



## USE OF OPEN AND DISTANCE LEARNING IN THE SKILL DEVELOPMENT OF LABORATORY TECHNICIANS

BHARAT INDER FOZDAR (author)  
IGNOU, India

### Summary

*By now, open and distance learning (ODL) Institutions have established themselves as an alternative to provide education especially at tertiary level. But from past few years many ODL institution also diverted their attention towards improving skills of teachers and industrial workforce through in-service teaching programme and skill development programmes. Yet, despite the rapid expansion of ODL institutions, policy-makers have limited evidence regarding the actual outcomes and impact of such initiatives. This paper shared an IGNOU's experience and also assessed the potential of ODL system in skill development related activities. Such ODL based model of improving skills of learners either in job or as their pre-jobs requirement has great importance and relevance in countries like India where there is an urgent need of providing, cost effective training to a large number of untrained work force and need of continuing education at different levels for improve overall their skills and enable them to be part of the productive force in fast growing Indian economy.*

### Abstract

By now, open and distance learning (ODL) Institutions have established themselves as an alternative to provide education especially at tertiary level. But from past few years many ODL institution also diverted their attention towards improving skills of teachers and industrial workforce through in-service teaching programme and skill development programmes. Yet, despite the rapid expansion of ODL institutions, policy-makers have limited evidence regarding the actual outcomes and impact of such initiatives. This paper shared an IGNOU's experience and also assessed the potential of ODL system in skill development related activities. Such ODL based model of improving skills of learners either in job or as their pre-jobs requirement has great importance and relevance in countries like India where there is an urgent need of providing, cost effective training to a large number of untrained work force and need of continuing education at different levels for improve overall their skills and enable them to be part of the productive force in fast growing Indian economy.

## **Introduction**

Over the past decades, there has been a noticeable growth in distance education around the world. This is very much evident from the emergence of mega Universities all over world like IGNOU, which having cumulative student strength is about 2 million (IGNOU Profile, 2009). Presently, ODL institutions are not only imparting education as an alternative to the formal system i.e. education in conventional courses/programmes, but also in areas skill development programmes such as vocational and continuing education, teacher education and even in high technology based education (UNESCO, 2001, 2002a and Bourne *et al*, 2005).

So far open distance learning has made noticeable contributions in teacher education. This is the area where distance education has been used extensively to provide pre-service teacher education, upgrading of academic qualification, in-service continuing professional development in subject content areas and instructional methods (Perraton, 2003, UNESCO, 2001 and UNESCO, 2002b). With rapid advancements in technology have further encouraged ODL institutions to offer programmes for improving skill needed for the work force working in industries and research labs who can contribute in the growing economy of their country. The ODL system has great potential to reach to un-reached and even marginalised and excluded groups. It can provide skill oriented like vocational and technical education and engage them in income-generating livelihood. In this globalize world, it well known fact that skill training enhance productivity sustains competitiveness in the global economy (Mishra, 1994 and World Bank, 2008). Keeping this in mind Indira Gandhi National Open University (IGNOU) is offering many programmes which are in the category of skill development, vocational and technical education and continuing education for the improving skills and capacity building of adult learners. One such programme is for the skill development of learners working in science laboratories at school and college level, research laboratories and industrial laboratories, that is, Certificate Programme in Laboratory Techniques (CPLT).

In many developing countries the laboratory technicians and assistants working in lower hierarchical levels at the educational institutions, national laboratories and industry are not fully trained; but most of them have acquired skills and knowledge required mainly through on-the-job experience. For the continuing education requirements of such technicians, distance education methodology could offer viable solution. Distance education has a close relationship with the frontiers of technology that results in synergistic effects, and suitable methods could be used for developing professional skills depending on national resources.

Like other programmes of IGNOU, the programme under investigation also follows a multimedia approach in instruction. It comprises: self-learning material, supporting audio/video programmes, teleconferencing, counselling sessions, and counselling sessions to meet specific learner needs. Teleconferencing is also used to provide greater clarity and understanding to the learners.

In this paper, we will examine the role of open and distance learning (ODL) system in providing education in the development of skills. Paper is ended with the IGNOU's experience in launching and delivery of a programme developed for the persons working in science laboratories to improve their skills so that they can provide effective and efficient services to the faculty and students in schools/colleges. This experience would be helpful in understanding the effective role of ODL system in offering skilled based programme which is also having heavily loded with laboratory component.

## **Role of Open and Distance Learning in Skill Development**

As mentioned earlier, ODL has been used to deliver education at all levels of education. This system can also be seen as a legitimate means through which to develop skills if it is implemented properly. There are many bases to support this. Firstly, most of the ODL systems have wider access and cost efficiency. Secondly, its rapid expansion in the past three decades suggests that there exists a ready-made infrastructure which can be capitalised upon to extend skill development. Thirdly, most of ODL institutions of the world are using of latest information and communication technologies (ICT). Through wider coverage, ODL systems are overcoming the gap between those who have had access to education and those who have not. Yet how effective ODL in providing education for skill development is remains an open question, and as little data exists to verify the claims made about it.

According to Moran and Rumble (2004), distance education is more costs effective and can take place while continuing full-time employment. There are many articles published in recent past, which support ODL system as a viable method for providing effectively skill based programmes. Raza and Allsop (2006) have concluded in there project report that ODL could be effective way of providing education for the development of skills required for untrined work force. They also reported some case studies of of ODL system of south east Asia region. Their study also concluded that for getting maximum benefit from the ODL system, institutions need to build bridges and collaborate more closely with public and private sector employers.

Furthermore, Fozdar and Kumar (2008) reported the staus of Indian voational and training programmes. They shared IGNOU's experience in offering a vocational programme for the development of skills of workforve working in shoos industry. The Word Bank (2008) has reported the status of skilled development programmes of India and suggested that to make the existing vocational education system relevant to market needs, a major restructuring of the system and how it is managed will be needed. If India wants to emulate countries where the vocational education system has succeeded, sweeping reforms are needed. This will require significant commitment on the part of policymakers. Many of these reforms are similar to those being proposed by the 2005 Central Advisory Board for Education (CABE) Committee report on Universalization of Secondary Education. Key among them includes:

- *Ensuring private sector participation in management of institutions and curriculum design* to ensure a direct connection to the labor market for graduates, and an effective medium for bringing about organizational and productive innovations.
- *Strengthening the general education component of these programs* for providing basic knowledge in humanities and sciences, preparing students to work in various occupations, teaching them to solve problems and encouraging them to continue learning.
- *Funding and budget allocations* - moving from a system which is exclusively financed by the government to a system which is increasingly financed by the private sector and by students paying user fees. The private sector would be willing to contribute only if they see that the system is producing relevant graduates. Students are likely to contribute if they see accrual of labor market benefits from vocational education.
- *Ensuring that vocational education is not a dead end* - allowing well performing students in the vocational education track to proceed onto higher education will ensure that the vocational stream is not seen as an option of last resort by prospective students.

Nations need skilled and trained work force for their growth. Above cited litrature clearly support that ODL system can provide skill based education if implimented with a care. Our formal education system can not provide training to desired number of skilled workers. In such situation alternative open and distance learning model can tackle such problems and

this system has has the tremendous scope in the area of skill base education like vocational education and training. ODL system is now well recognised for effective teaching learning process. So this sytem can also be used for providing effctive vocational education and training. Specialy in Developing countries where there is a need of providing training to large number of workers and with limited recourses

### **About the ODL System in India**

India established Indira Gandhi National Open University (IGNOU) in 1985 to enhance access and equality of higher education through distance mode and to promote, coordinate and determine standards in ODE systems. IGNOU provides innovative and need based general as well as continuing education to: the person from disadvantaged groups, physically challenged; homemakers; and, those, who are based in remote areas for their educational and professional development. The university practices a flexible and open system of education in regard to methods and place of learning, combination of courses and eligibility for enrolment, age for entry and methods of evaluation, etc. IGNOU has adopted an integrated strategy for imparting instruction. This consists of providing print materials, audio-video tapes, broadcast on radio and educational TV Channels, teleconferencing, video conference as also the face-to-face counselling, at its study centres located throughout the country. The University has adopted the method of continuous assessment and term-end examination for evaluation of the performance of its students enrolled in various subjects.

IGNOU has a large number of programmes, ranging from purely academic to technical, professional and vocational at various levels leading to award of: Competency Certificates; Diplomas; and Bachelor's, Master's and Doctor's degree to successful candidates. Many of these programmes are modular in nature. In the year 2007, the University has offered 129 programmes, which included 16 Doctoral level, 18 Master's level, 13 Bachelor's level, 21 Post-Graduate Diploma level, 22 Diploma level and 39 Certificate and Awareness level programmes. The University has fresh enrolment of about half million students during the academic year 2008-09. The student support system of IGNOU now consists of a network of 59 Regional Centres, 5 Sub-Regional Centres, 1468 Study Centres and 37 Overseas Centres.

People who live in remote areas find that ODL permits them to enroll in programmes, which otherwise would not be available to them. At present beside Indira Gandhi National Open University (IGNOU) there are 13 State Open Universities (SOUs), 150 Directorate of Distance Education (DDEs) under conventional system. The above said SOUs and DDEs have enrolled approximately one million fresh students in the academic year 2008-09. Only IGNOU is imparting higher education to 15 per cent of total population who is joining higher education in the country (Profile, 2008). Workplace learning is also expanding rapidly in organizations, boosted by online learning opportunities. Web-based training or E-training, an innovative approach to distance learning, can be effectively utilized for delivering knowledge to individuals any where in the country. If the developing countries want to enhance their international competitiveness for the well being of their people, they must address the concerns for skill based education like vocational education and training. The path for economic development and prosperity through the skills training and ODL as the modality for vocational education and training allows vast number of people, hitherto undetached to take advantage of education and training opportunities (Mishra, 2002). The changing skills demands due to competition and rapid market changes, especially in Small and Medium Enterprises (SMEs), calls for provision of continuous learning and training opportunities through Government, Non-government and Private Institutions. There is a need for a paradigm shift in the training approaches in the formal and informal sector for developing skills attuned to the needs of the society. All this can not be achieved by formal system.

Over 90 percent of employment in India is in the 'informal' sector, with employees working in relatively low productivity jobs. Provision of appropriate skills may thus be an important intervention to increasing the productivity of this workforce. This sector can not approach the formal system. Here open and distance learning mode institution can play important role by providing flexible and cost effective education to improve skills. For example, IGNOU along with some other Open Universities also offering successfully many programmes of vocational education and training. Presently IGNOU lays much emphasis on skill, capacity building, training, employability, life-long education and continuing education. Open and Distance Learning (ODL) system now is recognised and accepted as an important mode for achieving many of these targets. In addition to contributing to social and economic development, ODL plays a decisive role in the creation of a knowledge-based society.

## About the Programme

### CERTIFICATE PROGRAMME IN LABORATORY TECHNIQUES (CPLT)

This programme is intended for persons employed as or aspiring for employment as laboratory technicians in school or college laboratories. At present, no academic programme is available in India to train such people through the distance mode. This academic programme has been designed to train laboratory supporting staff in appropriate procedures for organizing and maintaining school/college laboratories. The curriculum for the programme was developed in an International Workshop organized by the School of Sciences, IGNOU in collaboration with The Commonwealth Secretariat, London.

The broad objectives of this programme are to:

- familiarize the learners with the basic facilities available in school and college level Biology, Chemistry and Physics laboratories;
- impart knowledge of the basics of organization and management of science laboratories;
- train the learners in the operation and maintenance of simple instruments used in science laboratories;
- enable them to develop skills in common laboratory techniques;
- train them in the procedures of procurement and storage of laboratory equipment and materials; and
- enable them to adopt appropriate disposal procedures and safety methods suitable for laboratories.

The programme is designed to train the learners to provide effective and efficient services to the faculty and students in schools/colleges.

This certificate programme is of 18 credits spread over four course and requires 540 hours of study time, which includes studying the print materials, laboratory work, attending counseling sessions and listening/ viewing audio/video programmes. The four courses are listed as follows:

Course Code	Course Title	No. of Credits		No. of Days of Practical Work
		Theory	Practical	

LT-1	Good Laboratory Practices	4	2	7
LT-2	Laboratory Techniques in Biology	2	2	7
LT-3	Laboratory Techniques in Chemistry	2	2	7
LT-4	Laboratory Techniques in Physics	2	2	7

The practical will be conducted at the study centres for 28 days. However, students working in the laboratories of senior secondary schools or colleges or universities will have the option to carry out 16 days of practical work at study centres.

### **Detail of Courses**

In each of the four courses, due emphasis has been laid on practical training through appropriate experiments/ exercises. These have been designed around the equipment/ apparatus/ concepts discussed in the theory parts. Due weightage is given for practical training in maintenance of instruments and safe laboratory practices.

#### **LT-1 Good Laboratory Practices**

This course is intended to help the learners in following correct approaches in the design, organization and management of laboratories, apart from proper maintenance of equipment and laboratory related essential services. The basic aspects of communication, information sharing and scientific reporting are described. The possible laboratory hazards, personal safety and first aid procedures as well as laboratory related laws and regulations are also discussed.

#### **LT-2 Laboratory Techniques in Biology**

This course aims at developing skills needed to organize and maintain a biology laboratory. Special requirements for lighting, seating, ventilation as well as ancillaries like museum, greenhouse and animal house have been discussed. Various methods to collect, procure, store and preserve biological materials have also been described. Emphasis has been given on the teaching of microscopy and culture techniques, preparation of fixatives, stains and slides.

#### **LT-3 Laboratory Techniques in Chemistry**

This course deals with identification, cleaning, handling, care, maintenance, use and storage of scientific apparatus and equipment in a chemistry laboratory. The course also deals with laboratory techniques such as glassblowing, preparation of solutions and various preparative, separation and purification techniques, which the technicians either perform themselves or they assist teachers/learners in doing so. Due emphasis has been laid on following proper safety procedures while working in a chemistry laboratory.

#### **LT-4 Laboratory Techniques in Physics**

Laboratory work in physics essentially involves measurement of physical quantities using a wide variety of instruments. With this in view, this course has two components covering both the theoretical and practical aspects of managing and maintaining a physics laboratory. The basic apparatus used in a school or college physics laboratory, the principles underlying their usage and their working are explained. The course also deals with how to use and maintain the apparatus in a physics laboratory.

The eligibility for the admission in this programme is XII standard pass or equivalent with science subjects. Those having two experience of experience of working in a school/college/university laboratory they can also be admitted to the programme. Minimum and maximum duration of the programme is 6 months and 2 years, respectively.

#### **Research Findings and Discussion**

Presented research is addressed the following key hypotheses:

- ODL is able to deliver educational programmes of skill development;
- The quality of learning outcomes/achievements of the completers is comparable with the other similar programmes offered by ODL Institutions.

Pass out rate of the students enrolled in CPLT programme during past four years are given in the Table 1.

**Table 1: Pass out rate of CPLT students**

Academic Year	Number of students registred	Number of students awarded certificate	Pass out rate in percentages
2005-2006	305	79	25.9
2004-2005	214	38	17.7
2003-2004	289	66	22.8
2002-2003	170	39	22.9

- Source: Annual Reports og IGNOU from 2002-03 to 2005-06

Passout rate in CPLT programme is quite comparable with the avarage pass out rate in many other certificate programme. Similar to IGNOU's B.Sc. programme the CPLT programme is also has laboratory components and its pass out rate is little higher then the B.Sc. programme. This may be because of the shorter length of the courses and the better match of materials for the skill needs of entering students. Similar conclusions were also reported by Raza and Allsop (2006), according to them technical programmes have lower completion rates regardless of the level of the programme. Further, programmes which allow a longer time for completion also have lower completion rates as one can see in the case of B.Sc. programme. From student outcome it may be concluded that student is also quite comfortable in a skill development programme similar to other ODL programmes and they did not stated any additional barrier during the programme. To further support we conducted interviews with ten learners who have completed this programme. We have enquired regarding the quality of the course material, counselling sessions and laboratory component and their expectation with programme. From those who were already in job, we asked whether programme has improved their performance and skills at their work place. Most of them agreed that course contents were of good quality. Regarding the support at study centre, they indicated that it was just average. Some told they face lot of problems in conduct of laboratory component of the course. Four of them were already in job when they enrolled in the programme, told that programme has improved their skill and understanding in

handling lab related activities. Two employed learners informed that they got promotion and high salary due this programme. To further support to these findings we have also developed a questionnaire to carry quantitative study. The result of this study may be reported during presentation of paper in the conference.

## Summary and Conclusion

Developing Nations, like India are looking to upgrade the skills of their large workforce to achieve high productivity. ODL institutions potentially can play significant roles as these institutions theoretically have a number of advantages, including cost efficiency and wider access. Along with this in many developing countries ODL institutions have established strongly and also created extensive infrastructure and reach as discussed in regard to IGNOU. This research finding provides a framework for offering a skilled based programme through open and distance learning. Similar ODL models could play important and viable role in the developments of skill of untained work force and continuing need of on-job training.

## References

- Bourne, J., Harris, D. & Mayadas, F. (2005). Online engineering education: learning anywhere anytime, *Journal of Asynchronous Learning Networks*, 9(1). Available online at [www.sloanc.org/publications/jaln/u9n1/v9n1\\_bourne.asp](http://www.sloanc.org/publications/jaln/u9n1/v9n1_bourne.asp) (accessed 1 September 2008).
- Fozdar, B. I. and Kumar, P.S. (2008). The role of open and distance learning in vocational education and training in India. PCF 5.
- IGNOU Profile (2008). IGNOU PROFILE 2008, New Delhi
- Mishra A. (1994). Case study on technical and vocational education in Asia and Pacific. UNESCO.
- Perraton, H. (2003). *Models for Open and Distance Learning 1: Teacher Education and Training*. International Research Foundation for Open Learning and The Commonwealth of Learning.
- Raza, Reehana and Allsop, Terry (2006). *Using Distance Education for Skills Development*, International Research Foundation for Open Learning (IRFOL).
- UNESCO (2001). *Teacher Education Through Distance Learning Technology – Curriculum Evaluation Cost*. Paris UNESCO.
- UNESCO (2002a). *Open and Distance Learning: Trends Policy and Strategy Consideration*. Paris UNESCO. Available online at: <http://unesdoc.unesco.org/images/oo12/001284/128463e.pdt> (accessed 1 September 2006).
- UNESCO (2002b). *Teacher Education Guidelines: Using Open and Distance Learning*, Paris, UNESCO.
- World Bank (2008). *Skill development in India: the vocational education and training*. The World Bank Report.no. 22.