EDUCATIONAL TECHNOLOGY : - WHAT, WHY & HOW ?

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1. Introduction :

Educational Technology (ET) is an emerging discipline, especially in the context of Engineering Education, and more particularly so in India. However, the recent awakening about the potential of ET is heartening. Thanks to New Education Policy in which the importance of ET is emphasised, not only as pious hope and philosophy but enough funds are being allotted to spread the message. In this paper an attempt has been made to clarify the concept of ET through various definitions put forward by national and international organisations. We will also consider why it is necessary to harness the strengths of ET and how can we do that ? Some practical suggestions are made based on experience and research.

2. What is ET ?

There is no cast-iron definition. There are sources of definitions put forward, which have added to confusion. For some it is a fashionable synonym for teaching aids, to others it covers every thing that comes under education if not under the sun. As engineers we will try to understand the practical aspects of it. Educational Technology involves two concepts *'Education'* and *'Technology'*. First let us define these and then ET and see how it is more than the sum of the parts.

Education :

The term education is defined in a variety of ways, each one appropriate to the context to which it applies. Education has been conceived as a process of individual development at the micro level catering to national development at the macro level. It aims to develop and cultivate the various physical, mental, social, emotional and moral powers of an individual. In the wider sense

education aims at the preparation for life. All definitions of education accept a basic feature that it is the process of teaching and learning through which an individual achieves desired obejctives i.e. changes his behaviour from entering behaviour to the desired terminal behaviour. This feature of education is the one accepted by All India association for Educational Technology (XVII Annual Conference of AIAET 1984).

Technology :

Technology is the process of creatively applying certain known and tested principles (science) to the given practical purpose (or problems). Thus, technology is application of the scientific methods to practical situations. (Romiszowski 1981) or 'The systematic application of scientific or other organised knowledge to practical tasks'.

Educational Technology :

Just as education, educational Technology is also defined in a variety of ways. On the one hand there are narrow definitions, which connote to the design and development of audio visual aids and educational materials, their use and evaluation. On the other hand there are broad and comprehensive definitions which encompass education in its totality (Rowntree 1974). A proper delineation of its boundries is essential for appreciation of the role of educational technology in contributing to successful implementation of national policies, related to technical education. As per the pragmatic definition suggested during the AIAET Conference (1984) Educational Technology is an approach to study, improve, innovate education - teaching learning process, so that an individual or group of individuals achieve the desired obejctives more efficiently and effectively. The word efficiency is related to time and cost / resources utilised in the process and effectiveness to the quality and level of accomplishment of obejctives.

The commission on Instructional Technology (USA) defined *"Instructional Technology as a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and non-*

human resources to bring about more effective instruction."

The definition of ET proposed by National Council for ET(UK) and adopted by NCERT (India) is *"ET is the development application and evaluation of systems, techniques and aids to improve the process of learning.".*

I.X. Davies a noted educationist and engineer takes a broader view to educate ET with 'Systems Approach' to educational system. The stages are :

- Analysis of problem
- Selection and synthesis of an optional solution
- Controlled implementation
- Evaluation and
- Possible revision.

A more comprehensive definition adopted by Association for Educational Communication and Technology (AECT 1977) considers Educational Technology as a complex, integrated process involving people, procedures, ideas, devices and organisation for analysing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of human learning.

These definitions suggest that the concept of ET includes –

- Learning principles based on psychology
- Relevant use of media
- Curriculum development
- Generation of Instructional Resources (IR)
- Efficiency and effectiveness of instructional process.
- Design of learning spaces.
- Design and control of educational systems
- Development of learning experiences through the application of science of learning.
- Selecting, developing and using appropriate teaching learning strategies and methods.
- Getting feedback at every stage to improve teaching-learning process

Planning classroom environment to promote learning.

We find that some definitions emphasize 'Hardware' others 'Software' and yet others 'Process' . The differences do not end here.

Controversy about 'IN' and 'OF' :

We can call the products of Engineering - from Black-Board to TV, Computer and Video Disc etc.. 'Technology ***in*** education' i.e. technology available to a teacher.

But this should not be identified with technology ***'of'*** education which are techniques of improving teaching-learning process.

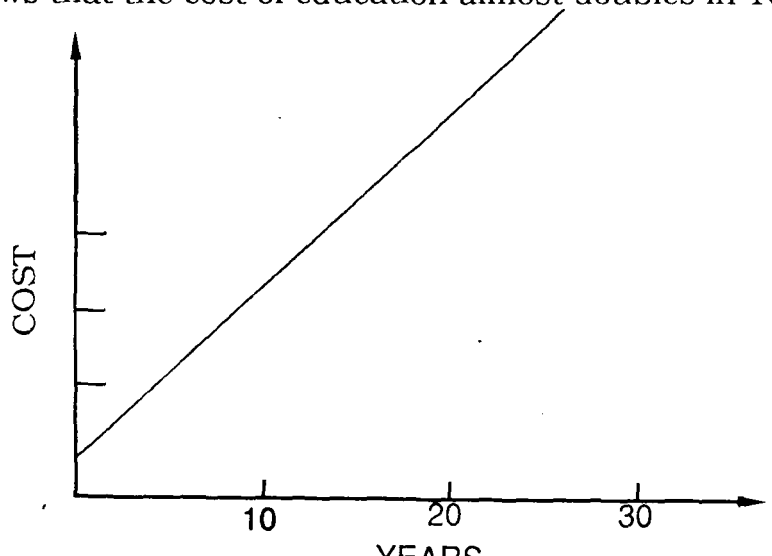
Which is more important ? Well! As professional teacher, we have to give each aspect its right place adopting an eclectic approach.

Why ET ?

This can be considered under four aspects :

I. Cost; II. Curriculum; III. Needs
IV. Research and V. Industrial Growth.

I. EDUCATIONAL COSTS : Cost of education is increasing but budget allocation is not increasing proportionately. Experience shows that the cost of education almost doubles in 10 years.



EDUCATIONAL COSTS

Teacher is valuable. His time should be used more efficiently and effectively. Technology might provide more economical alternative delivery system.

II. CURRICULUM NEEDS :- Knowledge is expanding and it has to be included in the curriculum. But the time span is same so efficiency of instructional system must be increased in terms of cost time and best alternative. ET comes to rescue here. Following are some examples :

1. Multi-Point Entry and Credit system in Gujarat State.
2. Computer Based Interactive Video - can individualize instruction.
3. Use of OHP considerably saves teachers' valuable time in drawing the diagram on board for every class.
4. Some students learn in classroom situation but some do not. They prefer to study individually and Multi Media Learning Packages (MMLPs) come to their help and save time and increases learning.

III. Research on ET :-
Does use of ET make instruction more effective? Or how students learn? Do they learn through media? Early research in USA showed that live Conventional Lecture is more effective than a lecture on TV. Students did not like sitting in front of TV watching a lecture. 'Talking Head' programmes are utter failures. But properly made video programmes based on sound instructional design principles, making appropriate use of the media attributes were found to be extremely successful. This proves the need for ET. in designing instruction using appropriate media wise using their strengths.

Neurophysiological reserach on the functioning of Right Brain and Left Brain also has supported the use of ET in improving instruction.

IV. GROWTH OF INDUSTRY-VIS-A-VIS EDUCATION :

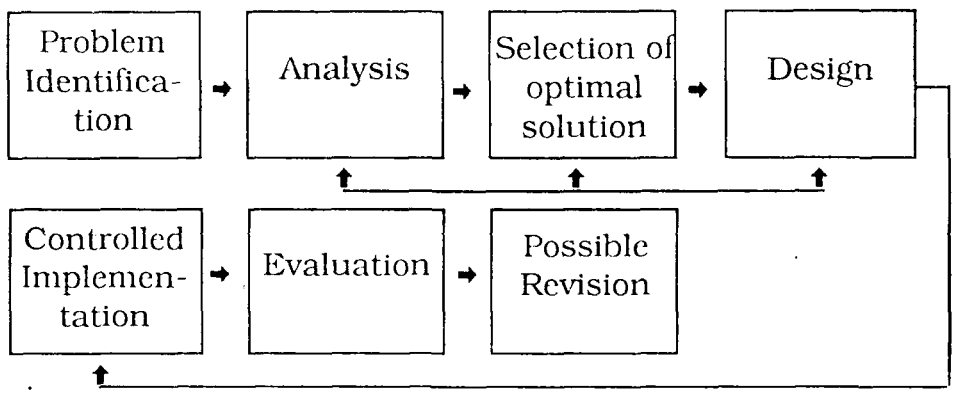
It has been found that the industrial and social growth is exponential where as growth of education in linear. This is causing a wider gap between individual expectations and needs and educational potential and capabilities of passouts of engineering institutes. ET attempts to reduce this gap by adopting systems approiach by analysing industrial needs and designing carricula to meet those needs in implementing the curricula effectively using strengths of ET.

How to use ET ?

The systems approach of ET may use different techniques like -

* Mass education or
* Individualised learning at two ends of the spectrum
* Classes instructions, Laboratory work and skill training lie in between.

Systems approach is usually depicted by a flow chart.



This gives an impression that the analysis happens at the beginning, synthesis and design in the middle and evaluation at an end. In reality all these activities occur at all stages throughout the process.

System approach does not imply that the process is algorithmic it is in fact heuristic i.e. a method of solving problem by inductive reasoning.

Systematic experiments in the application of educational technology for the design development, implementation and evaluation of polytechnic programmes have been conducted by the four Regional Technical Teachers Training Institutes. One such major experiment conducted by the Technical Teacher's Training Institute at Bhopal covers the Western Region and it is valuable experience in the application of educational technology.

Bhopal Experiment :

The Bhopal Experiment was a multi-pronged one and considered educational technology as synonimous with the application of systems approach to educational planning, implementation and evaluation. This model of the application of educational technology included identification of needs formulation of objectives, organisation of content, development of learning sources including Human and Physical, Quality Control through scientifically designed tests and examination and refinement of all the stages through formative and summative review process. A diagram indicating the model adopted and depicting the inter relationships between the various elements is given in the figure on page 9.

Changed Role of Teachers :

Educational Technology changes the contemporary role of the teacher from the instructor, software designer innovator, resource person to the manager of learning environment, but it does not attempt to replace teacher.

Effectiveness and Efficiency :

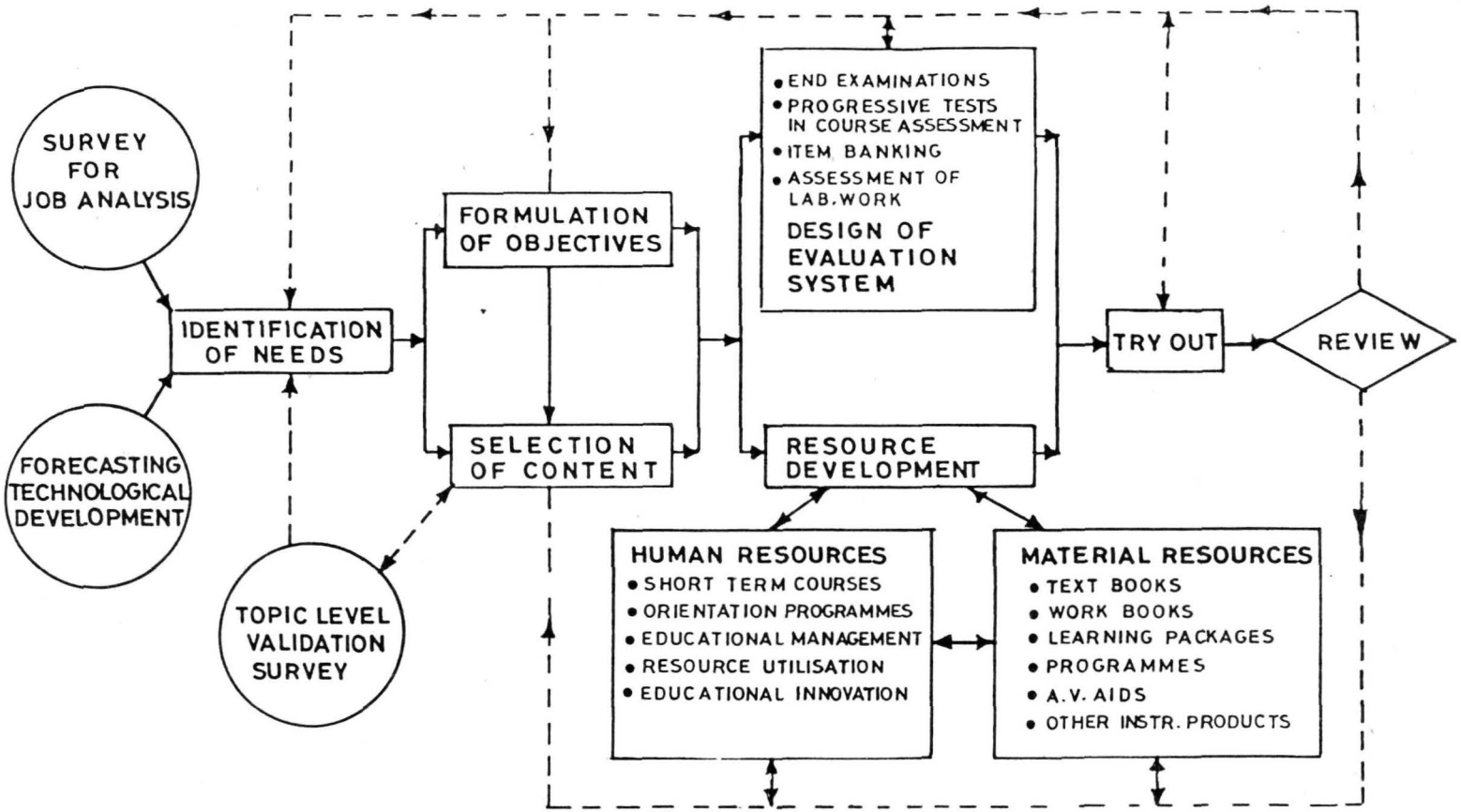
These two concepts are the essence of ET. The following table will distinguish these terms.

Differences between efficiency and effectiveness.

Effectiveness is doing the right things		**Efficiency is doing things right.**
This involves -		
	Rather than	
- creating alternatives	-do-	solving problems
- Optimising resource utilising	-do-	safeguarding resources
- realising responsibilities	-do-	following procedures
- meeting criterion	-do-	increasing pass rates
- satisfying needs	-do-	reducing costs
- using a systems approach	-do-	treating things separately.

Some Projects in India based on Educational Technology :

1. Indira Gandhi Open University
2. Countrywide classroom - UGC Programme of ETV
3. SITE - Satellite Instructional Television Experiment for mass education - 1976.
4. Establishment of Technical Teachers' Training Institute
5. EMRCs, AVRCs, CIET (Central Institute of ET)
6. Department of educational Technology and Curriculum Development Centres (CDC) in IITs and Engineering Colleges.
7. Media Research & Development Centre (MRDC) & CDC in IITs.
8. Teacher Preparation programmes of NCERT, TTTI and IITs
9. Post graduate course leading to a degree of Master of Technical Education offered by TTTI Bhopal.
10. ISTE, Winter & Summer Schools, Continuing Education Project.



APPLICATION OF EDUCATIONAL TECHNOLOGY TO CURRICULUM DEVELOPMENT
BHOPAL EXPERIMENT

Conclusion :

Educational Technology is a useful concept. It has potential for providing a sound base for overall improvement of technical educational system. Its credibility has been tested and established to technicians educations system in the country over the last two decades. It holds a promise for Engineering Education at degree level. Fortunately the system has reacted positively towards ET. The department s of ET is IITs and TTTIs courses conducted by them for creating awareness among undergraduate teachers are some of the right indicators. The movement is gaining momentum due to additional funds provided. Thus ET though not a *'Cure all'* for all the educational problesm has a bright future in the engineering education system.

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