

## Quality Issues in Lab. Courses of IGNOU: An Insiders' Perspective

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*Organising laboratory programmes for science courses is a challenging task. Indira Gandhi National Open University (IGNOU) has been trying to come to grips with the problems involved in implementing its B.Sc programme. The present paper addresses some of the complex issues related to the lab courses. The views expressed here are those of the authors. We hope that this paper would contribute to further discussion on the theme.*

### The Perspective

What I hear, I forget

What I see, I remember

What I do, I understand

— Confucius

Indira Gandhi National Open University (IGNOU) offers its programmes in science to a varied clientele. The profile of students includes unemployed graduates, lab technicians, people working in the secretarial and administrative wings of private and government organisations, engineers, nurses and community based functionaries. Many of these programmes have a substantial laboratory component which constitutes an integral part of the total credits. The quality and effectiveness of the lab components, however, remains an open question. Before we ask why, we should draw attention to two basic premises on which this discussion rests. They are:

- i) Science is commonly perceived as 'difficult'. For example, it requires mathematical competence. It is a hierarchical subject. This naturally gives rise to doubts as to how many students could cope with degree level science study without a formal grounding in the subject.
- ii) Science teaching at higher education involves the 'doing' of science. It is in essence a 'hands on' subject. How can 'practical' work be built into the 'delivery' of science 'at a distance'? In the context of developing countries this problem becomes even more complex as a result of limita-

tions in terms of technological resources. The questions that we would like to address here pertain to

- the relevance and contemporaneity of the lab courses
- the efficiency of the conduct of the lab courses
- problems relating to monitoring and quality assurance.

### **The Background**

For a distance learning institution the objects and intended outcomes of practical work in science courses constitute a key question. Traditionally the lab components of a course are intended to develop a taxonomy of skills such as i) manipulation ii) observation iii) recording iv) analysis v) presentation vi) experimental design vii) evaluation of information viii) data analysis ix) ambience x) and, safety awareness.

In the context of the UKOU, for example, these are the areas, i.e., skills that do require a laboratory setting — experimentation with instruments, manipulative skills, and team work — which provide the focus for the home experiment kits and Residential Schools (Bennet S. et al 1995).

In the developing countries these strategies may pose a few problems. The residential schools are expensive for the students as well as the institution. The question of affordability looms large in countries with limited resources. And the home experiment kit is yet another story.

The size, complexity and level of sophistication of home kits vary greatly. For example, the science foundation course (S 101) of UKOU uses a typically high resource kit. It contains over 220 items ranging from a spectroscope to a razor blade, a chemical balance to filter paper. In addition about 60 chemicals are issued with the kit. A low resource kit, on the contrary as used by a statistics course consists of one time only — a random number generator that looks rather like a child's spinning top. Alternatively, home kits might include software such as an audio cassette which talks to students through experiments designed to reveal the material properties of familiar domestic items.

### **The purpose**

The purpose of the home kits is to give the students a practical experience of some aspect of the course. Course units are written to develop a theoretical understanding of a course topic or theme. The home kit complements the course units by allowing the student to observe, explore or analysis a 'real world' situation related to the topic being taught. The uses for which the Open University kits have been designed include aural perception and teaching musical score reading, investigation of the inheritance of human traits, analyses of electronic signals and simulation of the air traffic control system at Heathrow Airport (Greenfield, D. 1984).

### **Advantages**

- i) A major advantage is that each home kit is tailored to a specific course. The practical work done by the student relates to the course goals. Further, a television programme might show an industrial process that the students handled on a small scale in their kitchen. A radio programme might contain an interview with a researcher discussing some of the problems related to the work. Integrating the presentation media in this case has a mutually reinforcing effect.
- ii) Because students retain the home kit for the duration of the course, they have continual access to it. They are, thus, in a position to make use of it when and how they like. The resultant sense of achievement (on handling home kit activities successfully) has a strong beneficial effect on their study attitudes.

### **Disadvantages**

The limitations of home kits spring from the students perception of their role in the study programme rather than the kit's value in terms of teaching techniques. Indifference on the part of the students can be a major limiting factor. Apart from avoidance, the cost of home kits can prove a disadvantage. Thirdly, conducting home kit activities in isolation with no 'expert' on the scene might be a handicap to a naive learner. Further there might be other context-specific problems which may arise only when the situation is put to test. We give a case in point here with an example from the Open Learning Institute, Hong Kong (OLIHK).

Home kits can be expensive to purchase. Secondly the shortage of space in the student's homes became a real constraint. The typical OLIHK student is likely to be sharing a 500 sq. ft apartment with either a few mates or a spouse, young children and may be even their grandparents! Space to conduct home experiments is usually terribly limiting... Practical training is provided either in OLIHK's laboratories or in those rented from other tertiary institutions... A positive outcome of this change is that opportunities are created for students to interact with peers and tutors at these lab classes. Additional support is also provided through the presence of experienced lab supervisors and technicians. In general, Hong Kong students prefer attending practical institutional labs to using home experiment kits. (Chandra and Wong, 1995).

### **The IGNOU Scene: An Overview**

In the case of IGNOU, the lab components are looked after jointly by the respective Schools of study and the Regional Services Division. The students are expected to work on the practical components in various study centres (situated in tertiary level educational institutions) under the supervision of academic counsellors (practising teachers in the campus-based institutions who work part-time for IGNOU). A stu-

dent of B.Sc programme has to each 24 credits of Foundation course, 56 to 64 credits of Electives and 8 to 16 credits of Application Oriented courses that would make a total of 96 credits. A range is indicated for the choice of credits in electives and application oriented courses. The choice of electives could be made across different disciplines of science to enable them to have specialisation or a generalised approach (Kavan's 1995). For the non mathematics electives, a minimum of 25% of the credits should be earned through the laboratory courses. The situation at present in IGNOU regarding the practical components of programmes demands a closer look. The reasons are many. We raise some of them below for discussion.

### **Location of Study Centres**

The study centres of IGNOU are, by necessity, located in the tertiary level institutions of campus-based instructional system. Here we encounter a rather unique problem with regard to the lab. components. We say 'unique' because this problem does not arise in relation to the other counselling sessions held for non-science courses. The curriculum of IGNOU is its own, designed for flexibility. However, the technology available in the labs where the practical sessions are conducted is hardly the state of the art. A pervasive resource crunch has often been cited as the reason why the technology has not been updated. So the irony continues in so far as only the curriculum gets updated from time to time, the laboratories remains as they were a few decades ago. The lab courses of IGNOU certainly suffer on this account. In other words, IGNOU is forced to design its lab courses depending on the facilities available at the majority of its study centres. Any scope for innovation or introduction of new technologies or even an updating of existing technologies is next to impossible, as it is not economically viable for IGNOU to equip the laboratories in the study centres.

### **The flexibility issues**

In accordance with the mandate given by the parliament, IGNOU has attempted to introduce maximum flexibility for the students in the choice of elective courses and lab. components. The wide range also necessitates that the academic counsellors in charge of the practicals should be trained for the various eventualities. Here again there is a lacuna. The orientation given to the academic counsellors is short, general in nature and can only give a broad outline of what is expected of them. This can not be called adequate preparation to what actually happens during the conduct of practicals.

At present, the laboratory courses are being conducted in all the forty two science study centres of IGNOU. The science study centres constitute only about 20% of all study centres of Bachelor's Degree Programme. For the current academic year the number of students who have registered themselves for ten different laboratory courses in the areas of Physics, Chemistry and Life Sciences range from 65 in PHE 12(L)\* to 1270 in CHE 3(L)\*\* with an average of 402 students for 10 courses. One of the issues that is debated is whether the lab courses should be held in all study

centres or they should be confined to a few of the centres that have better facilities as well as the student strength.

Confining to a few centres would tantamount to causing inconvenience to the students as they have to travel longer distances and be away from their homes/jobs for longer periods. Also with only a few centres activated the number of students per centre is larger and since laboratories can accommodate only a limited number of students, the study centres are expected to run each course in two or three batches, making it difficult for them to spare the laboratories for extended periods. In one of the centres this year two different lab. courses were conducted in one and the same laboratory at the same time to save time and in another centre over one hundred students were accommodated in one proper laboratory and a small make-shift laboratory. No doubt, such measures are likely to lead to dilution of standards. A major constraint in running the course in a large number of study centres is that of effective monitoring.

There is another dimension to the flexibility criterion and this relates to the choice of courses available to the students. The present system of flexibility in the choice of course allows a student to choose the theory course and lab courses in a very disproportionate manner. Out of 56 to 64 credits that a student should opt to complete the B. Sc programme, he/she may opt for all the 34 credits of lab courses that are currently being offered and only the rest could be the theory courses. As a matter of fact, there are some students who have completed a number of lab. courses in excess of the theory courses. The flexibility in the programme has led to the choice of those lab. courses in which students may not have any theory background. While there could be an argument that such a background may not be required for some lab courses, for certain others the carrying out of the experiments without comprehending the related theoretical concepts would only mean going through the motions mechanically. There are students who have opted for LSE04(L)-Lab. course - I of Life Sciences without having undergone LSE-03 Genetics course, one of the courses to which LSE 04(L) relates to an LSE 08(L) - Lab course - II without having opted for LSE-05-the Physiology course. Similarly one could opt for a lab. course in organic chemistry without opting for a corresponding theory course. These anomalies need to be given a serious thought and a procedure needs to be evolved to offer the theory and the related lab. courses comprehensively as a package.

### **Towards Solutions**

What we propose here is not to be taken as a 'ready made' solution to the problems outlined about. Our intention is to open up a debate/discussion on the various issues, and this part of the article should be taken as such.

### **Opening up Laboratories at Regional Centres**

If the primary problem is to be taken as the out of date equipment/set up available at rented labs, we could say that the creation of lab. facilities in Regional Centres

would solve the problem. On the positive side, the institution, in this case perhaps IGNOU, would be able to make available to its students state of the art equipment and facilities. Course-specific requirements, if any, can also be met more meticulously. However, a significant consideration in this respect would be the substantial initial investment that the institution will have to make in order to set up the laboratories.

### **Intensive Training and Frequent Updates for Academic Counsellors**

If the problem, on the other hand, lies with the matter of training the counsellors, this might well provide a solution. At the moment, the academic counsellors of IGNOU are practising teachers in the campus-based system. They are given a short orientation in adapting themselves to the needs of the distance education system. Our argument here is that this may be inadequate. It may well be worth while to consider longer, intensive training packages for the academic counsellors in the place of a mere orientation. This would invest the counsellors with a wide array of skills. Also they would have a greater understanding of the requirements of the courses they are to handle.

Further, there should be frequent updates on the initial training. This will hone/fine-tune their skills on the one hand and keep them abreast of the changes/revision of the courses on the others.

### **Course-specific allocation of study centres**

When a study centre is burdened with the prospect of conducting 10 different lab courses in a year (the numbers may increase further in future) accounting for 34 credits and requiring 17 weeks of work, the coordinators find it difficult to make available the laboratory-accommodation for such a long period of time. Simultaneous conduct of lab. courses in Physics, Chemistry and Life Sciences inconveniences the students as they have registered for more than one lab. course in a year and there is an overlapping of dates in the conduct of different lab courses. Essentially the problem calls for further decentralisation, meaning that there is a need to identify exclusive laboratory centres. Thus, the task of conducting the laboratory courses may be distributed among 3 or 4 centres in a given place, thereby lessening the burden on a single study centre. It is to be conceded that more the number of lab. centres, the task of monitoring also becomes more involved and complicated. But taking into account that such an approach would be learner-friendly as well as would ease the burden of existing study centres, it is worth giving it a try.

### **Monitoring**

Effective monitoring is perhaps the most significant means of ensuring quality/standards in any given situation. The various delivery mechanisms of the

distance education mode need to be monitored regularly and closely. There are certain specific problems in the monitoring of the conduct of lab courses in the study centres. These problems pertain to the management of human interests, resources and time budgets. For example in IGNOU, the monitoring falls under two distinct categories — academic and administrative. The Regional Services Division decides on the broad dates for the conduct of lab. courses in a year. These dates span around six months — say from July to December. It also receives confirmed schedules from the study centres, prepares the budget, allocates finance and identifies the examiners for the assigned experiments on the last day of the course — all part of administrative monitoring. The faculty of School of Sciences should be vested with the responsibility of academic monitoring. The counsellors' manual for lab. courses does provide adequate guidelines for carrying out the experiments. Nevertheless, there is a need for the faculty to visit the study centres while the lab. course is still on. Some of the problems faced by the counsellors related to the allocation of 8 hours of work to the various activities such as the briefing the students, viewing the video programmes, recording of the observations and results of the experiment, writing a brief discussion and the actual performing of the experiment by the student. Some counsellors tend to wind up the work much earlier than the scheduled time in a day. Non-availability of certain equipment or chemical with the study centre and incompatibility with the coordinator are certain other irritants that hamper the progress of the lab. course. In all these cases the learner is the ultimate sufferer. The faculty during their visits can help to sort out these problems and ensure a smooth conduct of the course. More importantly this is a fine opportunity to interact with the students as most of the registered students attend the lab. sessions which is a rare phenomenon when one goes for academic counselling of theory courses. The faculty could obtain a first hand-feed back on the course itself and would enable them to update or modify the course suitably in future. In fact, during such visits the faculty could help the students to solve their problems relating to theory courses, such as choice of suitable electives, combination of electives that would enable them to specialise in a particular area etc. The counsellors themselves are of the view that the presence of IGNOU faculty during lab. sessions besides boosting their morale provides the right atmosphere, especially during the last day examination.

### **A Matter of Pedagogy?**

As we worked our way through an array of issues outlined above, certain points of concern posed themselves in our path. They are as follows:

The self instructional material (SIM) as a package is indeed a well defined entity. With the advances in educational technology, the SIM package today is the sophisticated tool which can transact the content of most theory-based courses. But, what of the practical components, such as lab courses? If we concede that the delivery

mechanism of the lab courses is relatively ineffective or imperfect, would we then agree with the view that there is a gap here?

As a corollary, does it then follow that there is an ambiguity in terms of excellence at completion of a programme? The distance education system can only offer exposure to laboratories in a series of non-contiguous, brief encounters. This is a radical departure from the practices and approach of the conventional, campus-based system of instruction. The question here is, whether the learner may perceive a lacuna or uncertainty in his/her own levels of competence on completion. This needs a careful consideration because it touches upon a fundamental issues of pedagogical effectiveness.

However, the last word on these issues may well be that of Lord Perry's — open and distance learning is perhaps "the most difficult way yet invented to gain a degree" that succeeds so often in achieving the idealistic goals of education.

Science programmes in the distance learning systems offer an opportunity to those students who are interested in 'how come'? — those elephant's children<sup>1</sup> for questions never satisfactorily answered. These programmes offer them a valuable tool of being able to experiment with things and find out possibilities in areas that catch their fancy. The tools of pedagogy, then need to be fine — tuned to meet this objective in the years to come.

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1. In Kipling's 'Just So' stories, the Elephant's child stands for insatiable curiosity.

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