumptions and in the absence of comprehensive planning, we know this as a matter of hindsight. It is not an accusation of negligence. The common assumption that creating physical facilities would lead through a process of experimentation to their full and effective exploitation in the instructional process was perfectly reasonable. It was also, of course, generally wrong. But such errors of judgement as there may have been in establishing these facilities are surely among the lesser ranks of the mistakes that must always be made when large enterprises are forced through rapid growth.

The relatively small investment in television to date can, indeed, be interpreted as a tribute to the adequacy of the effort sustained by universities and the Provincial Government over the past eight years in creating enough student places to meet a spectacularly rising demand. In 1962 the planning report of the Committee of Presidents (the Deutsch report),[1] which became the basis for the expansion of the universities, mentioned the possibility of using television on a large scale to overcome a possibly serious shortage of qualified university teachers. That television was never needed for this role on a system-wide basis and only marginally in particular departments in particular universities in the intervening years is a measure of the successful university expansion achieved.

Television facilities have developed historically in different ways on the

[1] *Post-Secondary Education in Ontario, 1962–1970: Report of the Presidents of the Universities of Ontario to the Advisory Committee on University Affairs* (Toronto: Committee of Presidents, May 1962, Revised January 1963).

various campuses. Unexpected overflow crises have provided the spur in some cases. In others the opportunity to obtain television facilities in a new building has been eagerly seized by innovators in a department who saw possibilities for improving the quality of instruction. There have been signs in recent years of a merging of motives of improving quality while serving quantity. But most universities are a long way from looking at the instructional process comprehensively as a system in which resources and methods can be deployed in a variety of ways to achieve objectives. Even where attempts have been made to develop multi-disciplinary courses no systematic assessment of resources has been made. Realistic estimates of total instructor time required to make multi-disciplinary effort a success have usually been lacking. Attempts to use instructional media effectively when time allowed for basic course planning is inadequate are bound to fail and consolidate negative reaction to their further development.

None of what has been said is meant to imply that conventional instruction in our universities is ineffective. Our graduates compete on even or better terms with the graduates of many other jurisdictions. But experience in recent years suggests that existing institutions are not likely to adopt rapidly or widely a systems approach to the instructional process with the connotations which we have already explored. Universities do not like to discard something old that works for something new that is unproven. In this chicken-and-egg situation it is quite normal to cluck at length before making any visible movement. There will be some members of faculty in each university eager to experiment. But unless students are to suffer—or appear to suffer—innovators must persuade their reluctant colleagues that their experiment has a reasonable chance of success and that the work students do in it will deserve and therefore be allowed credit.

The biggest stumbling block in the way of innovation of the systems variety is, however, not tradition, not caution, but resources in time and money. The systems approach to learning requires a great deal of time which is just the commodity that is not to spare in an institution already engaged in the relentless cycle of undergraduate teaching and the complex governmental and administrative activity which supports it. Team development is not an activity which builds up gradually. Demands on time must be particularly heavy in the initial stages when, in effect, the faculty members involved are training themselves in a team-development approach. These considerations mean that existing institutions are unlikely to be able, however willing, to adopt a systems approach to curriculum planning, except perhaps on a narrow front, if they are to continue to carry their ongoing responsibilities effectively. Furthermore, a course-development team working within a single institution is unlikely to have the range of other expensive resources available to it which, next to time, are required to ensure success.

For those interested, three models are displayed in Appendix C, which offer a method of calculating the net additional cost or saving over conventional instruction resulting from the application of television given various assumptions about the variables involved. The basic model will be developed further and refined as part of a master's thesis by James Schram. In its present form, it shows clearly that, even when half the first-year courses are offered by television in a single institution of 6,000 students, the results are cost-competitive only if two assumptions are made: (a) that average class size is under sixty and (b) that hourly production costs are extremely modest (in the $300 range). This model deals with television applied to conventional instruction. It does not include the cost implicit in a total systems approach to instruction in the university. This would require a minimum scale of resources to be effective and is unlikely to be achieved in a single institution working by itself. On the other hand, it is quite conceivable that a course-development team working in and for a single institution could develop an adequate program based on units of instructional material available in suitable form and at reasonable cost from sources outside the university *if it were willing to substitute these for much "in house" classroom teaching.*

In fact such material does not yet exist in the required quantity or quality for most disciplines. There is, of course, a considerable traffic in video tapes and films among the universities of Ontario. This is mainly conducted on a personal basis between members of the same discipline at different universities who know each other. In at least one case, a complete set of instructional presentations prepared at one university has been sold for use in other universities outside of Ontario. But there is little evidence so far that considerable numbers of faculty in the same discipline are prepared to use each other's material regularly and on a considerable scale. It is now frequently observed that no one minds using another man's textbook—but using another man's voice, or face, or experiment, or demonstration on tape or film makes him an unacceptable intruder on the instructor's home ground. We noted earlier that this attitude probably stems from a particular convention about the privacy of the teacher-student relationship. This might extend in certain cases to a proprietary feeling for the student on the part of the teacher. We have also stressed at several points the absolute indispensability of the live, face-to-face teacher in the instructional process. At the same time, we have suggested that it may be possible to re-define the role of the teacher as manager, counsellor and guide as the student finds his way through the materials of a course which may be presented to him in various forms. In short, there are no technological barriers to the mass production of instructional materials if instructors in individual institutions are willing to pay for them and use them. The price depends on the extent of the use.

Use of such materials in existing institutions is likely to depend on how

much say the potential user has had in their preparation. It is unrealistic to suppose that video-tape or film presentations produced altogether independently of the instructors expected to use them will find wide favour in conventional settings. It is not likely to be profitable therefore to approach the problem of wider distribution on an institutional level alone. It will be more fruitful to encourage and facilitate cooperation among teachers in a particular discipline. There are prospects, for example, that a number of faculty from several universities concerned with the instruction of first- and second-year students in their discipline, will get together to discuss the problems of teaching Ontario high-school graduates as they are now prepared. This group may well find themselves taking the next step and exploring the possibility of producing for their common use certain elements of instruction. They might stop there or they might take the further logical step and decide that, given the necessary time, a smaller group of them might develop a whole "core" course in the subject complete with written outlines, video and audio presentations, lab instructions, exercises for continuous evaluation (perhaps machine readable) which they would all use at all their universities, providing "live" tutorial sessions and guidance on demand from their own students. If such a course were used on a sufficient scale and were re-usable in large part over a period of years the "trade-off" for the departments concerned could be substantial in terms of teaching time available for senior and graduate students and research and/or budget for faculty salaries.

We shall propose steps to encourage such developments. But for very good reasons such developments on any large scale, however encouraged, are likely to be slow. In the meantime enrolments in the latter part of the decade may well present themselves on a scale which offers the possibility of developing a new approach to general education at the university level making full use of the systematic approach to instruction from the outset. It is to this possibility that we turn next.

BRITAIN'S OPEN UNIVERSITY

In the first section of this report we summarized the course-team approach to the effective deployment of instructional resources as set out in the UNESCO publication *Teaching and Learning : an introduction to new methods and resources in higher education*, by Norman MacKenzie, Michael Eraut and Hywel C. Jones. The only large-scale application of these principles at the university level thus far attempted in the English-speaking world is in the Open University in Britain which begins its first programs of instruction in January 1971. There will be no attempt here to describe the operation of the Open University in detail. Interested readers are referred to the *Open University: Report of the Planning Committee to the Secretary of State for Education and Science*, pub-

lished in 1969 by Her Majesty's Stationery Office and to the relevant chapter of a forthcoming book by Andrew E. Soles, *Old and New Directions in Community Education*. Since, however, what is suggested in the following section as a possible development in Ontario is, in several important aspects, an adaptation of the Open University experience, it is important to clarify certain features of the Open University which may not otherwise be fully appreciated.

First, the Planning Committee of the Open University was chaired by a university vice-chancellor and included five other present or former vice-chancellors out of a total membership of nineteen. The Charter of the University, granted in April 1969, provides for an "Academic Advisory Committee of the University . . . which shall be responsible for keeping under review the standard of education provided in the University and of the Degrees Awarded . . ." This means, in effect, that each course of study comes under external review during the three or four years when the basic program of the University is being developed. The Academic Advisory Committee consists of "not fewer than five and not more than eight persons of high academic standing" appointed by the Lord President of the Council. The Vice-Chancellor of the University is a member but may not be chairman of the Academic Advisory Committee. In addition to advising the governing bodies of the University on academic matters and approving the institution of degrees, the Committee is, by the terms of the Charter, " to keep under review and to certify annually to the Council that it has satisfied itself about the procedure for the appointment of academic staff and the organization and conduct of University examinations including the conditions of appointment and service of external examiners." It is obvious that the Open University is intended to offer programs of a standard matching other similar degree programs in Britain, and that, while it is an autonomous university, it has evolved through the efforts of, and remains dependent on, many outstanding persons in conventional universities, as well as its own distinguished academic staff recruited largely from those same universities.

The needs to be met by the establishment of the Open University in Britain do not exist in the same form or on the same scale in the Province of Ontario. The Planning Committee identified in Britain a large backlog of qualified adults who had been denied access to university on leaving secondary school and who would be attracted by the kind of opportunity which the Open University proposed to offer. The most striking evidence of a continuing backlog problem is offered in paragraph 13 of the Planning Committee's *Report*. The Fifth Report of the Universities' Central Council on Admissions, 1966-67, stated

> some 30,000 boys and girls, all qualified to proceed to a degree course, failed to satisfy their ambition. Some, no doubt, entered other institutions of higher education, but it seems unlikely that, even with further university expansion, there will be a sudden elimination of a need for more opportunities. We do not therefore see the need for the Open University as a transient one, lasting only until such time as the

"backlog" of adults denied and anxious for higher education is eliminated, but as a continuing one throughout the foreseeable future.

In paragraph 14 the *Report* continues:

Thus the main work of the Open University will focus upon adult students. Indeed, we believe that it is always preferable for those aged 16-21 years in employment to attend sandwich courses, block release courses, or part-time day release courses at technological colleges, and at degree level, sandwich courses at technological universities and polytechnics designate. We consider that only those whose circumstances make it impossible for them to do so should be enrolled in the courses of the Open University.

The Open University then is designed to provide part-time opportunities for a large constituency of adults who were excluded from university opportunity and to provide continuing opportunity for those who will be excluded in future. It is quite clear that a similarly basic need does not exist in the Province of Ontario. In Ontario the proportion of the age group attending university has steadily increased and university expansion has to date kept pace with demand. Every student who could meet university entrance standards and who applied has been admitted to an Ontario university. If, therefore, a backlog exists of qualified persons who, for economic or other reasons, did not apply to university it must be very small as a percentage of the population by comparison with the backlog in Britain where university participation rates have been and remain much lower. Moreover, in absolute numbers the backlog must be relatively small since the population of Ontario is approximately one-sixth of Britain's. We lack positive information about the extent to which existing opportunities for part-time university work now offered in night classes, in summer school and by correspondence match the demand from the adult population. Part-time enrolments at our universities have been increasing rapidly. There is at present no evidence of significant unsatisfied demand for part-time degree work. This situation could change although indications are that with adequate funding of part-time students the universities can manage substantial further expansion. Of course the offering of new, more attractive and more varied courses for degree credit might well create demand in sectors of society not now participating in higher education. Nevertheless, once all the visible factors are taken into account, it is clear that the need for further degree programs for adults does not exist on a scale sufficient to justify the costs of creating an Open University on the British model in Ontario at this time.

Very different conditions in Ontario respecting home-delivery systems for audio-visual materials also argue against such a creation here. These materials make up an important part of the Open University's instructional package and that institution is able to rely heavily on broadcast facilities already in being. BBC-2, a UHF network, covers more than 70% of the British Isles. FM radio (BBC 3 & 4) provides almost complete coverage. In Ontario there is no such

single delivery system available at the present time, and it is at least questionable, in view of technological developments now in sight, whether further large-scale investment in UHF television broadcasting channels is warranted. In Britain, broadcast transmission costs represent about 7% of total costs. In Canada, according to the most recent annual report of the CBC, network TV distribution costs are almost equal to program costs. These are based on VHF stations, and costs of UHF transmitters are considerably higher.

The Open University is based on an instructional program of thirty-six weeks beginning in January. This allows for a week-long summer-school component for each course when students can assemble on campuses of existing universities while full-time students are absent. There will eventually be five multi-disciplinary first-level "foundation" courses—science, civilization and culture (humanities), man in society (social sciences), mathematics, and technology (the man-made world). Twelve additional courses will be developed at the second level. Many of these will also be multi-disciplinary and some will require a prerequisite at the foundation level. Educational studies will be an added category at the second level. Plans for third- and fourth-level courses are still fluid. For the general degree six courses must be completed—two at foundation level, at least two at the second level and two others at second, third or fourth level. The University also offers an honours degree for which a minimum of four courses at the second level, and two at the third and/or fourth level will be required in addition to the basic two foundation courses. The courses offered follow the pattern of the Scottish University Curriculum, and each is equivalent in terms of workload for the student to approximately two and a half undergraduate courses in an Ontario university.

What is most relevant to possible future development in Ontario is the Open University experience with course-team development. As the operation of their course teams is evaluated it will be possible to see in perspective how well their solutions to many new problems have worked. It is to be hoped that one of the teams will be released from the pressure cooker long enough to write its collective "confessions"—telling us what problems arose, how these were met, how people took criticism on a daily basis in the group situation. It will be important to have an estimate of the emotional as well as the intellectual energy expended on the input side of the cost-benefit equation.

It is not necessary for purposes of this discussion to identify in exact terms the future need for university development in Ontario. It is assumed, however, that the demand for general degree work will continue to expand on a scale sufficient to make a look at new patterns of instruction for that degree worthwhile. At the same time it is taken for granted that existing institutions are well equipped to meet the total conceivable demand for honours work and other specialized programs and that in most cases existing universities will be able to continue general degree programs as well. It would be reasonable, however, to

assume that as honours work expands at existing universities (if it does), some corresponding part of the responsibility for general degree work could be transferred to the new institution outlined below.

A NEW KIND OF INSTITUTION FOR ONTARIO?

To define is to kill
To suggest is to create
Mallarmé

The new approach to the delivery of a general university degree program outlined below and in the illustrative cost estimates to be found in the appendices is, with Mallarmé's slender sanction, put forward as an approach, a package of suggestions, not a proposal. The discussion of details is by no means complete. It will be proposed as a recommendation of this report that, if the overall approach is considered promising, an appropriately constituted planning committee be established by the Committee on University Affairs and the Committee of Presidents to examine in every aspect the feasibility of developing an institution in Ontario on the lines suggested here. Such a feasibility study would include ongoing evaluation of the Open University experience.

Although great variation in detail is possible within the approach to be outlined, certain assumptions are fundamental:

(1) That the degree Bachelor of Arts (general) must represent a program (however offered) at least at the level of present work in general arts at Ontario universities and that equivalent standards be established and met.

(2) That any institution offering such a degree should be governed in its essentials by its teaching staff with student participation.

(3) That it will be desirable in the near future to expand the opportunities for education at the university level substantially beyond the capacity of existing universities and without creating new universities on the existing pattern.

(4) That it will be desirable to provide these additional opportunities at widely distributed geographic points within the province.

(5) That wide distribution of opportunity will result in loss of quality unless

(a) a highly developed package of instructional materials is centrally prepared by talented and creative academic teams dedicated to the fullest exploitation of a systematic approach to general education (the term "package" should not be misunderstood. It does not connote a narrow prescription but rather a multiple set of

resources to be used by each student according to his abilities, preferences, and style of learning);

(b) there is a local or regional centre where each student has an institutional home which he shares with fellow students and faculty;

(c) a highly qualified professoriate, similarly dedicated, is available in every location to conduct tutorial discussions, to counsel and to assist each student to manage his individual learning experience.

(6) That to be successful such an enterprise must be based on a scale of enrolment sufficient to cover the heavy costs of high-quality, centrally produced materials and an adequately staffed tutorial service while remaining cost-competitive with existing institutions.

(7) That, for such a program, it is feasible to maintain and possibly improve quality while offering a relatively narrow choice of courses, and that there may be academic advantages in multi-disciplinary courses in which the student's capacity to integrate what he learns in various disciplines is a major instructional objective.

There will be further discussion of these assumptions as we proceed to examine the nature of a new province-wide institution which would respond to the needs, constraints and possibilities implicit in them.

Quality must be the first consideration. It is not the purpose to sell what is suggested here in competition with alternatives. It has been argued earlier, however, that universities, students, professors, and the public at large are in a critical state of uncertainty about the purposes of general education. This condition suggests that a new departure—an alternative to the pattern of general degrees offered in our existing institutions would contribute to the ultimate resolution of some of our present dilemmas. It follows, therefore, that a basically innovative approach should be carefully studied before additional demand for university places is provided by replicating existing institutions. It would, of course, be possible to develop an integrated multi-disciplinary program of instruction in a new university in a single location. But more than one such institution would be required. And, if opportunity is to be truly broadened, then a decentralized institution with study centres widely dispersed throughout the province offers certain advantages. It also involves clear disadvantages which can be offset only by fully exploiting the scale of numbers involved—in order to centralize every aspect of the instructional and administrative structure which can be centralized while preserving a strong, direct student/staff relationship.

The suggested institution and its operation can be summarized as follows.

It would be newly created as an academically self-governing degree-granting

body with the express function of offering a new kind of general degree program. Such an institution would have a provincial charter and a governing structure representative of faculty and students as well as of the community at large.

The President, senior faculty and central administration would make the headquarters of the institution in a central location. The rest of the faculty would serve students at selected geographical points throughout the province. Housekeeping arrangements for the physical facilities involved in each location would be made where appropriate with existing institutions which were able to offer the required facilities. If this were not feasible, then new facilities would have to be created.

All instruction would be based on carefully designed instructional materials produced by "course teams" of the best-qualified people available and prepared in accordance with the principles of course development as outlined broadly in *Teaching and Learning: an introduction to new methods and resources in higher education* by Norman MacKenzie *et al* (previously referred to) and as now being tested in practice in the Open University in Britain.

These principles, as has been noted, involve radical departure in curriculum and teaching methods from present norms at Ontario universities. Centrally produced, integrated packages of instructional material would include print, audio and visual items. The student would spend much time working alone at home or at the study centre.

It is assumed that most students would be full-time and would normally attend on a regular basis at the regional centre for viewing and listening to visual and audio materials and to attend scheduled tutorial sessions as well as finding informal contact with fellow students and professor-tutors. The local institutional setting would provide the focus of human interaction essential to any real educational process.

It is assumed that the course offerings in the first year would be few and that all would be multi-disciplinary. In order to achieve the desirable degree of integration within each course there seems to be merit in reducing the number of courses required and increasing the workload within each course accordingly. For illustrative purposes in the cost estimates, it is assumed that two courses a year will be a full load. A somewhat longer year than the normal university year is assumed. Each student would have on the average something like six hours of formal contact time per week. For four of these hours, the student would be involved with audio-visual materials, and for two, with scheduled tutorial groups of not more than fifteen. The individual student would be expected to carry a large part of the responsibility for his own study program and would be free to seek as much or as little additional counselling and tutoring as he wished.

The role of the professor-tutor would be quite different from that of the usual university professor today. He would not be responsible for the basic

structure of the course or for preparing lectures or other instructional materials. He would do his teaching within a framework prepared by faculty course teams at the centre. The professor-tutor would, however, retain a great deal of freedom in working with students within the framework of instructional materials provided and it is assumed that he would assist students in developing special interests within the prescribed content of the course. The word tutor must not be misunderstood. It is used to emphasize a different role—not a different status. It is not suggested that marginally qualified people be employed for professor-tutor appointments. On the contrary, these would be full-fledged academic faculty with rank and potentially with tenure. Formal teaching loads would be limited to approximately 10 hours per week, so that each professor would be free to spend at least half of his time in informal counselling of students who have particular problems. Professors would be expected to mark a number of major exercises but would be provided with marking assistance and clerical assistance sufficient to keep a major portion of time available for unscheduled contact with students. Machine-based testing devices would be utilized wherever applicable to conserve faculty time. The ratio of locally based faculty to students would be approximately 1 to 75 and, without any responsibility for the preparation of basic teaching materials, faculty would have the opportunity for contact with students at least as close as is normal for general students in conventional circumstances in any but the smallest of our present institutions. Students, it is assumed, would benefit from discussion with instructors who do not have a vested interest in the formal instructional package. A process of instruction on this model offers the possibility of genuinely high-quality experience to both student and instructor with an overall staff/student ratio including centrally based faculty of about 1:50 (see Appendices A and B).

Each full-time instructor would be a full-fledged member of the faculty board of the institution and would by no means be a passive recipient of material and instructions from the centre. It is recognized that liaison between local faculty and the course-development teams at the centre is absolutely vital, and the cost estimates include a staff of centrally based coordinating professors who would perform the liaison function by travelling widely and carrying criticisms and suggestions from faculty to the course teams. It is also assumed that several times each year seminars would occur bringing together local faculty and central course-development teams.

The central faculty of the university involved in course preparation would also be working in very different conditions from those associated with existing academic institutions. They would be working together in teams with qualified course consultants in establishing objectives for each course, developing outlines of content, selecting appropriate teaching methods and preparing appropriate instructional materials. It is assumed that each unit of the course would be presented in printed form with written assignments but that substantial units of

audio and visual material would also be distributed to regional study centres. Even though such materials are relatively high cost they are considered important for students who need supplements to the written word in the process of absorbing information and ideas.

In certain courses, field work and/or some limited laboratory experience will be an essential part of the study program. It is assumed, however, that laboratory facilities sufficient for the purposes of the courses offered can be provided at relatively modest cost. (The laboratory package developed by the Open University in Britain costs less than $150 and is designed for use in an ordinary household kitchen. Institutional space for practical work at this level need not be elaborate or expensive.) It is recognized that some students enrolled in the general program under discussion here will decide after a year or two that they want to specialize in a science, or indeed in any discipline. It is assumed that they will transfer to such programs at existing universities where appropriate facilities exist for specialized work. Admittedly, there will be a temptation to assume that science in the new program must be supported with laboratory facilities on conventional university lines. This temptation must be altogether resisted. The challenge to the course-development teams—the given objective indeed—is to develop valid, relevant courses in general science and technology for the non-specialist student, exploiting mixed media to the full and limiting "live" lab work to the "kitchen" level. H. R. Wynne-Edwards, Head of Geological Science at Queen's University, has suggested an approach to the problem of introductory science which has possible application here: "If education must now be relevant to succeed, the implication is that the pyramid of dependence should be reversed in the curriculum, with the basic science at least at the introductory level, being taught through the medium of the unified illustration provided by the earth and biological sciences . . ." The direct application of these sciences to the human condition is, as Dr. Wynne-Edwards points out, "more readily perceived than that of pure physics or pure chemistry."[2]

It is assumed that viewing and listening to such materials would be done on a scheduled basis in each local centre. Technological developments, however, will make it possible in future for considerable flexibility in playback arrangements. It may be, for instance, that video cassette machines will be available in quite small local libraries or in small schools. This means that a student who lives a considerable distance from a major regional centre where the instructor is located will not have to go into the main centre in order to receive the audio-visual materials. He might be able to proceed satisfactorily by attending the regional centre once or twice a week for tutorials while remaining a full-time

[2]*Science Forum*, no. 17, October 1970, p. 22. Mathematics stands alone at the top of the pyramid with physics and chemistry at the second level dependent on mathematics, while at the third level the earth sciences, biosciences and applied sciences are dependent on mathematics, physics and chemistry.

student. It is not assumed that distribution of video or audio materials for these courses would depend at all on broadcast or cable distribution facilities. The course would be designed basically for full-time school-leaving students based on study centres. Nevertheless the audio-visual components of the courses could be designed with the possibility in mind of adapting the course for extension purposes and the materials could be broadcast if facilities were easily available and the appropriate machinery for registering students and evaluating them was established. It is suggested, however, that the new institution ought to establish limited objectives in the first instance and be clear about its priorities. Just as the Open University in Britain was established to meet a need for home-study opportunity on a part-time basis intended for adults over 21, the need in Ontario to which this institution would be directed is the school-leaving population, most of whom will be in the 18-21 age group. By the same token, the substantial tutorial support outlined above is designed to meet the special needs of this age group, most of whom will wish to be involved in study on a full-time basis. Clearly, however, the offerings could be made available to part-time students in several ways once the full-time demand has been met.

Part-time enrolments are indeed likely to become an increasingly significant part of the total university responsibility. Moreover, the existence of new offerings, such as those described here, might well stimulate further demand beyond that now satisfied by extension programs of existing universities. The suggested design of the program would permit fairly rapid expansion or contraction of student numbers, either full-time or part-time, once the minimum enrolment for cost-effective operation was assured.

Before turning to discussion of costs, it must be acknowledged once again that the concept of a province-wide university college offering a limited program leading to a general degree has been presented here only in sketch outline. There are an enormous number of important matters of policy and detail which have not been covered. For example: If few courses are offered, how are student registrations to be distributed among them? What is the minimum viable registration for a local study centre? Would all such centres offer all courses, or would some smaller centres offer only part of the total curriculum? It has been assumed that literature of all cultures would be studied in translation in the humanities courses but that study of literature in the original of other languages would remain a function for the existing universities. Competence in speaking and reading another language can be achieved through various commercial programs, and it is doubtful that the proposed university should duplicate these efforts, although it might well provide language lab facilities for students wishing to achieve competence in French in addition to their regular studies. It is clear, moreover, that the type of program outlined, depending as it does on large-scale enrolments, can be offered economically only in English within the Province of Ontario. This need not be a major disadvantage, however, so long

as sufficient places for French-speaking Ontarians are available at Laurentian and Ottawa and means are made available to ensure that all qualified students attend one or other of these institutions. This is not to suggest that it would not be desirable for French-speaking Ontarians to have access to a similar program of study in the French language. It is simply to face the fact that the scale of enrolment required will not be found in Ontario. Perhaps it will be possible through cooperation with other jurisdictions to overcome this difficulty in the long run.

A simple model has been provided in Appendix A which estimates per-student operating costs for a normal intake of 12,000 first-year students and a steady state of 30,000 students, and an intake of 10,000 first-year students for a steady state of 24,000 students. An attempt has been made to estimate costs on a realistic basis in terms of 1970 dollars. Any one of the assumptions involved can be questioned, and therefore, each factor has been estimated somewhat generously above what might be a reasonable minimum requirement. The per-student costs resulting from this exercise indicate that, even allowing for a substantial margin of error, the system outlined could be considered cost-competitive and even cost-attractive compared with existing general arts programs. Even with a steady-state enrolment of only 20,000, the per-student cost would be barely $1,000 per year. If the new courses and instructional materials proved attractive from the student point of view and gained acceptance as being academically viable (and it would be essential that their quality be monitored from the beginning by a body like the Academic Advisory Committee of the Open University), existing institutions might well wish to utilize the course materials for their own general students and use the resulting savings to strengthen other parts of the university program. Any uses beyond those of the new institution itself would, of course, improve cost effectiveness.

In addition to operating costs, capital costs would be involved in providing space for the central faculty and administration of the university college as well as space at each regional study centre. A rough estimate of space required for steady-state enrolments of 30,000 and 24,000 will be found in Appendix B. In each case, total space required appears to be less than 50 square feet per student. Again, any of the assumptions can be questioned. But, on the basis of generous assumptions, the number of square feet per student place is modest when compared with conventional institutions.

In providing space for local and regional study centres it may be possible in a number of instances to use classroom facilities in existing colleges of applied arts and technology or to provide such additional facilities as may be required within the building programs of the colleges. It would be possible, however, to provide physical facilities in other ways. In some county jurisdictions elementary-school populations will begin to shrink in the near future, and quite possibly, some existing elementary-school buildings could be transformed into

regional learning centres for the new province-wide university-level institution. Except where such a building already exists, however, it would be desirable to build new space as required in conjunction with existing institutions, most frequently CAATs. Economies of classroom use, audio-visual facilities, study space, library, etc., would in many cases result from such a policy. Students in the various programs might well benefit from the interaction involved in sharing a roof while maintaining separate institutional identities.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

It may be useful before presenting conclusions to recapitulate some of the main points covered in earlier chapters. Page numbers follow each quotation for the convenience of the reader who wishes to refer to the original context.

It is not profitable to look at any single teaching/learning resource in isolation from others in use or in prospect. We must aim at nothing less than fundamental review of the instructional process.

(Page 2)

The overriding imperative of technology is system. Any discussion of educational technology must therefore be about the systematization of the educational process. Systematization in turn implies collaborative and collective effort—professionalism of a new and different kind.

(Pages 3 and 4)

It is fashionable today to speak of the teacher as manager of a learning system. At university, the student is also critically involved in managing his own learning process.

(Page 4)

"More progress towards effective learning may be made by concentrating attention on the needs and activities of the learner than by approaching the problem from the standpoint of the teacher."

(MacKenzie *et al*, quoted on page 6)

It may no longer be either possible or desirable to multiply opportunities for general education on the pattern of existing universities. Increasing

numbers may therefore make it necessary and possible to design new, fundamentally different patterns of instruction and so help to resolve the crisis in purpose.

(Page 10)

The student is the most important "input" to the educational process. His energy, aptitudes and sense of purpose determine first the choice and then successful exploitation of the opportunities presented by the university. He is basically responsible, as an active agent of the educational process as well as the material acted upon, for the additional skills, understanding, knowledge of self and of others, ability to solve problems, to reason, to evaluate information—for all that he takes with him as "output."

Page 11)

So far, then, as general education is concerned, the major question becomes whether individual choices are to be made among a wide variety of course offerings, with the student left to his own devices in integrating what he learns and relating it to a "model of the world" as best he can, or whether individual choices are to be made among a variety of possible emphases within a very small number of broadly conceived multi-disciplinary courses designed to realize the integrative, overview function of general education.

(Page 13)

[Since] a trained capacity to continue the learning process throughout life and to participate constructively in the process of change may be the main social value in providing opportunities for general education . . . . individualized instruction may have to involve more than tuning instructional resources to individual needs and capacities. It may mean remedying weaknesses in styles of learning as well as building on strengths.

(Page 14)

Televised instruction has been tested for effectiveness in a teacher-centred institutional context. The potential of such material developed in an integrated way within a student-centred instructional process has not been tested. The important thing to note is that, when a systems approach to curriculum development is tested, it will not be television or any other technology which is on trial. It will be the systems concept itself.

(Page 19)

A much more systematic approach to the problem of curriculum and course development is required. Objectives must be defined, all possible

methods must be canvassed and evaluated, including solitary study in the library as well as applications of technology, and then courses must be designed and evaluated every step of the way.

(Page 29)

Most universities are a long way from looking at the instructional process comprehensively as a system in which resources can be deployed in a variety of ways to achieve objectives. Even where attempts have been made to develop multi-disciplinary courses no systematic assessment of resources has been made . . . Attempts to use instructional media effectively when time allowed for basic course planning is inadequate are bound to fail and consolidate negative reaction to their further development.

(Page 36)

There are no technological barriers to the mass production of instructional materials if instructors in individual institutions are willing to pay for them and use them. The price depends on the extent of the use.

(Page 37)

It is assumed that the demand for general degree work will continue to expand on a scale sufficient to make a look at new patterns of instruction for that degree worthwhile. At the same time it is taken for granted that existing institutions are well equipped to meet the total conceivable demand for honours work and other specialized programs and that in most cases existing universities will be able to continue general degree programs as well.

(Page 41)

The first question to be considered in conclusion is whether any action can be taken to make more effective the use of television in the member institutions of the Committee of Presidents of Universities of Ontario. For reasons already discussed, it is apparent that the further development of television and other audio-visual facilities depends on the way in which each institution orders its instructional process. It would be fruitless and counter-productive to set down rules. Much change is already taking place. Further change will occur. But it is not the purpose of this report to suggest that all change should be in one direction or should occur at the same pace. We have steadily viewed diversity within our universities in Ontario as a strength, not a weakness. That premise is not challenged here.

Furthermore, it must be stressed that concern for good teaching can exist quite independently of concern about the effective use of technology in the

instructional process. It is freely granted that there are a great many professors in our universities who take a fully professional attitude towards their teaching responsibilities in the sense that they feel as much responsibility towards students as towards their disciplines and their peers. Yet, as we pointed out in the opening chapter of this study, any discussion of educational technology must deal with the systematization of the educational process and professionalism on the part of faculty of a new and different kind—a professionalism implying collaborative and collective relationships among faculty and allocation of alternative instructional resources (including technology of various kinds) on the basis of careful evaluation of cost and effectiveness in relation to well-defined objectives.

This new kind of professionalism, even when accepted as a desirable goal, will not be achieved quickly. And, assuming that a particular university or department within a university wished to move towards a systematic approach, it would have to look beyond the boundaries of Ontario to find experienced advice and assistance. Ideally, each university should have its own curriculum consultant of the sort discussed earlier. Yet, such persons are in short supply everywhere. They are a new breed, and so far, a rare one. The only realistic course is to develop our own people. This will have the advantage of providing persons already familiar with the ethos of higher education in Ontario. In other words, just as seven years ago the Province and the universities, through the Graduate Fellowship program, took steps to produce a greater number of university teachers, so now on a much smaller scale we will have to produce our own experts in the instructional process.

In Great Britain, following the report of its Committee on Audio-Visual Aids in Higher Scientific Education, 1965 (The Brynmor-Jones report), the University Grants Committee provided special funds in support of a number of specialized "high activity centres" which would give special emphasis to the development of particular aspects of educational technology in selected British universities. It was hoped that experience would be gained and evaluative research done which would then be widely shared among universities. While the balance-sheet on this decision is not yet in, it seems clear that the centres produced less in the way of widely sharable results than was hoped. It has been suggested that in Ontario we require a Centre for Educational Technology to conduct research and make results available to all the universities. This is a useful idea but does not go far enough in present circumstances.

If one point has emerged from this report it is simply this:

educational technology (in the sense of various kinds of hardware applied to the production and delivery of instructional materials) has not been fully and effectively used in universities (or anywhere else in the educa-

tional system for that matter) because it has been kept in a compartment and considered separately from other resources which must or can contribute to the instructional process—the teacher, the student, the library, the laboratory—and the methods by which these resources are mixed and deployed. It follows then that, if this situation is to change, educational technology must be brought fully into the process of allocating resources of all kinds to meet specific objectives in specific ways.

This aim will not be furthered by the creation of any new body which deals separately with the technology and its applications. It is therefore recommended

I

that the universities of Ontario establish a "Centre for Instructional Development" to assist the faculties of Ontario universities in improving the effectiveness of instructional processes in terms of objectives, content and methods.

The centre could combine several important functions. Perhaps most importantly, it would help to train instructional development consultants. In the first instance, this will probably mean providing the means whereby qualified academics can train themselves. The Centre could also provide consulting services to faculty in the universities and collaborate with discipline groups on a single or inter-university basis in approaching the problems of defining objectives, choosing the appropriate mix of resources to be used, evaluating results and so on. The Centre would also assist in setting up "professional improvement" courses for university faculty. It would be encouraged to publish the results of research into any and all of these problems. At least in its early years, it is to be hoped that the Centre would direct its total energies to the solution of practical problems. In the current jargon it should be "mission-oriented."

The outline of a proposed constitution for the Centre is found in Appendix D. This suggests possible approaches to matters of membership, organization, location, staffing, accommodation of graduate students, financing and support. The overall objective should be to make various kinds of membership available so as to achieve within two or three years a continuing and active association between each university and the Centre.

It is foreseen that the Centre for Instructional Development would have the means and the mandate to support initiatives on the part of any province-wide

discipline group which might be interested in the course-team approach to the development of instructional materials to be shared by the existing universities. Since it may take some time to bring the Centre into being, and since it is important that such initiatives be encouraged in the meantime, it is recommended

II

that the Committee on University Affairs and the Committee of Presidents of Universities of Ontario authorize the Steering Committee for the CPUO/CUA Study of Educational Technology to provide interim support for any inter-university discipline group wishing to explore the course-team approach. Once a fully documented proposal for cost-effective production of common materials has been produced, further support for actual production should be provided through special funding.

This funding should be regarded as risk investment to be recovered in large part from universities using the materials on an equitable basis related to the potential savings projected in the original proposal. While some small non-recoverable investment would be justified for such projects, they should be judged primarily for their cost-effectiveness in relation to existing universities. They would, however, offer other benefits as well. The experience gained by members of single-discipline, inter-university course teams would be valuable if it were eventually decided to proceed with the establishment of a new institution as recommended for study below. It is to be expected, moreover, that some instructional materials developed for single-discipline courses could be adapted to the purposes of multi-disciplinary courses proposed for the new institution.

In view of the further large increases in undergraduate enrolment implicit in projections from various sources now under study, and in view of the probable need to establish institutional facilities in addition to those contemplated in the plans of existing universities, it is recommended

III

that the Committee on University Affairs and the Committee of Presidents of Universities of Ontario establish jointly an appropriately constituted planning committee to consider alternative ways of providing high-quality general degree programs on a level comparable with those now offered in the universities for the expected numbers of additional students, and in

particular, to examine fully and in detail the feasibility of developing an institution in Ontario on the lines suggested in Chapter 5, pages 42 to 49, of this report.

In the last decade there have been large increases in the so-called rate of participation in higher education in Ontario—that is to say, the proportion of the relevant age group attending a university. It is possible indeed to conclude, as some persons have done, that higher education has been oversold. This may be true. But, if so, it is mainly true only for the middle- and upper-income groups. Higher education has been undersold or not sold successfully in the lower-income sectors of the population. In view of the substantial evidence then that adequate representation of all socio-economic groups in the society is not yet in sight, it is recommended

IV

that the universities of Ontario, through the Ontario Universities' Television Council and/or the Channel 19 Committee or other appropriate body, actively seek collaboration with educational authorities at all levels and with public and commercial as well as educational broadcasting authorities to devise effective and systematic ways of exploiting radio and television to communicate as widely as possible, and to all age groups, an understanding of what higher education is, what it offers, and that it is a realistic goal for talented young people whatever their family or economic circumstances.

During the past year, the Ontario Universities' Television Council has considered broadening its mandate to offer advice and assistance on all types of audio-visual aid to higher education and changing its name to the Council for Educational Communications. If, however, a Centre for Instructional Development is established on the lines recommended above, it would be redundant to have a second body responsible for offering advice and assistance on teaching methods to the universities. Moreover, it is to be hoped that the AUCC Learning-Media Office will perform many of the clearinghouse functions formerly covered by OUTC. There will, however, be a continuing need for an association of those responsible for television and other technological resources in the universities and a mechanism through which the Committee of Presidents can relate to the Ontario Educational Communications Authority and through

which regional subcommittees can be organized as the need arises if and when further UHF channels are made available for educational purposes. It will also be necessary to have an inter-university body to facilitate the technical aspects of exchange of course material between universities and the distribution of video and audio materials that may be developed in connection with shared course-team projects of the sort contemplated in Recommendations I and II. It is therefore recommended

V

that the Ontario Universities' Television Council be reconstituted with terms of reference as follows:

(a) To facilitate the exchange of electronically and photographically produced instructional materials among the universities of Ontario by providing technical advice and assistance as requested by academic discipline groups and approved by the Committee of Presidents of Universities of Ontario;

(b) To advise and assist CPUO on all matters pertaining to the relationships of the universities of Ontario with the Ontario Educational Communications Authority and/or any regional authorities which it may establish;

(c) to advise CPUO at its discretion on any matter relating to the technical capacity of electronic delivery systems within and among the universities of Ontario;

(d) to maintain liaison between CPUO and the AUCC Learning-Media Office.

In the reconstituted Council, each university should be represented by the senior administrator directly responsible for maintaining television and film services at his university. Up to fourteen additional members should be selected by the Committee of Presidents from the academic and technical personnel of the universities on the basis of special experience and knowledge. The Council should be permitted to co-opt further members on a short-term basis if special assistance is required in connection with a particular project.

It has been suggested in the body of the report that universities will wish to do their own studies of cost-effectiveness as they decide whether to expand further the television facilities now in place. A simple method of assessing costs to assist in decision-making is provided in Appendix E. It has also been suggested that alternatives to television such as audio-tape/slide production, and audio tape alone have not been exploited to the extent possible. No

recommendations on these matters are entered here, nor on the organization of audio-visual facilities within single institutions. Needs and circumstances vary and will affect local decision, although there appears to be a *prima facie* case for the economy and flexibility which can be achieved by centralized administration of these facilities within each institution.

While the terms of reference of the Study of Educational Technology make specific mention of computer-assisted instruction (CAI), there was agreement, as noted in the Foreword, that no attempt should be made to deal with it comprehensively at this time. Computer-assisted instruction, computer-managed instruction, computer-based instruction are all concepts involving the use of computer technology in the instructional process. While most universities are now teaching students how to use the computer as a tool for storing and manipulating information, very few attempts have been made as yet to do more than demonstrate that the computer can be used successfully to teach limited modules of instructional material. Such experiments are inevitably expensive, and it is a fair guess that large-scale instructional uses of the computer for subjects other than computer and information science and mathematics are several years in the future. It is nevertheless important to the integrated instructional development process emphasized in this report that CAI and other forms of computer application be fully considered with other resources with a view to their ultimate availability in cost-competitive form. In the meantime, of course, administrative applications of the computer are absolutely essential to the effective operation of the province-wide institution recommended above for further study. Moreover, extensive use of the computer in the evaluative process may well develop before direct instructional applications become economic. The Information Science Section of the National Research Council's Radio and Electrical Engineering Division has now entered "the second phase of a long-range program of research, development and evaluation in the field of computer-aided learning systems."[1] "The second phase of the program involving cooperative, evaluative work with a selected group of educators, now is in progress." W. C. Brown, Head of the Section, emphasizes that "plans include no work on curriculum content—that is strictly a matter for educational authorities. Likewise the evaluation of the system as it evolves will be under the direction of competent educators." The NRC program "will include the assessment and subsequent development where necessary of input and output equipment, information storage and retrieval methods and the systems programming required to make computer-aided learning systems effective at all educational levels." It is no doubt unnecessary to add that the computer will not provide a learning system in isolation from other resources for teaching and learning. Its potential as a tool for assisting students and faculty to manage other learning resources more

[1]"Second phase of research in computer-aided learning systems," in *Science Dimension* (National Research Council of Canada: April 1970).

effectively is possibly one of the most important applications to be kept in mind as the attempt is made to systematize and at the same time individualize the instructional process.

Finally, it must be pointed out that, although this report emphasizes television, some major questions respecting television have not been dealt with. There has been no discussion of copyright problems or of problems of access to film and video-tape material. Both of these matters are the subject of continuing study elsewhere. Copyright guidelines have been produced by the Ontario Universities' Television Council and are sufficient for immediate purposes. For a province-wide general degree institution of the kind suggested for study in recommendation III, it is assumed that materials resulting from the course-team approach will be the property of the institution paying the salary of the course-team members. This is the basic principle expressed in the terms and conditions for faculty of the Open University. This is modified slightly by provision for sharing part of the proceeds of sales of course materials to other institutions among members of the course team. There is no intention here to minimize the importance of copyright arrangements. They can have a profound effect on the cost-effective equation. But, if the developments outlined in this report are funded largely with public money or with grants provided by tax-exempt private foundations, the monetary value of preserved rights held by individuals can properly be minimized.

The problem of keeping track of film and tape material of potential use to educators is one that has not yet been solved. Many partial catalogues exist, but there is as yet nothing like a national or international union catalogue. Several projects are now under way or in the discussion stage in Canada and elsewhere. This is a large and important matter but still a marginal one in relation to fundamental questions about the instructional process which have been the focus of this report.

A final note. The overviewing perspective of this report has precluded any attempt to chronicle the many imaginative and successful applications of television and other technologies in the Ontario universities. In concentrating on an overall view of television in the universities and on possibilities for major development in the future it must be acknowledged that much has been and is being accomplished on individual campuses. Much useful experience has been gained, many lessons have been learned, and a solid foundation has been laid for the full and effective integration of television and other technology in the instructional process.

APPENDIX A

SUMMARY OF ANNUAL AVERAGE COST PER STUDENT FOR TWO MODELS OF A PROVINCE-WIDE GENERAL DEGREE PROGRAM

MODELS FOR A PROVINCE-WIDE GENERAL DEGREE PROGRAM

Enrolments

Model A

	First Year	Second Year	Third Year
Year I	12,000	—	—
Year II	12,000	10,000	—
Year III	12,000	10,000	8,000 (=30,000)

Model B

	First Year	Second Year	Third Year
Year I	10,000	—	—
Year II	10,000	8,000	—
Year III	10,000	8,000	6,000 (=24,000)

In both models, 4 courses will be offered in the first year,
14 courses in the second year,
21 courses in the third year, and thereafter.

These are totals for each year.

Average Annual Operating Cost Per Student*

	First Year	Second Year	Third Year	Fourth Year
Model A	$880	$1,111	$994	$816
Model B	$974	$1,266	$1,139	$916

More detailed summary tables follow.

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*For detailed breakdown of fixed and variable cost components see the following pages.

For total space required per student see Appendix B.

SUMMARY COST TABLE FOR MODEL A

		Year I (enrolment 12,000)	Year II (enrolment 22,000)	Year III (enrolment 30,000)	Year IV (enrolment 30,000)
Fixed Costs					
for factors used in calculations see below	total	4,512,000	12,336,000	14,004,000	9,726,000
	per student	376	561	467	32
Variable Costs					
for basis of calculation see below	total	3,944,000	7,223,100	9,860,000	9,860,000
	per student	328	328	328	328
*Overhead**	total	2,114,000	4,889,775	5,966,000	4,896,500
	per student	176	222	199	163
Total		10,570,000	24,448,875	29,830,000	24,482,500
	per student	880	1,111	994	816

*Overhead (Administration, Supplies and Maintenance, etc.)

It will be noted that three support staff have been budgeted for centrally based academic staff and that tutorial/secretarial/clerical assistance has been provided for study centre faculty on a scale of roughly $7,700 per year.

For convenience in these rough calculations 25% of the total fixed and variable instructional costs is added to provide for general administartion, fringe benefits on salaries, data processing, supplies travel and building maintenance.

SUMMARY COST TABLE FOR MODEL B

		Year I (enrolment 10,000)	Year II (enrolment 18,000)	Year III (enrolment 24,000	Year IV (enrolment 24,000)
Fixed costs					
calculated on same basis as for Model A. See below	total	4,512,000	12,336,000	14,004,000	9,726,000
	per student	451	685	583	405
Variable costs	total	3,280,000	5,904,000	7,872,000	7,872,000
	per student	328	328	328	328
Overhead	total	1,948,000	4,560,000	5,469,000	4,399,500
	per student	195	253	228	183
Total		9,740,000	22,800,000	27,345,000	21,997,500
	per student	974	1,266	1,139	916

The summary tables above show average per-student costs for Models A and B. Model A is illustrated in detail below. Fixed costs are common to both models. Variable costs depend on enrolments. Overheads are calculated as 25% of total fixed and variable costs. Figures shown for Model B have been based on the same assumptions as Model A.

FIXED COSTS

Cost of one course

The cost of developing one course is assumed to be $600,000 on the basis described below. This figure is used throughout. 25%, or $150,000, per year is charged throughout for updating each course annually.

(a) Course development		
9 full-time faculty @ $15,000 average	$135,000	
1/2 course-development consultant	10,000	
1/3 co-ordinator	8,000	
academic consulting fees	30,000	
	$183,000	
(b) Television production costs		
60 hours @ $6,000/hr.	360,000	
(c) Correspondence material	57,000	
Total cost of developing one course		$600,000

Year I

First Year

1. Course development costs		
Cost of developing 4 courses (each course is worth 2½ present credits: i.e., 6 courses constitute a general degree):		
$600,000 × 4 =	$2,400,000	
2. Coordinating professors (6 per course)		
6 × $16,000 × 4 =	384,000	
3. Support staff (3 per faculty: average salary $8,000)		
3 × 72 × 8,000 =	1,728,000	
Total fixed costs		$4,512,000

Year II

First Year

1. Cost of updating 4 courses (we assume 25% of the course must be updated each year):		
$2,400,000 × .25 =	$ 600,000	
2. Coordinating professors: 6 × $16,000 × 4 =	384,000	

Second Year

1. Cost of developing 10 courses: 600,000 × 10 =	6,000,000	
2. Coordinating professors: 10 × 6 (profs/course) × $16,000	960,000	
First and second years: subtotal	$7,944,000	
3. Support staff 3 × 183 × $8,000	4,392,000	
Total fixed costs		$12,336,000

Year III

First year

Same as year II	$ 984,000	

Second year

1. Cost of updating 10 courses (same assumption regarding % change): $6,000,000 × .25 =	$1,500,000	
2. Coordinating profs: 10 × 6 × $16,000 =	960,000	

Third year

1. Cost of developing 7 courses: $600,000 × 7 =	$4,200,000	
2. Coordinating profs: 7 × 6 × $16,000 =	672,000	
First, second and third years: subtotal	$8,316,000	
3. Support staff 237 × 3 × $8,000	5,688,000	
Total fixed costs		$14,004,000

Year IV

First year

Same as year II	$ 984,000	

Second year

Same as year III	$2,400,000	

Third year

1. Cost of updating 7 courses: .25 × $4,200,000 =	$1,050,000	
2. Coordinating profs: 7 × 6 × $16,000 =	672,000	
First, second, and third years: subtotal	$5,166,000	
Support staff: 190 × 3 × $8,000	4,560,000	
Total fixed costs		$9,726,000

VARIABLE COSTS

Instructional costs associated with study centres

These work out to $328 per student whatever the total enrolment. For assumptions see below.

Year I
(enrolment 12,000)

1. Replay of audio-visual materials

   (A rate of $13 per hour is used to cover all costs associated with various kinds of replay, including equipment on a rental basis.) Each student will view/listen 4 hours per week for 30 weeks. Assume viewing groups of 60. Then total cost is $\frac{4 \times 12{,}000 \times 30 \times 13}{60} =$ $312,000.

2. Faculty based at study centres

   Each professor-tutor would teach groups of 15 students for 10 hours per week, or 150 student classroom hours. Each student will attend two hours per week, one for each course. Then number of professors required is $\frac{2 \times 12{,}000}{150} = 160.$

   At average salary of $15,000, cost is $160 \times 15{,}000 =$ $2,400,000.

3. Marking and tutorial assistants (one per professor)

   Assume 675 hours per year at $4 per hour.
   Cost is $160 \times 675 \times 4 =$ $ 432,000

4. Support staff (one per prof.) @ average $5,000 $\times$ 160 = 800,000

   Total variable costs $3,944,000

Variable cost per student: $\frac{3{,}944{,}000}{12{,}000} = \$328.$

APPENDIX B

SPACE REQUIREMENTS FOR A PROVINCE-WIDE GENERAL DEGREE PROGRAM

The calculations of space needed are not meant to carry any implication as to how space is to be provided and whether or not it will be shared with other users. Requirements are for the third year of the program when fourteen courses would be updated and seven new courses would be added. Staff required is as follows:

CENTRALLY LOCATED SPACE*

			Net assignable sq. ft.
New courses 7×9	= 63 professors		
14 courses updated $\frac{14 \times 9}{4}$	= 31 professors		
Course consultants	= 10		
Coordinators	= 7		
Coordinating professors	=126		
Total central faculty	237 × 150 sq. ft.		35,550
Support staff 237×3	=711 × 120 sq. ft.		85,320
Reference library			10,000
Shops			10,000
Printing and storage			10,000
			150,870
		Plus 20%	30,174
			181,044

*Note: The matter of staffing course-development teams involves questions of detail more appropriately left to a feasibility study. It is assumed here, however, that many, if not all, centrally based professors would retain a connection with an existing university and that arrangements would be made for their use of research laboratory and library facilities at their own or other existing universities. No provision is made for separate research space in these calculations.

It is also assumed that existing television production facilities will be used on a rental basis. Whether this proves feasible or not does not affect estimates substantially since the production costs estimated in Appendix A include rental charges for studio space and equipment.

LOCALLY BASED FACULTY, ADMINISTRATIVE AND STUDENT SPACE
for enrolment of 30,000

		Net assignable square feet	
Professor	400 × 150	60,000	
Assistants	400 × 100	40,000	
Support staff	400 × 100	40,000	
		140,000	
	Plus 20%	28,000	
Total local faculty and administration			168,000
Study space for each student 30,000× 15		450,000	
20 local reference libraries* 20 × 4,500		90,000	
Kitchen lab (assume one station for six students 30 sq. ft./station) $\frac{30,000}{6} \times 30$		150,000	
Viewing space (assume section of 60, four hours per week, assume each room scheduled 20 hrs./wk.) No. of rooms derived as follows: $\frac{30,000 \times 4}{60 \times 20} = 100$			
Space required 100 × 60 × 15		90,000	
Seminar rooms (assume section of 15, two hours per week, each room scheduled 20 hrs./wk.)† No. of rooms derived as follows: $\frac{30,000 \times 2}{15 \times 20} = 200$			
Space required 200 × 15 × 15		45,000	
Lounge and dining space for each student 30,000 × 7		210,000	
Total student space			1,035,000
Total local space			1,203,000
Centrally located space			181,044
			1,384,044
Total for institution of 30,000: $\frac{1,384,044}{30,000}$ = 46 NASF per student place			

*As noted in the text on page 47 there has been no attempt to establish here the minimum enrolment required to achieve appropriate economies of scale in each study centre. The figure 20 is used arbitrarily as a probable minimum number of such centres. If a large number of small study centres were established library space requirements would be slightly greater per student.

†The arithmetic involved in these calculations is not intended to prejudge the type of space required. Needless to say, spaces should be planned systematically to serve the purposes of instructional methods and materials selected. Kenneth Austwick offers an approach to such planning in "Spaces for learning and teaching" in *Media and Methods*, ed. D. Unwin (see bibliographic note).

STUDY CENTRE SPACE

LOCALLY BASED FACULTY, ADMINISTRATIVE AND STUDENT SPACE
for enrolment of 24,000

Professor	320×150	48,000	
Assistants	320×100	32,000	
Support staff	320×100	32,000	
		112,000	
	Plus 20%	22,400	
Total local faculty and administration			134,400
Study space for each student $24,000 \times 15$		360,000	
20 local reference libraries $20 \times 4,000$*		80,000	
Kitchen lab $\frac{24,000}{6} \times 30$		120,000	
Viewing space (see calculation for 30,000)			
No. of rooms: $\frac{24,000 \times 4}{60 \times 20} = 80$			
Space required $80 \times 60 \times 15$		72,000	
Seminar rooms (see calculation for 30,000)			
No. of rooms: $\frac{24,000 \times 2}{15 \times 20} = 160$			
Space required $160 \times 15 \times 15$		36,000	
Lounge and dining space for each student $24,000 \times 7$		168,000	
Total student space			836,000
Total local space			970,400
Centrally located space			181,044
			1,151,444

Total for institution of 24,000: $\frac{1,151,444}{24,000} = 48$ NASF per student place

*As noted above.

APPENDIX C

A MODEL FOR ASSESSING THE RELATIVE COSTS OF LARGE-SCALE TELEVISION USE IN CONVENTIONAL UNIVERSITIES OF VARIOUS SIZES

by James Schram

(As explained in Chapter 5 of the text, this model will be developed further and refined as part of a master's thesis by James Schram. Only a few sample calculations are shown here. These are sufficient to demonstrate in a general way, however, that even large applications of television in sizable universities will be cost-effective in inverse proportion to the class-size assumed for sections of conventional lecture courses. If the class-size is assumed to be 60, the costs of using television will equal those of conventional instruction. If the assumed section size is as low as 35, as the model shows on page 73, a net saving of as much as $535,000 would be possible for an institution of 6,000 students and given the other factors as shown. Since, however, the model deals only with first-year courses, an average section size of 35 is not realistic for most situations. Whatever the postulated class-size for conventional instruction, any net savings depend on the further assumption mentioned in the text that average television production costs are held at a very modest level, i.e. about $300 per hour. Compare this with the per-hour cost of $6,000 assumed for the general degree institution outlined in Appendix A.)

KEY TO VARIABLE IDENTIFICATION AND FIGURES FOR THE MODEL

Abbreviaton	Explanation	Case I	Case II	Case III
x	total university faculty	100	200	400
s	total courses offered in first year	28	43	60
f	total student courses* taught by T.V.	2,597	5,390	14,700
P	cost per hr. of production	$330	$330	$330
H	number of production hours	700	1,100	1,500
R	number of courses in first year which were T.V. taught	14	22	30
C_t†	courses taught per professor when teaching is on T.V.	1.5	1.5	1.5
C	courses taught per professor—under normal circumstances	3	3	3
S	salary for professor	$15,000	$15,000	$15,000
N	number of hours worked by each graduate student	200	200	200
M	hourly wage per research student	$4.00	$4.00	$4.00
Y	weeks in the school year	25	25	25
G	number of graduate students needed for research	9	15	20
A	cost per hour of replay	13	13	13

Notes: *One student course is 1 student taking 1 course.

†Course load estimate is valid for cases I and II but doubtful for III. The same figure has been used across the board for simplicity. The important assumption is that the normal load for conventional teaching will be cut in half for professors giving television courses.

B	average number of sections per T.V. taught course	5.3	7	11
L	lecture hours per course per week	2	2	2
F_1	number of students per tutor if T.V. is used for lectures	120	120	120
T	tutor's salary	$7,000	$7,000	$7,000
a	student/faculty ratio	1:15	1:15	1:15
J	number of first-year courses taken per first-year student	5	5	5
D	number of first-year courses taken per second-year student	2	2	2
Q	average class size	35	35	35
W	total enrolment of the university	1,500	3,000	6,000
F	number of students per tutor if lecture is live	180	180	180
b	total sections of first-year courses	99	198	396
q	average number of sections in courses not taught by T.V.	1.75	1.75	1.75
0	departmental overhead (calculated as a % on total professor salaries)	10	10	10

It has been possible to build a model so that it could be determined whether the introduction of television as a substitute for the lecturer would be a cost saving. The equation representing this model is given below:

$$\left[PH + \frac{R}{C_1}(S) + 0\left(\frac{RS}{C_1}\right) + NMG + ABRLY + \frac{f}{F_1}(T)\right] - \left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] = ?$$

The first set of terms in the square brackets indicates the cost of presenting lectures via television and the terms in the second set indicate the costs of presenting the lectures "live" or in the traditional method. If the equation is set equal to zero, all the variables but one can be numerically fixed. It is then possible to solve for the one undetermined variable. This would indicate what number of sections, for example, would be required before television and traditional instruction would cost the same.

The terms represent the following:

PH—television production cost

$\frac{R}{C_1}(S)$—cost of the instructors who give the television lectures

$0\left(\frac{RS}{C_1}\right)$—overhead incurred because of professors (secretaries, supplies, etc.)

NMG—research help for the professors appearing on T.V.

ABRLY—replay costs

$\frac{f}{F_1}(T)$—tutorial costs under television

$\frac{BR}{C}(S)$—cost of professors required to teach the same number of sections as was taught on T.V.

$\frac{f}{F}(T)$—tutorial costs under traditional instruction

$0\left(\frac{BRS}{C}\right)$—overhead (professors)

Most of the variables in the equation can be determined directly from empirical observation, e.g. professor's salary. However, it may be easier when dealing with the university at the macro level to determine some of the variables (B and f) using more basic and more easily acquired data. To determine these variables, it was decided that it would be best to determine them in small equations before applying the overall equation. This avoids confusion in the overall equation. Making assumptions about the number of students taking first-year courses, it is possible to determine the number of sections in first-year courses from total enrolment and average class-size. There are two basic steps in this exercise. This equation

$$(1) \qquad b = \frac{(\alpha W)J + \phi(\alpha W)D}{Q}$$

determines the total number of sections of first-year courses, using total numbers of students involved in the various first-year courses and dividing that by average class size.

It is necessary to estimate the number of courses in first year. After some empirical observations it was determined that the number of courses offered at the 1,500 enrolment level was 1.9% of enrolment; at the 3,000 level, 1.45%; and at the 6,000 level, 1% of enrolment. These figures were determined this way for the theoretical model. The university planner would have this quantity dictated to him.

The second step is to determine the number of sections per course in T.V. taught first-year courses. It is assumed that 50% of the first-year courses are not suitable for T.V. teaching, being language courses, or having too few students to make television worthwhile. The average number of sections in these courses is set at 1.75. The remainder of the sections calculated in (1) above must be distributed among the remaining 50% of the courses. The equation is

$$(2) \quad B = \frac{b-(q(s-R))}{R}$$

"f" is the last variable to be determined:

$$(3) \quad f = QRB$$

Determination of T.V. Saving for University with Enrolment of 1,500

Case I

$$(1) \quad b = \frac{(\alpha W)J+\phi(\alpha W)D}{Q}$$

$$b = \frac{(.35)(1,500)(5)+.8(.35)(1,500)(2)}{35}$$

$$b = 99$$

$$(2) \quad B = \frac{b-(q(s-R))}{R}$$

$$B = \frac{99-(1.75(28-14))}{14}$$

$$B = \frac{74.5}{14}$$

$$B = 5.3$$

(3) $f = QRB$

$f = 35(14)(5.3)$

$f = 2{,}597$

Main equation:

$$\left[PH + \frac{R}{C_1}(S) + 0\left(\frac{RS}{C_1}\right) + NMG + ABRLY + \frac{f}{F_1}(T)\right] - \left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] =$$

[231,000 + 140,000 + 14,000 + 7,200 + 48,230 + 151,491] − [375,000 + 37,500 + 101,500] = $77,921.

Conclusion:

Television is more expensive by $77,921.

Determination of T.V. Saving for University with Enrolment of 3,000

Case II

(1) $b = \frac{(\alpha W)J + \phi(\alpha W)D}{Q}$

$b = \frac{(.35)(3{,}000)(5) + (.8)(.35)(3{,}000)(2)}{35}$

$b = 198$

(2) $B = \frac{198 - (1.75(43 - 22))}{22}$

$B = 7$

(3) $f = QRB$

$f = 35(22)(7)$

$f = 5{,}390$

$$\left[PH + \frac{R}{C_1}(S) + 0\left(\frac{RS}{C_1}\right) + NMG + ABRLY + \frac{f}{F_1}(T)\right] - \left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] =$$

$$[363{,}000 + 217{,}500 + 21{,}750 + 12{,}000 + 100{,}100 + 315{,}000] -$$

$$[770{,}000 + 77{,}000 + 210{,}000] = \$-27{,}650$$

Conclusion: Traditional lecture methods are more costly by $27,650.

Determination of T.V. Saving for University with Enrolment of 6,000

Case III

(1) $b = \dfrac{(\alpha W)J + \phi(\alpha W)(D)}{Q}$

$b = \dfrac{(.35)(6{,}000)(5) + .8(.35)(6{,}000)(2)}{35}$

$b = 396$

(2) $B = \dfrac{b - (q\ (s - R))}{R}$

$B = \dfrac{396 - (1.75(60 - 30))}{30}$

$B = 11$

(3) $f = QRB$

$f = 35(30)(11)$

$f = 11{,}550$

$$\left[PH + \frac{R}{C_1}(S) + 0\left(\frac{RS}{C_1}\right) + NMG + ABRLY + \frac{\cdot}{F_1}(T)\right] -$$

$$\left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] =$$

$$[495{,}000 + 300{,}000 + 30{,}000 + 16{,}000 + 214{,}500 + 673{,}750] -$$

$$[1{,}650{,}000 + 165{,}000 + 449{,}167] = \$-534{,}917$$

Conclusion: Traditional lecture methods are more expensive by $534,917.

The important variable in the above equations is average class size. This determines the number of sections necessary. The larger the number of sections to be taught, the greater the number of professors saved. This is where the real television saving lies. To show how important average class size is, the above models were re-worked using an average class size of 70 rather than 35. It can be seen that in none of the three models is television a cost saving under this new class size.

Note: The equation was set up so that television costs — traditional lecture costs = balance.

If the balance is positive, television is more costly than traditional lecture methods and vice-versa (see page 74).

	Balance	
	Class size of 35	Class size of 70
Case I (1,500)	+ 77,921	+411,200
Case II (3,000)	− 27,650	+369,650
Case III (6,000)	−534,917	+320,000

Conclusion: The equation set is as follows:

Steps

(1) $b = \frac{(\alpha W)J + \phi(\alpha W)D}{Q}$

(2) $B = \frac{b - (q(s - R))}{R}$

(3) $f = QRB$

(4) $\left[PH + \frac{R}{C_1}(S) + 0\left(\frac{RS}{C_1}\right) + NMG + ABRLY + \frac{f}{F_1}(T)\right] -$

$$\left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] = 0 \text{ or } ?$$

This system may be used in one of two ways:

(1) As has been shown in the three example cases, all variables may be given values, and the net loss or saving from a T.V. installation determined.

(2) One variable may be designated as dependent. Values are given to the independent variables and the equation set equal to zero. It is then possible to compute the value for the dependent unknown. The resulting value determines the level of that variable necessary to make television and traditional instruction equal in cost.

APPENDIX D

DRAFT PROPOSAL FOR A CENTRE FOR INSTRUCTIONAL DEVELOPMENT IN HIGHER EDUCATION

I. Purpose

The main purpose of the proposed centre is to assist the faculties of Ontario universities in improving the effectiveness of instructional processes in terms of objectives, content and methods.

II. Functions

(a) to engage in independent research into all aspects of the instructional process in universities, including problems of defining objectives, deciding the mix of instructional resources to be used, evaluating results, curriculum development, training of university teaching staff, etc.;

(b) to collaborate in these activities with teaching faculty in individual universities, in inter-university discipline groups, in inter-discipline groups in a single university or in a group of universities;

(c) to provide consulting services to faculty at all universities in Ontario;

(d) to train appropriately qualified persons as instructional development consultants,

(e) to provide research opportunities for graduate degree candidates at any university in Ontario;

(f) to offer "professional improvement" courses to university faculty and/or assist individual universities or discipline groups in arranging such courses;

(g) to publish research findings and other papers which will assist the purposes of the Centre.

III. Membership

(a) Full Membership—conditions

i. an academic appointment in a university in Ontario;

ii. active engagement in systematic and scholarly study of the instructional process at the university level or a particular aspect thereof;

iii. secondment on at least a half-time basis to the purposes of the Centre.

(b) Associate Membership—conditions
as for full membership except that work for the Centre may be less than half time.

(c) Visiting Membership

i. an academic appointment at a university in Ontario or elsewhere;

ii. secondment to the Centre on a full-time basis for not less than three months.

(d) Other kinds of membership or association may be defined from time to time by by-law of the Council of the Centre.

IV. Organization and Liaison

(a) The Centre will be administered by a Director and a Council representative of the Provincially Assisted Universities of Ontario under an appropriate constitution.

(b) The Council will be empowered to recommend on behalf of the Centre to appropriate authorities formal actions necessary to further the purposes of the Centre.

V. Students and Courses

(a) As proposed in function (e) above, the Centre will assist in training of graduate degree candidates in approved programs offered by a graduate school at an Ontario university. The supervisor of the candidate need not be a qualified member of the Centre at the candidate's university. The most probable discipline or interdisciplinary areas in which graduate research might be assisted by the Centre are psychology, economics, sociology, communications theory, history, information science, systems analysis—although this is by no means an exhaustive list.

(b) As proposed in function (f) above, the Centre would be involved in arranging professional improvement courses for university faculty members. These would normally be non-credit courses of varying length—from six weeks to one day. Universities would presumably work out individual arrangements to facilitate attendance by interested members of faculty.

(c) The Centre itself would not offer any degree or diploma.

VI. Staffing

(a) It is suggested that to launch such a Centre will require the appointment of a Director and at least two other full members (as defined, these are persons devoting at least a half-time to the Centre). At least the Director and one of the full members should be resident at the location of the Centre. One of the full members might be resident elsewhere.

(b) Support staff might initially be limited to a secretary and a research assistant.

(c) The objective should be, within three years, to have a full-time equivalent staffing of six or seven full members with fifteen or twenty associate members. Assuming that the Director and two others were giving full time to the Centre, there might be as many as eight half-time full members. There would be at least one full member and one associate member on each larger university campus and at least one associate member on each smaller campus.

VII. Physical Requirements

The Centre should be located centrally in the Province for liaison with the Ontario Institute for Studies in Education,* with easy access to a number of different types of university situations. The Centre would require office space of its own and access to audio-visual facilities, etc.

VIII. Financing and Support

(a) It is suggested that in the formative stage the universities of Ontario fund the direct expenses of the Centre through CPUO. These expenses are estimated at $80,000 for the first year and would cover the salary of the Director and the

*The suggestion in Section VII that liaison with the Ontario Institute for Studies in Education should be convenient implies that the Centre would be set up as a separate organization, albeit a modest one. This is not meant to rule out the possibility of establishing the Centre as an integral part of OISE. On the whole, however, it is the judgment here that the Centre would be able to respond more directly to the specific needs of the universities if it were created by them and were directly responsible to them.

equivalent of one full-time full member, plus support staff, office expenses and travel. It is assumed that associate members and full members at other universities would continue to receive full salary from their institutions.

(b) It would be one of the tasks of the Director to seek private foundation and government support for particular research projects and/or activities furthering the aims of the Centre.

(c) It would be expected that professional improvement courses would be financed by fees or by contributions from participating institutions. Pilot projects might be funded by special government grant.

(d) The Centre would be empowered to negotiate satisfactory financing arrangements with each graduate school for graduate students using Centre facilities.

(e) Consulting services would, for at least the first year, be without charge except for the travelling expenses of the consulting Centre member.

APPENDIX E

A SIMPLE METHOD OF ASSESSING TELEVISION COSTS AND USE IN A SINGLE INSTITUTION

Universities wishing to follow the suggestion made in the text of this report, in Chapter 6, that the cost-effectiveness of existing television facilities should be studied before further investment is made will easily devise methods of assessment appropriate to their circumstances. The procedure shown here is intended only as an example and demonstrates that sophisticated and expensive cost-accounting procedures are not required to relate activities to costs with sufficient accuracy for planning purposes.

In this example, only three basic types of activity are separated: playback, classroom origination and studio origination. In other cases, a further breakdown will be required, depending on patterns of use. The object of the exercise is to provide deans and department heads with two pieces of information:

(a) what relative use various groups within the university are making of the television facility, and

(b) the approximate dollar value of the services consumed by each user.

This information is useful, whether or not a decision is made to charge users for services. (In some cases, of course, users are already charged, and the pattern of use and cost is therefore already clear.)

A SIMPLE METHOD OF ASSESSING TELEVISION COSTS AND USE IN A SINGLE INSTITUTION*

Total operating costs of television service	$64,870
Subtract replay costs of $7 per hour × 865 hours	6,055
Net amount attributable to production costs	$58,815

Assumptions: service operates for 48 weeks for a 5-day week and a 7-hour day

Potential production hours $48 \times 5 \times 7 = 1{,}680$ hours

Cost of facility $\frac{58{,}345}{1{,}680} = \$35$ per hour

Facilities are used for two purposes:

(a) Classroom origination—average takes one-hour set-up, one-hour program and one-hour take-down; i.e. 3 hours @ 35 = $105.

No. of classroom originations: 259 total cost (259 × 105)	$27,195
Remainder attributable to studio production ($58,815 − 27,195)	$31,620

*N.B. These rates are close to one actual situation in 1969–70. They would be unrealistically low for current or future years.

(b) Studio production

To establish cost of studio production for one hour of material:

Add actual number of hours of material produced	77
plus	
Estimate additional unused capacity in slack periods (e.g. May/June)	47
Total studio production	124

To establish cost of producing one hour of material in studio:

$$\frac{\$31,620}{124} = \$255$$

Actual no. of hours of material produced	(77×$255)	$19,635
Additional capacity not now used in May/June	(47×$255)	11,985
Total production costs		$58,815

Using the basic rates established above, a year's activities might be summarized as follows:

Department	Hours × Rate ($)	Cost ($)	Total ($)
A	400 × 7	= 2,800	28,675
	125 × 105	= 13,125	
	50 × 255	= 12,750	
B	75 × 7	= 525	4,350
	15 × 255	= 3,825	
C	130 × 7	= 910	6,610
	30 × 105	= 3,150	
	10 × 255	= 2,550	
D	110 × 7	= 770	4,955
	35 × 105	= 3,675	
	2 × 255	= 510	
E	20 × 7	= 140	1,190
	10 × 105	= 1,050	
F	18 × 7	= 126	126
G	35 × 7	= 245	1,715
	14 × 105	= 1,470	
H	50 × 7	= 350	4,025
	35 × 105	= 3,675	

I	27 × 7	= 189	
	10 × 105	= 1,050	1,239
Unused*	47 × 255	= 11,985	11,985
			$64,870

*It should be noted that unused capacity results when faculty are not prepared to produce tape material in May/June or other slack months. At the same time a system may be overextended in the winter months. Spreading the production load on a year-round basis can result in substantially improved cost/use ratios.

It should also be noted that these figures do not include major equipment costs. To get a realistic total picture it is necessary either to pro-rate actual expenditures for the year in question against each department on the basis of share of operating costs—or to pro-rate a percentage (20% is suggested) of the total value of equipment. (See page 28 of the text.)

APPENDIX F

MODEL—EXAMPLE OF A UNIVERSITY DEPARTMENT USING ACTUAL FIGURES

(for key to symbols, see Appendix C)

(a) Production cost: PH \$290 × 196 = \$56,840

The figure \$290 represents the average cost per hour including an equipment rental charge on the basis outlined on page 28 of the text.

(b) Salaries of instructors giving lectures: $\frac{R}{C_1}(S) = \frac{4}{1}(\$19{,}000) = \$76{,}000$

(c) Overhead: $0\left(\frac{RS}{C_1}\right) = .10\,(76{,}000) = \$7{,}600$

(d) Research help for profs appearing on T.V.: NMG = \$450

(e) Replay costs: ABRLY = \$6,110

(f) Tutorial and lab demonstration costs when using T.V.: $\frac{f}{F_1}(T) = \$37{,}208$

(g) Costs of professors required to teach the same number of sections as was taught by T.V.: $\frac{BR}{C}(S) = \frac{13.5}{2.3}(\$19{,}000) = \$110{,}200$

(h) Overhead: $0\left(\frac{BRS}{C}\right) = .10\,(110{,}200) = \$11{,}020$

(i) Tutorial and lab costs without T.V. were reported to be the same: \$37,208

Other characteristics of the model:

average class size: Q = 103

student/faculty ratio: 1:15

Equation:

$$\left[PH + \frac{R}{C_1}(S) + 0\left(\frac{RS}{C_1}\right) + NMG + ABRLY + \frac{f}{F_1}(T)\right] - \left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] =$$

$$[\$56{,}840 + \$76{,}000 + \$7{,}600 + \$450 + \$6{,}110 + \$37{,}208] - [\$110{,}200 + \$11{,}020 + \$37{,}208] = \$25{,}780.$$

Television thus appears to be \$25,780, or 16%, more expensive than traditional lecture methods.

If, instead of teaching one course on television, a professor taught as many courses on T.V. as he would under normal circumstances, there would be a saving of m . e than two professors or about \$40,000 to offset the cost of television and produce a net saving of about \$15,000. It is not realistic, however, to assume as great a teaching load for the television professor since extra preparation is required in the interests of quality and there must be an incentive to make this extra effort. Another way of looking at the figures is that television teaching in effect buys some extra time for the professors involved. This extra time is the incentive and costs, in this particular case, about \$6,500 for each.

SAME EXAMPLE USING OTHER AVERAGE SALARY AND COURSE-LOAD FACTORS

As noted in the text, the net additional cost of using television is sensitive to salary and course-load factors. To illustrate this point the activities of the example department are costed below holding all figures constant except that average salary is assumed to be $15,000 instead of $19,000 and average course load 2.5 instead of 2.3. With these changes television becomes considerably more costly relative to conventional instruction.

(a) Production cost: PH $290 × 196 = $56,840

(b) Salaries of instructors giving lectures: $\frac{R}{C_1}(S) = \frac{4}{1}(15{,}000) = \$60{,}000$

(c) Overhead: $0\left(\frac{RS}{C_1}\right) = .10 \times 60{,}000 = \$6{,}000$

(d) Research help for profs appearing on T.V.: NMG = $450

(e) Replay costs: ABRLY = $6,110

(f) Tutorial and lab demonstration costs when using T.V.: $\frac{f}{F_1}(T) = \$37{,}208$

(g) Costs of professors required to teach the same number of sections as was taught by T.V.: $\frac{BR}{C}(S) = \frac{13.5}{2.5}(15{,}000) = \$81{,}000$

(h) Overhead: $0\left(\frac{BRS}{C}\right) = .10(81{,}000) = \$8{,}100$

(i) Tutorial and lab costs without T.V. were reported to be the same: $37,208

Other characteristics of the model

average class size: Q = 103

student faculty ratio: 1:15

Equation:

$$\left[PH + \frac{R}{C_1}(S) + 0\left[\frac{RS}{C_1}\right] + NMG + ABRLY + \frac{f}{F_1}(T)\right] - \left[\frac{BR}{C}(S) + 0\left(\frac{BRS}{C}\right) + \frac{f}{F}(T)\right] =$$

$$[\$56{,}840 + \$60{,}000 + \$6{,}000 + \$450 + \$6{,}110 + \$37{,}208] - [\$81{,}000 + \$8{,}100 + \$37{,}208] = \$40{,}300$$

Television thus appears to be $40,300, or 32%, more expensive than traditional lecture methods.

BIBLIOGRAPHIC NOTE

Acknowledgement has been made in the body of this report, especially in Chapter 2, of its dependence on the work of Norman MacKenzie, Michael Eraut and Hywel C. Jones in *Teaching and learning: an introduction to new methods and resources in higher education*, published by Unesco and the International Association of Universities in September 1970, and available in Canada from Information Canada bookstores. This book is also an excellent bibliographic source. More than two hundred and fifty works are listed in references which follow each chapter. The chapter headings themselves serve as useful bibliographic categories, and cross-references from one chapter to another are provided. The fourteen chapters are organized into four sections: "Expansion and innovation," "The impact of new media," "Systematic approaches to teaching and learning," "The management of resources." It can be presumed that all major writing having to do with innovation in teaching and/or the management of teaching resources will be listed in these references. Many of the listed works themselves contain major bibliographies. One which is worth noting, especially here, is *Learning from televisions what the research says* by G. C. Chu and Wilbur Schramm, published by the National Association of Educational Broadcasters, Washington, D.C., in 1967. This compendium deals with television at all educational levels, but contains much material relevant to higher education both in the text and in a bibliography of more than two hundred items. There are very few publications which concentrate on technology specifically in higher education. Perhaps the most useful and practical of these is *Media and methods: instructional technology in higher education*, edited by Derick Unwin and published by McGraw-Hill in 1969.

Since extensive bibliographies are already available as indicated above, the listings below are confined to Canadian materials, published or in prospect.

CENTRE FOR LEARNING AND DEVELOPMENT McGILL UNIVERSITY

Learning and Development, Montreal. Published several times yearly, this internal publication in newsletter format devotes most of each issue to a particular aspect of the instructional process. Sample titles: "Towards meaningful educational objectives," "Instructional options: adapting the large university course to individual differences," "Research on university teaching: a perspective."

COMMITTEE OF PRESIDENTS OF UNIVERSITIES OF ONTARIO

University Television: Supplementary Report No. 3 of the Committee of Presidents of Provincially Assisted Universities and Colleges of Ontario, University of Toronto Press, 1965. This report led to the establishment of the Ontario Universities' Television Council. It reviewed briefly the research done in other jurisdictions to 1965 and examined administrative, legal, technical and financial aspects of university television.

EDUCATIONAL TELEVISION AND RADIO ASSOCIATION OF CANADA (ETRAC)

Brief to the commission on post-secondary education in Ontario. Addendum 2 to the brief is an English translation of an article by A. Schardt on the Telecollege in Bavaria, Germany. The Telecollege offers a curriculum corresponding to that of "The vocational continuation school." A series of research reports on the activities of the Telecollege has been published by Bayerischen Rundfunk in Munich. While Telecollege is not offering university work, the research methodology is generally relevant to problems of evaluating various approaches to instruction.

GOOD, H. M.

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MILLER, D. LEWIS (ed.)

Educational television conference in Newfoundland and Labrador, 1966, an abstract of the proceedings (Ottawa: Queen's Printer, 1967), pp. xx, 163.

NIBLETT, W. R. (ed.)

Higher education: demand and response (San Francisco: Jossey-Bass, 1970). This book contains papers and summary of discussion at an international seminar held at Quail Roost, North Carolina. Canadian participants included Northrop Frye, Edward Sheffield, Claude Bissell and John Deutsch.

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Curriculum innovations in arts and science (Toronto: Higher Education Group, University of Toronto, 1970). A brief summary report of the Canadian universities' workshop arranged by the Higher Education Group of the University of Toronto, partially funded by the Department of Adult Education of the Ontario Institute for Studies in Education, and held at York University in May 1970.

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PROCK, LEONE M.

College teaching and learning. (Publication arrangements pending.)

SHEFFIELD, E. F.

Professors as teachers: a study of the characteristics of effective university teaching. (In preparation for publication early in 1972.)

SOLES, ANDREW E.

Old and new directions in community education. (In preparation for publication in 1971 or 1972.)