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Strategies in Preparing Open University Learners For Science Programmes

DAMAYANTI DEVI

Associate Professor of Zoology, Dr. B.R. Ambedkar Open University, Hyderabad.

Teaching science courses through distance mode is still a challenge before distance educators in the developing countries. Although tons of literature is available on this subject, the experience is mostly that of technologically advanced countries or institutions. Damayanti Devi's reflections on the theme focus on some specific issues of an Indian Open University offering science programmes. These reflections, we think, are relevant to situations where experience in offering science programmes through distance mode is still limited.

Introduction

The Indian distance education scene at the Higher Education level is a complex and multifaceted one. In recent years a number of institutions in India have started devoting attention to science programmes. The Dr. B.R. Ambedkar Open University, Hyderabad, Andhra Pradesh has the distinction of being the first to make available Bachelor's level programmes in the Science subjects and a certificate programme in Food and Nutrition through Telugu — a regional Indian language. The Indira Gandhi National Open University offers Bachelor's level programme and Certificate and Diploma level programmes in areas such as Computers, Engineering, and Health sciences. The YCMOU, Nashik, Maharashtra offers certificate and Diploma level programmes in Computers, Electronics and Agriculture.

The main lingering doubt in many minds however, is this: can quality science training be imparted through this system, in the absence of constant face-to-face interaction between the teacher and the learner, since it involves both theory and practical instruction? This doubt is rather surprising in view of the fact that many successful science programmes are offered by different Open Universities and Distance Education Institutions, eg., Sri Lanka Open University, YCMOU, India. Different approaches, methods, and technologies are developed to facilitate the two way communication of teaching and learning process in the absence of face-to-face interaction. (Rowntree 1986 & 1990, Keegan, 1990). The present paper proposes a few strategies which could be adopted for teaching the Science Programmes to an Open University learner by taking Dr. B.R. Ambedkar Open University as a case study.

Curriculum of Science Programmes at Dr. B.R.A.O.U.

Dr. B.R. Ambedkar Open University (BRAOU) formerly known as the Andhra Pradesh Open University is the first Open University in India to offer science programmes through distance mode. BRAOU has been established to provide access to higher education to a large segment of population, primarily to those disadvantaged groups living in remote and rural areas, working people, housewives and other adults who wish to upgrade or acquire knowledge and sharpen their skills. The University has established 92 study centres with 61,000 students all over the state of Andhra Pradesh, where students can participate in the counselling sessions related to their areas of studies. But of the 92 study centres established all over Andhra Pradesh Science programmes are offered through 21 study centres.

a) Admission Criteria for the Science Programmes

Admission to the Science Programme is through two different streams:

The first one is the formal stream, similar to conventional Universities where students would have completed the 10+2 course with science subjects.

The second is the non-formal stream in which the aptitude of the learner is taken into consideration : I) 50% of marks in the Foundation Course of I year indicating the learner's ability for study of Science subjects. II) The work experience in relevant areas i.e., Veterinary Hospitals, Fisheries Department, Sericulture or Agriculture Department, etc.

b) Nature of imparting the Science instruction or the Study method

The print medium is still the primary substitute of the teacher in the BRAOU courses. The printed self-instructional learning materials are supplied to the learners for both theory and practice. Electronic media, Radio, Audio and Video are the important devices for teaching in Distance Education system but they are used on a limited scale at BRAOU. Besides this, the University is conducting Contact-cum-Counselling sessions for the theory instruction — 24 sessions of two hours duration each (i.e., 48 hours) for each course, for which the attendance is not made compulsory. However, the practical contact sessions are the compulsory components with a duration of 72 hours for each course. That is, the learners have to spend an equal number of laboratory contact hours as their counterparts in the conventional system.

For the learners' convenience the practicals are divided into four groups:

1. Hands on training experiments
2. Visual experiments
3. Group experiments
4. Demonstration experiments.

These are usually conducted by using the infrastructural facilities available in the already existing institutions of Higher Education.

Evaluation

Three levels of evaluation have been devised to obtain feedback from the learners of the University.

The first level is that of the self-assessment of the students themselves based on the suggested questions, exercises, activities etc. given in every Block/Unit of the course material.

The second level assessment is done by the Counsellors at the Study centres.

The third and the final level assessment is done by the Faculty. The question paper for this is designed to test the comprehensive abilities of the learner both in theory and practicals.

In addition to all the above approaches to teach sciences through distance mode, some activities are discussed in this paper for better orientation of the learner to the learning process. Zoology courses are taken as an example.

The activities include:

1) preparation of study guides;
2) compulsory exercises;
3) notes for mental practices;
4) strengthening of the Assignment component;
5) V-mapping of concepts and activities in both theory and practical sessions;
6) sequential presentations;
7) demonstration of experiments through Video;
8) pre-training and post-training discussions;
9) personal supervision;
10) other general activities.

Suggestions to Strengthen the Existing Practices in Counselling for Improved Theory and Practice

To make the science programmes more effective and purposeful, there should be an integration between the theoretical and the practical component. To achieve this, the additional activities listed earlier can be designed as follows:

1. Preparation of Study Guides

A study guide linked with the test may be supplied to the learner, besides the course material.

The study guide may include:

- Framework for study

- Additional comments and explanations for the better understanding of the topics in the course materials.
- More self-assessment questions with answers
- Discussion of important assignments.

2. Compulsory Exercises

The student should be made to work out some compulsory exercises pertaining to practical work before s/he is allowed into the laboratory.

The exercises may relate to:

- The essential steps involved in the experiment
- The key aspects of the experimental procedures
- The theory or the principles underlying the practical exercise
- Some important applications of the experiments.

3. Notes for Mental Practice

Mental skill practice is as effective as physical skill practice to perform well in the laboratory in terms of accuracy and precision (Beasley, 1978, 1979).

The booklets may contain:

- Important structured exercises
- Procedural steps
- Important concepts

These should be prepared and supplied for mental rehearsal/practice of the learner before the practical training sessions start.

4. Strengthening of the Assignment Component by Including Activities

The assignments pertaining to each unit/course have to be prepared in specific formats, instead of the present routine ones and these may be made compulsory. It is desirable to give some weight to those assignments in the final examinations. The format of the assignments may be designed suitably for a specific topic in theory or a particular experiment in the laboratory. These assignments may be in the form of:

- figures
- sequence of operations
- applications
- tables
- numerical exercises.

5. V-Mapping of Concepts & Activities in both Theory and Practical Sessions

V-Mapping is one of the important instructional devices in science teaching (Novak.et.all 1993).

The objectives of the V-map are:

- To link the concepts and the methods
- To relate the results to the concepts
- To illustrate the key ideas of the knowledge
- To acquire the theory based practical knowledge
- To gain a holistic view of the scientific processes.

6. Sequential Presentations

Every demonstration, experiment or dissection conducted by the counsellor should be supported by the systematic presentation of the sequence of events relating to the experiment/dissection.

The supporting materials may include:

- still photographs
- visual aids and printed charts
- hand-drawn charts with some important useful hints.

This type of support enables the distance learner to understand the process step by step systematically, unlike the demonstrations in the conventional classes where only a single diagram describes the entire experiment/dissection. However, this is compensated by the teacher in conventional classes.

The model chart for the demonstration of dissection of ''afferent bronchial arteries of Scoliodon'' for example, may include the following figures:

Chart - 1 : How to fix the animal in the tray.

Chart - 2 : How to cut open the animal to expose pericardial cavity

Chart - 3 ; How to expose the heart and ventral aorta

Chart - 4 : How to trace out the afferent bronchial arteries arising from the ventral aorta

Chart - 5 : How to display the entire dissection with black papers.

7. Demonstration of Experiments Through Video

- The experiments and discussion can be shown on video stepwise as in a class room.
- Video could be successfully used to effectively save time and money in the utilisation of time and expensive experiments
- Video provides an opportunity to the learner to view the experiment a number of times staying at their own place.

8. Pre-training and Post-Training Discussions

In the pre-training discussions, an emphasis on the following aspects will be helpful.

- The salient features of the experiment
- Principles underlying the experiment
- Manipulative skills required for the experiment
- Precautions to be observed in the experiment

In the post-training discussions, the following aspects deserve to be stressed.

- Elucidation of the experiences and the difficulties, if any, faced by the learner
- Reasons for the specific personal difficulties
- Remedial measures to overcome these difficulties

9. Personal Supervision

Every student in the counselling classes should be given an opportunity to express his difficulties, problems and limitations in respect of the learning process. The counsellor should extend all the help to the student to get over such difficulties.

10. Other General Activities

- Students from the nonformal stream need prior academic counselling in the subject for proper understanding of the objectives and the skills of the practicals.
- The theory and practice should not disjoint themselves in the courses.
- Practical manuals should be highly illustrative giving sequential diagrammatic presentations.
- ''Essential key note points'' shall be given under every specimen for learner's immediate reference.

Conclusion

Several Indian institutions of higher learning are offering science programmes at Bachelor's, Certificate and Diploma levels through distance mode. In this context the print medium and the electronic media play a vital role in imparting education in the absence of constant face-to-face interaction between the teacher and the taught.

A variety of activities like study guides, compulsory exercises, assignments, notes for mental practice, and inclusion of instructional devices such as 'V' mapping and personal supervision help in imparting effective counselling for both theory and practice in science programmes.

In science education, there are two pathways. One pathway is the ''theory and concepts'' and the other pathway is the ''practical knowledge''. The quality of a

science programme can be assured only with the integration of these two pathways. Though the author's experience is with distance education science programmes, the strategies suggested in this paper are quite relevant to both conventional and distance education for imparting effective learning skills to handle science subjects.

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