CHAPTER III

DELIMITING THE STUDY.

The commonly accepted meaning of the term 'cost-effectiveness' that "either something more (or better) will be produced for the same cost or that "less money" will be needed to produce the same effects" is also accepted for the purposes of the present study. However, in view of the conflicting results of research findings on inter media comparisons of effectiveness, and numerous dimensions of effectiveness, some of which are not capable of being measured, the choice in practice becomes limited to the costs aspects. In other words for the purposes of the present study, the term 'comparative cost-effectiveness' is taken to mean that less money might be needed to produce the same effects.

The categorisation of certain teaching aids as "low-cost" and certain others as "high cost" appears to be not only arbitrary but also highly misleading. What is usually meant by "low-cost" or "high-cost" in relation to teaching aids or educational media is the low or high initial investment of money without any reference to ultimate unit costs. But in the ultimate analysis from the point of view of unit costs the "so called" "low-cost" teaching aids might in fact prove to be high cost and the so called "high-cost" the reverse of it. While the "high-cost" media like films, video, television, computer-assisted instruction etc. are marked out as such in the popular mind, the "low-cost" media is not so clearly marked out because of the further branching of the latter.
Two types of "low-cost" educational media might be identified. The first category is somewhat more organised and commercially produced and available for sale in the open market. They are deemed as "low-cost" not merely because of a comparatively small capital outlay but mainly because any school may buy a very small quantity costing just a few rupees depending upon the availability of funds. Thus while a single piece of chart will cost just Rs. 20/-, one piece of television receiver set will cost one hundred times more than that and a school may never be able to spare that much money.

The second category of "low-cost" teaching aids, which has ever remained the dream of the school administrator, but has always remained on the side lines without being able to become a part of the system, is the teacher-made improvised teaching aids. It is generally thought that if the teacher, in addition to carrying full teaching load, could put in a bit of extra labour in his spare time to prepare the required teaching aids, then the school would get them rather cheap as the teacher is not to be paid for that "extra labour", or what may be called the opportunity cost. And since the teacher is usually not willing to spare his time and labour on a continuous basis, though he may not mind it once in a while, the administrator's dream continues to remain a dream. On the other hand it is a general experience that wherever readymade useful teaching aids are placed within easy reach of the teacher he would generally make use of them. Moreover, the improvised teaching aids constitute a rather vague and uncertain commodity without any uniformity in costs
and life, every individual piece being specific to itself, as they do not easily lend themselves to mass production techniques. This is evident from the published reports of the workshops on "low-cost" teaching aids organised by UNESCO*2 in some countries during the past few years and by NCERT*3 in India.

Therefore, the present study takes into consideration only the commercially produced teaching aids as a category of "low-cost" teaching aids as they are readily available in the market and have a considerable measure of standardisation and uniformity in costs and life span.

Charts and pictures, or a combination of them in the form of pictorial charts, are selected as a category representing the "low-cost" audio-visual teaching aids. As discussed in Chapter I, other graphic materials have comparatively limited range of use in the teaching learning process. As regards models and other 3 dimensional materials, these are quite costly and their use is limited within the four walls of a conventional classroom. Torkelson rightly comes to the conclusion that "the advantages of 3D materials are so small in proportion to their high cost as to discourage their use except under special circumstances".*4

Projected aids like filmstrips, filmslides, overhead transparencies etc. are not taken into account as a category of "low-cost" teaching aids as they require capital investment of considerable sums on equipment in addition to expense on software. Furthermore the life span of these materials is uncertain. There is no data available about the life span of this kind of materials as no film library in India keeps a record of the number of times they have been used. But experience shows that
their life might be much shorter than expected. Unlike the
motion picture whose each picture frame is held before the light
gate for only a fraction of a second (at 24 frames per second),
each picture frame of the filmstrip or filmslide is held before
the heat of the projection light for at least 15 to 20 seconds,
but often more than that if the teacher wants to explain it to
the class. This often results in warping or distortion of the
picture frame, putting the warped portion of the picture out of
focus. This is difficult to remedy by readjusting the focus as
the adjustment puts the in-focus parts of the picture out of
focus.

Furthermore, like the graphic materials, filmstrips, film-
slides, overhead transparencies etc. are closely tied up with
the classroom teacher, which in economic terms means add-on
costs without the possibility of substitution of capital for
labour.

Audio-aids are ruled out of consideration as their known
use is very limited in the context of the entire range of school
curriculum and they require capital investment on equipment.

Films, video and satellite television are selected in the
category of the so called "high-cost" audio-visual teaching aids
or educational media. As stated earlier, these media require
high initial investment of capital not only on equipment and
infrastructure but also on software. A professional production
of films, video or television programmes is beyond the means of
any ordinary individual institution. But since these media have
a much longer life span and are a mass media, the unit costs can
be very low as compared to the other media. Furthermore, in the
case of these media it is possible to substitute capital for labour which adds a new dimension to their cost-effectiveness.

It may be mentioned here that the present study takes the school stage as its working base, though much of it is of equal relevance to post-secondary or higher education. A brief over view of the pattern of school education in India is given below for a better appreciation of some of the problems.

India is a Union of States with a democratic federal polity and division of powers between the Centre and the States. There are 22 States and 9 Union Territories. The Union Territories are small pockets of territories under the administrative control of the Union or Central Government. Education is a State subject, though it has lately been placed in the concurrent list as well which enables the Central Government to pass legislation on matters concerning education. In case of a conflict between the Central and State legislation on a subject in the concurrent list the Central legislation prevails. Over the years due to the compulsions and problems arising out of planning and financing of big projects or inter-State schemes more and more powers have tended to gravitate in the hands of the Centre so that the States have started resenting any Central inroads into the preserves of the States. Consequently, any major project or shift in policy affecting the States cannot be easily carried out without the willing consent of the States.

A 12 years schooling pattern has been introduced in the country. But presently there is no uniformity of educational pattern in the country and older patterns still exist in some of
the States. However, all States are likely to implement the 10+2+3 pattern of education in a phased manner. 10+2+3 pattern of education envisages 10 years schooling, wherein most of the subjects are common to all the students; a diversification of courses at +2 stage, wherein a student might choose 4 or 5 subjects out of several Classes IX and X of the 10 year school constitute the Secondary stage and classes XI & XII constitute the +2 or Higher Secondary/Senior Secondary stage. The college or first degree course is to be of 3 years duration. However, presently different patterns of schooling continue to exist in different States. A few States continue to have the previous pattern of 11 years school i.e. 8+3, while some still have the earlier pattern of 10 years school, i.e. 8+2 in which case class X is the terminal stage with first degree course of 4 years at college. Similarly, there is no uniformity at the Primary and Middle levels. Some States have 4 years primary +4 years Middle while some have 4 years Primary +3 years Middle. But most of the States have 5 years Primary +3 years Middle in conformity with the new pattern of 12 years schooling and the remaining States are also expected to switch over to this pattern. Therefore, under the 10+2 pattern of school education, Primary stage is of 5 years duration from classes I to V; Middle stage is of 3 years duration with classes VI, VII & VIII; Secondary stage is of 2 years duration consisting of classes IX & X and the +2 or Higher Secondary stage is also of 2 years duration consisting of classes XI & XII. This pattern of 12 years schooling is taken as the working base for the present study which is also the basis of the Fourth All India Educational Survey.
The present study takes for a working base the statistics given in the Fourth All India Educational Survey, published by N.C.E.R.T. in July, 1982, with date of reference as 30th September, 1978, which is the latest published survey report available. The Survey gives data schoolwise as well as sectionwise. The term section denotes the stage of education such as Primary, Middle, Secondary and Higher Secondary. Thus, a Higher Secondary School may consist of only one section or may have all the four sections from primary to higher secondary. The present study considers media facilities and costs on the basis of sections and not schools. Since the costs are based as in April 1983, the number of sections and student enrolment in the country is projected as on 30-9-1983 on the basis of rate of increase during the half-decennial between the Third Educational Survey (1973) and the Fourth Educational Survey. It may be mentioned that in most of the States the school year starts from March or April or May ending on the same date the next year. The school year thus almost coincides with the financial year which is from 1st April to 31st March. The date of reference for educational survey is fixed at 30th September because all those who want to discontinue school usually leave by that date. Some important indicators based on the Fourth All India Educational Survey are given in Appendix-22.

The cost analysis of teaching with different media, i.e. charts, films, video and satellite television forms the subject matter of chapters IV to VII. The chapter on each different media is prefaced with an explanatory note on the methodology
and sources of data on technical and costs aspects. The collection of economic data was taken in hand in 1982 but the emergence of certain new technologies on the Indian scene necessitated a widening of the scope of the study to include video and satellite television which appeared in a big way about the end of 1982. The economic data had, therefore, to be revised and based on costs in April, 1983, that is, the beginning of the financial year. Since the costs are based on the month of April, 1983, the number of schools/section and student enrolment were also projected to the academic year 1983-84.

The costs of various components of media are first worked out on a disaggregated basis and are placed in various appendices at the end of the study. Therefore, the cost analysis in the main chapters deal only with major heads of costs based on details worked out in respective appendices.

A word may be added here about the present study fixing the production costs of media to only once in the 15 years assumed life of the programme of media use and not doing so on a continuous, every year, basis (though additional costs of obsolescence are also mentioned). Such a situation is not without precedents in more advanced and rich countries. As reported by Jack Lyle, Hagerstown, which operated one of the most sophisticated projects of instructional television in the world, was producing 140 programmes a week in the mid 1960's. "Today new production is limited to only a few series each year. Much of this production is not local."5 This study assumes centralised production of media lessons as against local production. This assumption is also supported by new trends in more advanced
countries like U.S.A. and Japan. Earlier much emphasis was laid on the necessity of programmes to be indigenous and even within nations, such as United States, it was argued that local production was essential to accommodate regional differences. But studies for the Corporation for Public Broadcasting in United States reveal that there is "a strong shift to increased use of programmes not made locally".*6 Another new development reported is that because of difficulty in getting suitable air time for telecast of lessons and the high cost of cable television, both Hagerstown and Chicago T.V. College have switched over to video. "The Course series are all now available in cassettes".*7

As to the centralisation of the curriculum which would be necessitated by the use of satellite television for teaching, a good example comes from an advanced country like Japan where the curriculum is reported to be centrally controlled at Primary and Secondary levels by the Ministry of Education of Japan and "the students throughout the country are likely to learn very similar topics at any given period of the school year".*8

A slight departure is made in the present study in the use of the terms like fixed and variable costs. The term fixed costs used in the present study denotes capital costs or initial capital investment. A further distinction of capital costs as fixed and variable is not made as this is not a part of the design of the present study in order to keep it within limits and not make it too unwieldy in view of four media included in it.

Although there is some controversy regarding the applicability of the concept of a social rate of discount to educational projects, the concept sounds reasonable. The argument that the
Education Minister of a country or a State has no choice or alternative to the use of funds allocated for education does not hold water in the context of a developing country like where there is a considerable alternative use available in other sectors such as agriculture, irrigation, power generation, industry, transport etc. Therefore, investment in education "represents the sacrifice of alternative opportunities to use the resources". \(^9\)

Since there is no general agreement as to the interest rate the present study analyses the costs at several rates of interest as advocated by Jamison, Klees and Wells and also by Eicher and others. \(^9\) The rates chosen in the present study are zero percent, 5 per cent, 10 per cent and 15 per cent. The four rates give a wider choice of value the society might place on a programme of massive use of educational media. Furthermore, the zero rate of interest places the educational media at par with the alternative costs of labour which are accounted for at zero rate of interest in official statistics. \(^10\) The interest rate of 5 per cent represents interest on Savings Fund Accounts allowed by banks; 10 per cent represents interest allowed by banks on long term fixed deposits and 15 per cent as the interest rate charged by commercial banks on loans and also interest allowed on deposits with public and private sector industrial or commercial undertakings in India.

For the sake of comparability with charts medium, which has no operating costs as against high operating costs of the other three media, the various rates of interest are applied in the
present study to operating costs as well even though the general practice is to apply the social rate of discount only to fixed or capital costs and not to annual operating costs.

A brief mention may be made here of Indian terminology of numerical figures and certain monetary denominations used in expressing the costs which are somewhat different from the western system. For example the costs are expressed in Indian rupees (abbreviated as ₹). The official exchange rate of Indian currency presently is about ₹10 = $1 (one American dollar). The cost figures are expressed using Indian denominations like lakhs and crores instead of the European system of hundred thousand, millions, billions, etc. Thus rupees two hundred fifty thousand is expressed as rupees two lakhs and fifty thousand (₹2,50,000) and not as 250,000. Similarly rupees one crore (or ten million) is expressed as ₹1,00,00,000.

**The Size of the Media System:**

One of the critical elements in a cost-effectiveness study of media is the size of the system. In a country like India where a vast majority of the people live in villages, this question assumes considerable importance. If the use of educational media is restricted to high student enrolment centres or high density population areas, the unit costs could be considerably low. But such a policy will militate against the cardinal principle of equalisation of educational opportunities for all. In big urban schools the strength of a section of a class is 50 or even more with several sections to a class. On the other hand as many as 66% rural primary schools have a class strength of less than twenty. Therefore, while
working out unit costs, i.e. cost per student lesson, the all India enrolment of the entire school stage is taken into consider-
ation and is used as a basis for working out unit costs. This approach is in line with educational policy decision of univer-
salisation of elementary education and equalisation of educational opportunities for all. The first three media, viz, charts, films and video can be introduced in any one or more than one of the various stages of education independently or in any one or more of the states without significantly affecting the basis of unit costs. But in the case of satellite television it will be most economical if used on an all India basis for all stages of school education because the fixed and operating costs of transmission system constitute a major segment of the expenditure. However, if television is introduced on a selective basis in high density population areas in the country leaving out sparsely populated areas and scattered and isolated habitations with small populations, it can prove to be still more economical. In fact the proposed new scheme of Ministry of Information and Broadcasting claims that television coverage can be extended to roughly 70% of the country's population with just 135 low-power transmitters and a few rebroadcast stations with 10 kilowatt transmitters. Whether the proposed scheme will actually achieve 70% coverage of population can only be affirmed through an on-ground survey after the scheme is fully implemented. However, for the present it seems possible, on paper at least, to cover about two thirds of the country's population at about one third of the transmission costs as worked out on a whole country basis in the present study. However, the introduction of satellite
system on a selective basis in high density population areas will not affect the other cost components such as costs on programme production which will still have to be done in 15 languages. The reception costs will not be affected as the number of television sets will equal the number of sections/schools covered. Nevertheless, unit costs will fall appreciably because of concentration of larger student populations in comparatively smaller geographical area and higher class strength in larger sized classes, reached through far fewer transmission units.

Extension of satellite television to cover the non-formal sector and adult education can be achieved at marginal costs of transmission as the entire transmission network will be available in the evenings, after formal-school hours. However, the present study does not take this into account to apportion or assign costs to an almost non-existent system or which at best is still in its infancy. Nevertheless, the operating of the system at some additional costs for non-formal, adult-education and informal systems is a real potentiality of the Satellite Television system. But the present study considers it's use exclusively for formal school system. It will, therefore, have a large idle capacity, which, can be utilised by an increase in the number of television lessons at marginal transmission costs. The other three media, each one of which is a composite whole, cannot be extended at marginal costs to other sectors of education. The use of films, video and television also pre-supposes availability of electricity in all the schools all over India, though in reality it is not so on the ground.
As stated before, one of the critical elements in a comparative cost-effectiveness study of educational media is the number of lessons for which media will be employed. While in a system like charts and pictures number of lessons will not make any significant difference to unit costs, in a system like satellite television, where fixed costs are high, the number of lessons for which the system is utilised has a significant bearing on unit costs.

No study is available to show the number of major concepts in the curriculum of all the states of India. Therefore, for purposes of media comparison a rough estimate of the number of major concepts is made by the present writer on the basis of NCERT's publications on School Curriculum, Teaching Units and Teacher's Guides for teaching of various subjects. The teachers' Guides specifically identify major concepts to be taught in a subject. Personal discussions were also held with various team leaders in N.C.E.R.T. who had coordinated the development of Teacher's Guides for various subjects for various school stages.

A rough estimate of the number of major concepts, or in other words topics or lessons is made on the basis of NCERT's work as referred to above, for the purposes of comparing costs of various media. The number of lessons thus worked out are kept constant for all the media in the present study for purposes of inter media cost comparison. Further, the present study is based on the use of media as an aid to teaching and not as a replacement of the teacher. Therefore, only major topics are taken into account for estimating the number of lessons to be taught through or with the help of...
The number of lessons at the primary stage is lesser as compared to the other stages because in classes I and II a major part of the teaching is devoted to skill formation - the learning of 3 R's. But there are four separate subjects from classes III to V. Science and Social Studies are grouped under the subject as Environmental Studies but have separate text books and Teacher's Guides. The number of lessons as 200 at the Primary stage may be treated as flexible within the Primary stage allocating more or less number of media-based lessons to any particular class or subject.

The number of lessons at the Middle stage is 300 for three classes, i.e. classes VI, VII and VIII, with 5 subjects in each class. The number of subjects for classes IX & X is higher as compared to the Middle stage. Therefore, the number of lessons for the two-year secondary stage works out to 300 lessons.

An equal distribution of media lessons between all the subjects is not envisaged, as a subject like mathematics is not much amenable to equal visual presentation through media for all stages of school education. This is particularly so at the secondary and Sr. Secondary stages where mathematics tends to be more and more abstract. Therefore, an internal flexibility is presumed in the matter of allocation of number of media lessons for any particular subject for any given class level or stage of school education.

The number of media lessons for the two-year course at +2 stage is computed much higher than for any other stage because of diversification of courses at this stage, which will necessitate
preparation/production of media-lessons for almost all the options at the + 2 stage. Therefore, the number of media lessons at the higher secondary stage poses some problem. The large number of media-lessons at the higher secondary stage will considerably raise the unit costs as all students will not view all the lessons. A student will utilise only 100 media lessons for the 4 subject opted by him or her at the + 2 stage, as per syllabi of Central Board of Secondary Education (CBSE).

LIMITATIONS REGARDING NUMBER OF MEDIA LESSONS;

A stage-wise estimate of the number of media lessons is made solely for the purposes of inter media comparison of costs. It represents only a rough estimate to provide a working basis and is not claimed nor meant to be a standardisation of number of media-lessons for each school stage.

RATE OF OBsolescence IN MEDIA-LESSONS;

It may be added here that the "high-cost" media viz., films, video and television will have to incur additional costs on a periodical revision of media-lessons due to the factor of obsolescence after a certain period of time. What will be obsolescence rate and in what period of time, cannot be decided in advance, because only experience and feed back will make it possible to decide as to how many media-lessons will need revision after a certain period of time. Therefore, it can at best be an assumption, which may be somewhat arbitrary. However, it may be presumed that not all media-lessons in all the subjects will need revision though a certain percentage of lessons may be revised periodically. It is, therefore, presumed that 25% of the total number of 1300 media lessons may get revised every 3 years to coincide with the replace-
ment of charts every 3 years. Thus by the time the charts are replaced for the last time after the 12th year, all other media-lessons will have a chance of getting revised, though some media lessons may not need even one revision while some may undergo more than one revision.

Therefore, if it is assumed that 25% of media lessons (other than charts) are revised every 3 years, then 325 lessons may get revised every 3 years. This works out to 108.33 or say 110 lessons per year.

The revision process will only affect the cost of production of media-lessons but will not affect the distribution or reception costs. The revision process will have a major adverse affect on unit costs of film medium as it will render the existing product largely redundant and will entail a reproduction of either the whole film or at least a major part of it. In the case of video it entails only the costs of programme production, recording and duplicating, for which the lesser used video tapes may be withdrawn and reused after mechanically wiping out the previous lessons. In the case of television, revision will be still easier and therefore much less costly as large scale duplicating of video tapes is not entailed.

In working out the costs of obsolescence and consequent reproduction of a certain percentage of media lessons, total costs on this head are taken into account, that is production, dubbing/reproducing in 14 other Indian languages and duplicating costs. In the case of films duplicating involves the complete costs of taking out new film prints also which constitute a major component
of film costs.

As already explained the costs are taken as constant as on April 1983 because the inflator/deflator method cannot be rationally applied to the media because while the costs of charts and films may be rising there is a continued but erratic decline in the costs of electronic media the world over as well as in India.
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