

# The Importance of Research in Developing Countries

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## 1. INTRODUCTION

The question is often asked - "Is research in a developing country worth while?" The question is sometimes posed the other way, should not a developing country concentrate on other tasks, and leave research to the more developed countries? The question, whichever way it is phrased is one of considerable importance when considered in the context of the build up of a university - particularly in connection with technical education. Thus, engineers are necessary in a developing country to design, build and maintain civil engineering works, electrical power stations and many other purposes. The word "engineer" here is used in a collective sense, for there are, in fact, many different categories of workers required for an engineering project. These are:-

- (i) the professional engineers themselves;
- (ii) the technicians; and
- (iii) the artisans.

Obviously it is unsatisfactory to provide educational facilities for one class at the expense of one of the other classes. All the categories are important. One type of personnel cannot work without the others, although it should be realised that many more technicians are required than professional engineers, and many more artisans are required than technicians. Clearly therefore the educational system needs to be geared to these requirements.

Trade schools are often up-graded to technical colleges and in some cases technical colleges are up-graded into universities. This can be a very good thing, but it is no use penalising the training of technicians to get trained engineers, or to reduce the supply of trained artisans to supply more trained technicians, unless the training facilities for the lower grade of person is already more than sufficient. What all this amounts to is that "first things must come first!". It is the same in research. When UNESCO helps to build up a technical university, it concentrates first on building up the laboratories and the undergraduate teaching,

and only when the undergraduate courses are operating well and a supply of well-trained graduates is beginning to result is the second stage - the setting up of research facilities for the training of research scientists tackled.

Now, we can come back to the question - "Is research important in the developing countries?" I think it is, but it must be kept in proportion. Clearly, it would be unreasonable for all graduates to tackle a research course after obtaining a first degree in science or engineering. This would be too heavy a financial burden on the exchequer, and so this privilege must be reserved for the relatively small minority who may be undertaking some research occupation in their later life.

## 2. TRAINING IN RESEARCH METHOD.

I must say more about this later in my lecture, but for the present I would like to discuss another but related matter, namely that some training in research method is desirable, to say the very least, for all science and engineering students whatever their future occupations. The standard method of dealing with this matter in many universities has been to introduce project work into the undergraduate courses. Every student at the University who comes under my direction, apart from carrying out a number of set exercises to obtain proper training in the use of scientific equipment appropriate to his courses and the various measuring techniques employed, has a project to do. This is a major piece of work, taking of the order of 50-70 hours. Each student has a different problem, which he (or she) has to carry out on an individual basis. It may involve theoretical study, design work, constructional and experimental work, measurements and the drawing of some conclusions. It is, in fact, a small piece of research. Each student has to write up a detailed report on his project. He also has to make an oral presentation of his work before the other students and his supervisors and stand up to their questions. He has to gain a pass in his project in order to



graduate\*, and he is awarded marks according to the quality of his work, his report, his oral presentation and the way he stands up to questions.

I consider that projects as we operate them are a real success. They help to develop the student's initiative, his knowledge, and his ability to express himself both in writing and in speech.

### 3. POST-GRADUATE RESEARCH.

Returning now to research in the universities at the post-graduate level, obviously the immediate needs in a developing country are for engineers to design public works schemes, to operate the various development schemes and to help the various manufacturing concerns in the country to get going. In the early days much of the highly technical equipment required will be designed and manufactured in one of the more developed countries, and so engineers tend to be required, initially at least, to man, operate and maintain technical equipment which may have been designed elsewhere. I consider this the right point of view to adopt at this stage.

However, one thing that it is very apparent to all is that developing countries must concern themselves first and foremost with their natural resources. This does not, however, mean selling these natural resources abroad as raw products. No, to get the maximum benefit, the raw products must be turned, if possible, into manufactured products and then exported. I believe this is one of the main reasons why developing countries should encourage a proportion of their better graduates to have training in research method. However, it is equally important that a proper proportion of these young men do get interested in projects which will be helpful to the country's further development.

To explore this matter further it is worth considering how scientific and technical advances are made in applied science. In many instances it seems to be a matter of a man with a problem which needs to be solved, coming into contact with a technical specialist with the required knowledge which may be used to solve this problem. Many problems have remained unsolved for a long time because this necessary contact between the man with a problem and the man with the knowledge of the technique for solving this problem failed to meet.

If this is admitted, how then are we to avoid these delays and make sure that development advances as quickly as possible. It is possible to encourage visits from as many international experts as possible, but this means dividing the rewards! Whilst I think this method should not be neglected, something should be done about the other method as well, by choosing a few people each year, who are given some research training, and who one

hopes eventually become experts in one field or other.

Well, this covers applied science, but what about more fundamental work in science. Can a developing country really afford to indulge in fundamental research, and if it can, what in any case, are the rewards of pursuing this course? The first argument which is always used here is that teaching and research are complementary; working on the one helps the other. Research and advanced study in the more fundamental parts of the subject are, in any case, very appropriate to the work of the universities, and help the lecturing staff to inculcate in their students the proper spirit of inquisitiveness, of systematic enquiry and the desire to understand. However, it is much more than that! Good results in fundamental research brings world recognition and this can be very important to a developing country wanting to encourage financial investments. If country 'X' can make fundamental discoveries, it must obviously have good potential manpower. It will be argued, to make its investment succeed.

Apart from this, discoveries in fundamental science have a habit of becoming of importance in applied science and industry at not too late a stage, as recent events have shown us on many occasions.

A point of special interest is that results in fundamental science are just as likely to be uncovered in one place as another. No one location, or one person, or one nation has the monopoly. One can go further, and say that no one sex. It is interesting that occasionally a really outstanding woman scientist comes forward, and in some of these cases it may be noted that even her possibility of scientific education has resulted from an accident. There are not so many people of really outstanding ability that we can afford to neglect them. It is therefore a worrying thought that when education has to be on a selective basis because of the relative poorness of the country, that we may, in fact, be turning down someone who could develop into a genius. There seems to be no way out of this dilemma, but to work hard for the day when at least some education is available for all!

### 4. THE LAGOS CONFERENCE.

It is appropriate at this stage to mention the work of UNESCO and E.C.A. in surveying the African scientific scene and arranging meetings to encourage Governments to expand scientific training and research on the African continent. These efforts culminated in the Lagos Conference\*\* held on July 28th to August 6th, 1964.

This conference was very successful and recommended establishing a network of national and international scientific institutions of the

\* This is apart from passing the normal written examination papers on all the general subjects appropriate to his degree.

\*\* See "Final Report of the Lagos Conference" published jointly by UNESCO and ECA.



highest possible standard for training and research in natural resources in Africa. It is useful to recollect that natural resources cover a very wide field and amongst the subjects which received some attention at Lagos were cartography, hydrology, energy resources, arid zone research, savannah zone research, humid tropical zone research, geophysics and siesmology, mining and economic geology, volcanology, soil science, irrigation and drainage, oceanography and marine biology, plant pests, forestry, taxonomy and ecology, flora and fauna, including wild life management, veterinary science, range management, limnology, tropical and sub-tropical medicine and parasitology cancer research, building materials and documentation

There was considerable discussion about the actual numbers of research workers in the African continent, and what the aim should be over the next few years. It was finally agreed that the aim should be to expand the number of scientists so that a target of 200 scientists per million of population for Africa as a whole should be reached. It was also agreed to establish national manpower registers to assist in attaining this objective.

Amongst the other important matters discussed were:-

- (i) UNESCO and OAU to enter into formal co-operative and collaborative arrangements in connection with attaining these objectives;
- (ii) UNESCO to undertake studies in the scientific manpower needed in Africa and the budgetary resources that research calls for, together with aiding countries, at their request, in the organisation and planning of scientific research and the establishment of the new national institutes referred to above;
- (iii) UNESCO, ECA and the UN Agencies and other professional bodies along side the member states outside Africa to co-operate with the African continent through the provision of financial and technical assistance in the realization of the Lagos Plan.

Progress is being made with the Lagos Plan, but perhaps in the discussion period we can consider this matter further.

## 5. THE 'PUGWASH' CONFERENCE.

The subject of tonight's lecture also received consideration at the recent Pugwash Conference held in Addis Ababa, December 29th 1965 to January 3rd 1966. They gave special attention to the organisation of institutions and research in developing countries. They pointed out that the developing countries are at widely differing stages in the advancement of science and vary in the availability of scientific manpower and equipment, the degree to which science is organised and the size and quality of the supporting educational system. It was therefore agreed that ready-made plans which would suit all countries cannot be provided.

However, the conference did come out with a number of suggestions. They considered that research was important in developing countries, and that in the planning and co-ordination of scientific research in developing countries some type of advisory body at the highest level of government should be provided. They were energetic in pointing out that the organisation of research should be designed to liberate the creative energies of scientists and provide them with what they need for effective work. They considered that a rigid bureaucratic organisation which does not sufficiently devolve responsibility on working scientists leads to grave frustrations and should be avoided. They also pointed out the important advantages to be gained by the development of a team spirit, a multi-disciplinary approach, the efficient use of equipment and the proper evaluation of research. My own experience is very much in support of these conclusions, and I would also emphasise another matter which was discussed. This is that in the early stages of development, efforts should be directed to the solution of urgent national problems, and they should be selected after a realistic appraisal of the resources available for the execution of the work.

The 'Pugwash' Conference covered a great deal of the ground already covered by the Lagos Conference, and it is not surprising therefore that they came to similar conclusions, and, in fact, commended the actions already taken by UNESCO and ECA.



