EDUCATIONAL TECHNOLOGY IN THE PURSUIT OF CONTINUING ENGINEERING EDUCATION THROUGH DISTANCE MODE

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Introduction

Ours is overwhelmingly a technological society and the one in which the rate of technological changes continues to increase dramatically. The engineering profession of today not only calls for working at the new frontiers of knowledge, but also demands one to be a creative person, able to innovate and use knowledge developed by others. One should be able to develop new techniques and technologies and apply them for the betterment of one's output and environment. For this the practising professionals must not only keep uptodate in their specific fields of specialisation but also be aware of discoveries and technological transformations taking place in other fields. In this competitive world one can no longer afford to remain contented within his own shell, but must keep abreast of the developments taking place in other spheres as well.

Distance mode for continuing education

The above objective cannot be accomplished only within the four walls of the class-room type situations as in a formal system of education. The conventional system of classroom oriented education requires full time attention and adherence to rigid rules and regulations, much to the inconvenience of working professionals on various counts. The nonformal and distance education modes for continuing education of working personnels have to be resorted to particularly in view of the large backlog of the technocrats needing updating. It is high time now to explore 'new advances' where educational transactions could go on unabated at one's own pace and at one's own convenient time and place. The Distance Education system can effectively meet these challenge. The distance mode in continuing education makes it possible for education to reach to the doorstep of the learner wherever he/she may be.

Distance education for whom

Distance education is capable of taking in a vast and varied clientele such as -

1. In-service personnel who wish to update their knowledge/skills or acquire certificate/diploma/degree.
2. Persons who had to leave their studies

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at an early age to take up jobs for economic reasons but now want to resume their education.

3. Those people who are not able to fulfil the criteria for entry into the formal system of higher education.

4. Drop-outs of the formal system of education.

5. Spillover from colleges/university teaching departments where admissions are made on merit and for a fixed number of seats.

6. Persons who want to earn and learn simultaneously.

7. Handicapped persons

8. Socially and economically backward sections of the society.

9. Persons residing in geographically difficult terrain or remote rural areas with no or meagre educational facilities.

10. Persons who want to utilise their leisure time and pursue an academic activity in their spare time.

Why Distance Education

The distance education system offers the following distinct advantages -

1. Economical and more cost-effective compared to the conventional class-room system of education.

2. Large number of students can be handled giving a high student-teacher ratio.

3. The achievement of a few excellent teachers can benefit thousands of students

4. Requires comparatively a smaller number of full time faculty/staff.

5. No big buildings, student hostels etc. required as in case of full time institutions.

6. No student indiscipline problems due to concentration of large number of students in campuses as in residential colleges/universities.

7. Working personnel, housewives, disabled persons, socially and educationally backward sections of the society, dropouts of the school/college system etc. can avail of the distance education courses offered.

Distance Education in Engineering

There is a notion prevailing among some academicians that science and engineering subjects can not be taught through distance education system. They are probably not aware of the tremendous success with which some distance education polytechnics in Russia have been imparting education for full fledged engineering and technological courses as well as refreshing and updating courses for engineering professionals and technologists throughout the country. We also know of some technical universities and institutes of Australia and U.S.A. teaching technical courses through distance mode. In fact the potential of distance education mode for the continuing education of working engineering professionals and vocationals needs to be fully exploited by the developing countries like ours, so as to make the distance education more broadbased, meaningful

and relevant to the needs of the society.

Educational technology to the rescue of Distance Education

Keeping in view the complex nature of the engineering education and the fact that it is predominantly skill/practice based, full potentials of modern educational technology if harnessed optimally will yield desired results. Educational technology viewed as systems approach to education provides a perspective to tackle many problems concerning continuing education of engineering professionals through distance mode.

Educational technology and systems approach

Educational Technology has been for a long time misconcieved as 'tools technology' i.e. making use of mass media and audio visual aids in education. In this sense of the term the concept of Educational Technology has been extremely limited. Educational Technology is not merely an induction of hardwares in education. It is a sum total of all educational facilities, media, methods and techniques for optimizing learning. The most crucial function in educational technology lies in restructuring the environment for better learning. This process of educational structuring and management of educational environment with the help of hardware and software that is available or that can be made available to the best advantage of the learner is the concept of Educational Technology today. Such a structuring could be at micro (Institutional) mezzo (Regional or State) and macro (National) levels.

The Systems Approach applied to educational transactions, involves the following four interlinked and interdependent stages.

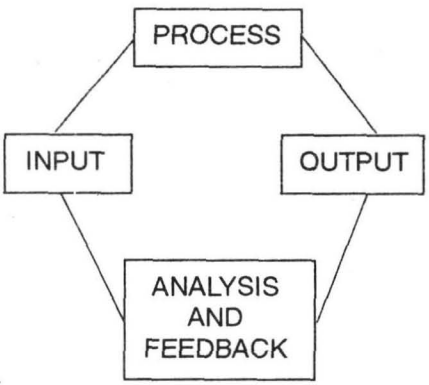
1. Planned input suitably geared to the needs of the target group.

2. Right processing of the intended input involving learning materials and methods.

3. Monitored output.

4. Analysis and feedback to revise and improve the input and/or process.

These components of system's approach to educational situations are shown in Fig. 1.



Systems Approach applied to continuing education

Translating this approach to the continuing education of working professionals, the following steps are envisaged in keeping up with the tenets of Educational Technology.

1. Identification of continuing education needs of engineering professionals in different sectors.

2. Design and development of relevant course materials.

3. Trial of course materials on sample target population.

4. Modification of course materials

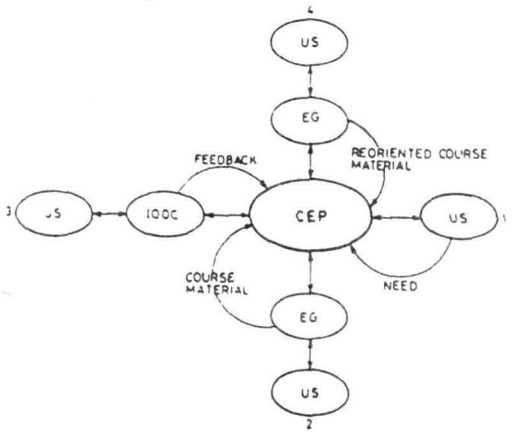
5. Offering continuing education programmes through distance mode.

6. Assessing the impact of programmes on target popoulation.

7. Applying corrective measures for improvement.

8. Mass dissemination of continuing education courses.

The initiative for the continuing education of working professionals on a systematic footing has been taken by the Government of India through a "Continuing Education Project" which provides for a continuous cycle of interaction generating need based course materials and updating of the knowledge of working professionals as shown in Fig. 2.



CEP = CONTINUING EDUCATION PROJECT
US = USER SYSTEM
EG = EXPERT GROUP
IODC = INSTITUTE ORGANISING DISTANCE EDUCATION

Under this project, 10 Resource Centres (5 IITs + 4 TTTIs + ISTE) have been identified for the preparation of course materials and organising/conducting continuing education courses for the working professionals in consonance with the principles of educational technology. For preparation of a course material, a team is formed which consists of a coordinator, subject experts from academic institutions and industries and an education technologist. The group interacts and undertakes the preparation of course content, media to be used, post-test etc. and suggests the way, the course should be organized. To begin with the courses are being conducted by 'contact mode' and subsequently will be taken up by distance mode also. Feedback is received from the participants after the course for improving the course material and reorienting the conduction of the course. The course materials prepared have been well received by the participants and the efforts are being lauded by the user system.

A list of course materials prepared on these lines at TTTI Bhopal Resource Centre is given in Annexure.

Media in Distance Education

Since these courses could be offered on distance mode, liberal use should be made of the potentials of different media such as slides, transparencies, photographs, audio and video cassettes, film strips, films, models, radio, telephone, T.V., computers etc. in addition to a good print material to the best advantage of the distant learners. Each of these media has its specific field of applications.

The print material provides textual content where a good deal of ground needs to be covered or where the subject matter

needs to be dealt with in-depth or where certain preliminaries of skills - conceptual and analytical - need to be developed. With the print material the learners can work at their pace and at their own convenience. The learners can also complete the assignments given to them in the form of print material by the distant tutor. The print material thus forms the backbone of any distant education system.

Radio is being effectively and widely used for broadcasting educational programmes throughout the country. Radio is much cheaper, simpler and flexible compared to television. Radio sets are now available to people in almost all the villages in the country. Radio could be utilised to provide more need based educational programmes for the area covered as there are large number of radio stations spread over each region and state of the country. Radio is particularly suitable as a mass media for educating the people living in the rural/hilly areas which are not easily accessible by other means.

Television is a powerful audio-visual medium for distance teaching. The T.V. educational programmes can provide distance learners with useful resourse information. The demonstration of intricate scientific experiments, medical surgeries, presentation of complex ideas, interviews with outstanding experts of various fields can be presented to the student in their homes through T.V. broadcasting.

Information received through the eye and ear, with the help of a T.V is better retained by the distant learner. Although TV broadcasting is an effective medium of distance education, it must be admitted that it is an expensive medium. However Distance Education must exploit the potential of this electronic medium to the maximum.

The audio cassettes provide opportunities to distance learning students in regard to the explanation and discussion of the instructional material periodically sent to them by post. These can be used for providing resources material such as group discussions and interviews with experts in different fields. The audio cassettes give considerable freedom to the students in the sense that they can stop the cassette player to relax and replay the taped material. The human voice (s) they listen to makes them mentally alert establishing a contact though a remote one. Audio cassettes can be used with advantage as a supplementary teaching medium in conjunction with print material.

A video cassette is an excellent technology on the audiovisual materials front. The video cassettes provide bridges to comprehension by giving concrete examples of complex and abstract ideas covered in print.

The telephone also offers two-way communication across distance. This medium can provide tutorials and seminars, where interactive communication can take place between the learners and the tutors.

Micro-computers are coming in a big way to the rescue of Distance Education. There are basically two kinds of computer usage for distance teaching/learning. The first is Computer-Assisted Instruction (CAI) and the second is Computer-Managed Instruction (CMI). In the former, the student interacts directly with a computer, while in the latter, there is no direct interaction. The computer provides the learners with an additional support and the feedback on their work. In certain advanced countries like U.K., the British Open Unniversity is planning to provide microcomputers at the students'

residences as part of its educational programmes. Country like ours may not afford that but we can certainly make them available at the 'study centres'.

Conclusion

Success of distance education depends largely on the use of alternative media available. There could be several other media not discussed here but of relevance to distance education such as teleconferencing, wordprocessors, video-discs etc. What is more important is not just using these media but properly intergrating them into a well defined instructional strategy, which is the essence of educational technology. Knowledge/skills to the distant learners can be imparted in a variety of ways through different media, each having an edge over others in some aspects. It is for us to make a judicious use and select the right media. Educational Technology can play a pivotal role in the promotion of continuing and distance education by establishing a link between those on the 'giving side' and others on the 'receiving side'. In this endeavour, establishment of radio stations in teaching universities, provision of a dedicated educational TV channel and creation of a dedicated satellite system for educational purposes are also being envisaged.

List of Course Materials Prepared At T.T.T.I., Bhopal Resource Centre Under Continuing Education Project

1. Quality Circles
2. Basics of Electricity and its utilisation
3. Electrical Substation
4. Executive Decisions and quantitative techniques
5. Optical Fibres in Communication
6. Quality Control Using latest SQC and use of modern machines for inspection
7. Electrical Safety - I
8. Electrical Safety - II
9. Under reamed Pile Foundation - Manual Construcion
10. Basic Principles of Refrigeration (a self instructional unit)

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