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TECHNOLOGICAL EDUCATION AND INDUSTRIAL DEVELOPMENT*

THE financial year 1945-46 has been marked by a remarkable progress in the planning of technological education and in implementing some of the plans. Almost all the provincial governments have published their post-war reconstruction and development schemes, and some of them have published the reports of their technical and industrial education committees. These envisage a large increase in the facilities for technical education of all grades and are based on the conviction that intelligent planning of vocations and of national resources both material and human is indispensable for rapid progress. I may give some relevant information from personal knowledge. In Bengal, plans have been practically approved for transforming the Sibpur and the Jadabpur Engineering Colleges beyond recognition and for improving the Calcutta Technical School into an up-to-date polytechnic. In Madras, the University has already opened centres of advanced training in Communication Engineering, Chemical Engineering and Leather Technology; and considerable progress has been made in starting new centres of technical education at Coimbatore, Vizagapatam, Bezwada, Calicut and Annamalai University. In the Bombay Presidency, the Engineering College at Poona and the Victoria Jubilee Technical Institute are rapidly implementing their well-considered schemes of development, and the University Department of Technology in its spacious new abode at Matunga, has, with the support of private benefactions, added to its well-established courses of Textile Chemistry and Chemical Engineering, the following new courses—technology of intermediates and dyes, pharmaceuticals and fine chemicals, foods and drugs, plastics, paints and varnishes and oils, fats and soaps. Mysore is building a magnificent occupational institute at a capital cost of twenty lakhs of rupees, a silk institute at a cost of seventeen lakhs of rupees, and is reorganising its textile institute at a capital cost of seven lakhs of rupees. The Central Provinces intend to establish "a national grid of technical education which will carry a constant flow of power into industry and commerce", and have planned the establishment for four polytechnics at Nagpur, Jubbalpore, Amraoti and Raipur and are enlarging the existing College of Science into a College of Science and Technology. The Behar schemes of technological education have been conceived on a more modest scale, specially in view of the possibility that her mineral resources may make her the hub of the industrial life of India. I believe other provinces and States are also busy planning similar developments. Nor have the Government of India at the centre been lagging behind. The Delhi Polytechnic is being

* Extracts from the Presidential Address delivered by Sir J. C. Ghosh, D.Sc., F.N.I., at the Annual General Meeting of the Association of Principals of Technical Institutions (India), March 1946.

expanded and equipped on up-to-date lines at a capital cost of twenty-three lakhs of rupees. Funds have been provided for opening in the Indian Institute of Science, Bangalore, departpartments of Aeronautical Engineering, Internal Combustion Engineering, Metallurgy, High Voltage Engineering and Chemical Engineering, and the services of three experts from England have been secured for the first three departments. A scheme for opening in the Indian Institute, a department of Power Engineering is also under consideration.

The Government of India, however, are not satisfied that these provisions are enough. There are no two opinions now regarding the urgency of India's industrial development. The Defence Services are convinced that they can only be effective in co-operation with modern industries producing inexhaustible supplies at their rear. And even a much maligned Tory Secretary of State did not hesitate to declare in 1943-44 that "India has in her all the latent resources of raw materials, of power and of human skill to make her a great industrial country. The development of her own industries to the fullest possible extent, both for their own sake and in order to raise the standard of living of her population, is the natural and proper ambition of all patriotic Indians. I can say that the Government of this country (Britain) naturally want to see Indian industry developing to the fullest. The last thing industrialists in this country have in mind now is the idea that British export trade can best prosper by India being held back in the course of her industrial development". Effective industrial development is not possible without adequate number of trained industrial personnel. As a matter of fact, Government are convinced that finance will not be so much of a bottle-neck in post-war development as dearth of qualified technical personnel. The Indian Scientific Delegation which visited U.S.A. in the winter of 1944-45 were struck by the immense scale on which technological education and research had been fostered in that country. Following a discussion in the Board of Scientific and Industrial Research, the Hon'ble Sir Ardeshir Dalal felt that the time was now ripe for establishing in India a technological institute of the very highest grade comparable with the Massachusetts Institute of Technology. The Deparment of Education had already come to a similar conclusion; and accordingly a committee, representative of all interests concerned namely, business, applied science, technology, etc., met in April last and generally agreed that the "existing facilities were entirely inadequate both in quality and quantity to satisfy India's post-war needs." They expressed the opinion that in view of the size of India and location of her industries, the provision of four Higher Technological Institutes--one in the North, one in the East, one in the West and one in the South—would be necessary. They have suggested that one institute in Calcutta should be taken in hand immediately, and another in Bombay either concurrently or as soon after as possible. Preliminary estimates indicate that each institution of this type will require a capital expenditure of the order of 3 crores of rupees and a recurring expenditure of 67 lakhs of rupees. Considering the importance of the problem and its significance in our industrial structure, such expenditure is very much worth incurring.

Even if, as we hope, adequate funds are available, success of technological education of every type will depend on three factors—(1) recruitment of proper staff, (2) recruitment of proper students and (3) planned dovetailing of education with gainful employment. These are constant sources of headache to me—probably to all of us.

It often happens that the type of men we wish to have in our staff will refuse to respond to an advertisement, but can be had only after delicate personal negotiations. The public are on the other hand suspicious—and justly so, with so much nepotism evident in wartime—and demand that every appointment should be made in accordance with the rigid methods prescribed by the Public Service Commissions. I doubt if Sir Asutosh Mookerjee could have gathered round him such a galaxy of talent when he established the post-graduate departments of the Calcutta University by following such methods. I wish we could, in course of our deliberations, suggest a method of recruitment which will combine the flexibility of private negotiation with the scrupulousness of public service procedure.

It will also be unwise to ignore the existence of an unfortunate feeling in the country that foreigners should not be employed in important positions in the educational world. This is a short-sighted view which originated in those days—not long ago—when many third-rate British educators were appointed members of the Indian Education Service and automatically became senior to the best indigenous scholars, who had taken to education as a profession. One need not apprehend that such things will again happen in future. In our recent tour in the U.S.A., which is the most advanced country in the world in the field of technical education, we found that many European Professors of established reputation have been employed by the authorities, in the educational institutions and even in research projects of war-importance. To-day Russia is reported to be "kidnapping" the German scientists from her zone of occupation to serve Soviet technical institutions and industrial enterprises. India should not hesitate to invite experts of high standing from every part of the world, if necessary, for affording equal opportunity to Indians of all classes to acquire the highest technical knowledge and skill in their own country. It pays better to engage a foreign expert on £2,000 a year to train a dozen talented young Indians in the country itself than to send the same dozen overseas for similar training at a total cost of £6,000 per year.

This naurally brings me to a discussion of the problem of sending Indian students for training overseas. The wisdom of such a policy has been questioned recently. People should be assured that it is purly a *temporary* measure designed to train personnel required immediately for staffing our scientific and technical institutes and providing technical personnel for our rapidly developing industries; that Government fully recognise that public funds will be far better spent in equipping and staff-

ing first-rate technological institutes and scientific laboratories in India itself than in maintaining students abroad. Our memories of what happened in the past in this connection have not been altogether happy. Mediocre youngmen from well-to-do families have often gone abroad and on their return, with a degree from a foreign university, have been placed in responsible positions over the head of far more brilliant youngmen who have been trained in Indian educational institutions. Our appointing authorities have invariably ignored the fundamental truth that talent is a part of one's heritage and that education can only bring out latent talent but cannot, as the Bengali saying goes, make a horse out of an ass. A young man with an indifferent record of work in the educational institutions of our country must never, by virtue of some foreign degrees which he has acquired later by utilising his privileged economic position, be allowed to supersede the claims of those who were his betters in India, for responsible appointments. A clear enunciation of this principle will go a long way to remove the job-hunting psychology of young Indians going overseas. They will then try harder to master a subject or a technique than to get a mere degree during their sojourn abroad.

Selections for admission to all grades of technical institutions should be made purely on merit subject to the condition "that some proportion of the seats should be reserved for the educationally backward classes so that in due course the general level of education throughout may be raised". In the case of institutions maintained by central funds the student population should, as far as possible, be representative of all parts of India. I lay great stress on the provision of merit-*cum*-poverty scholarships. The worth of a State is the collective worth of the individuals constituting the State. Science is definite that ability is very widely distributed in the community, and that it would be of the greatest advantage to the country as a whole if opportunities for satisfactory training and scope for the play of such ability are most widely spread. The aim should be that every child regardless of religion, caste or income of parents be educated to the limit of his abilities. As a practical approach to that aim, our educational policy should ensure that poverty becomes no bar to talented boys rising to the topmost position to which they are entitled by virtue of their ability and character. This is the least that we should do in India to restore social justice. The provision of 400 merit scholarships and 400 poverty scholarships for a student population of 3,000 in the Higher Technological Institute is, therefore, very welcome.

We now come to the crux of our problem—integration of vocational education with gainful employment. The following observation of "Eavesdropper" in a recent issue of *Indian Finance* is worth quoting :—

"For centuries, education meant only the acquisition of the habits and mental outlook and equipment of a scholar. It did not include the capacity to make a living by giving the rest of society some consideration for letting you share in the total stock of food and clothing and other requisites of life. Indeed, work and the capacity to work were looked down upon by more than one race in history. Science languished for centuries because of man's contempt for manual work; and in India, science was virtually killed by confining manual work to the lowest class of Hindu society. The upper classes all the world over looked down on work; and the slump in self-esteem, which a consciousness of parasitism might cause, was sought to be prevented by the emphasis on the development of the mind, of culture and the like. Where culture was accompanied by pretensions to otherwordliness, the danger of education being purely lettered was even greater. Talks of true dignity of work were largely a fashionable bourgeois fetish, till the higher classes had to engage in manual work, if not for its own sake, at least as a necessary basis of technical and scientific knowledge. When the educational system supported by the State had to cater to the needs of children of the lower middle and the working classes, work and skill in work came to be included within educational aims and purposes. Training took a high place by the side of learning. The practical and social purposes of education began to be taken notice of as much as the ideal and the individual. The commonest error is to suppose that employment depends upon the content of education or the nature of the training, and not the demand for either. The error was not brought home till it was found that men with technical training had no better prospects of employment than men with a purely liberal education. The success of the educational system, from the standpoint of employment for its products, depends upon an economic organisation capable of absorbing the young men as they finish their courses of study and step out of their colleges. The student of to-day is the worker, even more than the citizen, of tomorrow. His place in office or factory must be ready there for him, earmarked well in advance of the completion of his studies. But the school or college will train him all the better for knowledge of the place he is to fulfil.

"The strong point of economic planning is that it brings production and employment together in the closest possible relation. It guards against a divergence between production and consumption by security of employment, and through it, steadiness of demand. And it ensures employment, not only by having an adequate programme of production, but also by ensuring employability. The primary function of an educational system which is designed as part of an educational system which is designed as part of an economic plan is to ensure the employability of its products at all levels and of all grades. The educational facilities will be determined by the proportion in which qualified men of various grades of attainment will be required in the different professions and crafts. It will ensure that the students entering the various departments do not exceed or fall short of the requisite number. It will be capable of speeding up or varying or intensifying the training of the students in each grade, when the progress of the plan requires such action to be taken. In other

words, education will be the handmaid of economic planning."

The sudden termination of hostilities in the East has made difficult transition of war-time industries to peace-time conditions. It has been estimated that 8 million persons in India are in the process of becoming unemployed due to cessation of war activities—about 7 millions engaged in small-scale and cottage industries for the production of goods required by the defence forces, ½ million in large-scale industries, ½ million engaged in transport, trade and office-establishments, and 1 million by demobilisation from fighting forces. 250,000 men in the last category, whose claims for re-employment should be given the highest priority desire to be absorbed in technical jobs. I do not know if any short-term plan has been prepared by Government to ameliorate this situation. My personal experience has been rather unfortunate. I know many employees in the Hindusthan Aircraft at Bangalore. Out of the 12,000 technical men there, about 10,000 have been discharged already. Under the stress of the war, we opened in the Indian Institute of Science, a department of Aeronautical Engineering equipped with a large wind tunnel and were admitting 12 graduates in mechanical engineering of Indian Universities for a sixteen month's course of intense training in Aeronautical Engineering. As long as the war lasted these men were immediately absorbed in Aircraft establishments and we were even encouraged by such appreciative remarks:—"From what I have seen I can assure you that your ex-students are a credit to the Institute. I hope they will eventually form a sound nucleus on which to build up the aeronautical engineering industry in India. This industry must sooner or later become of primary importance". Most of them have now been thrown out of their jobs and we do not know what the present trainees are going to do. The trouble is that war being now over, the Bureaucracy may again forget that time is the most valuable asset in the life of a nation as of an individual, and they may again take upon themselves the duty that we make no mistakes, and make no wrong moves, with the result that the pious wishes of a Viceroy or a Finance Member may not get a chance to be translated into actual deeds. A practical idealist is he who, while aiming at the very best, is often satisfied, for the time being, with the second or third best; a short-term plan of post-war development covering all sectors of national life, quickly evolved and capable of immediate execution, is the need of the hour. We hope such a plan would be forthcoming soon.

VEGETABLE GHEE*

SPECIAL significance attaches to the Joint Discussion on "Vegetable Ghee", held during the Science Congress Week, in view of the increasing number of vegetable ghee factories which the Central Government are encouraging to be brought into being. The problem of the nutritional value of vegetable ghee was discussed in all its bearings and it was felt that the widespread and unrestricted employment of vegetable ghee in the Indian dietary, in absence of an authoritative and trustworthy pronouncement if its nutritional value or at least its innocuousness, was fraught with danger to national health. As Professor Damodaran of Madras pointed out, it is curious that in spite of the growth and prosperity of the industry, there was little information regarding its nutritive value. Powerful vested interests have no doubt conspired to ignore certain facts about vegetable ghee since they would adversely affect their industry.

It is fortunate, however, that a few scientists in this country have interested themselves in the problem of determining the nutritional value of this product. Dr. V. N. Patwardhan (Bombay) who spoke at the symposium revealed that vegetable ghee adversely affected growth and reproductive function of animals. His researches have demonstrated that litters bred of rats maintained on vegetable ghee as the only source of fat, suffer from infantile mortality and the few survivors do not grow well. Dr. Patwardhan said that of the fats he investigated butter stood out as the fat *par excellence* viewed from any angle—growth, maintenance, reproduction and lactation. No particular nutritional advantage was derived by hydrogenation of a vegetable oil since the untreated oil was equally nutritive. On the other hand, information available from other sources indicated that the ill-effects of hydrogenated oils may manifest themselves in the second or third generation of animals brought up and bred on diets containing hydrogenated fats.

The refining and the hydrogenation of oils, the two essential processes involved in the production of vegetable ghee, are probably responsible for "devitalising" the oil and for depriving it of all the essential vitamins, unsaturated fatty acids and other growth-factors. Insect feeding experiments, conducted by Miss de Souza in the Section of Fermentation Technology, Indian Institute of Science, support this fact.

From the nutritional standpoint, the refined and hydrogenated "vegetable ghee" whose popularity is reaching dangerous proportions, is not only inferior to ghee made from butter but possibly harmful to the consumer. The verdict of the scientists who participated in the discussion was clear and unambiguous—consume butter if you can afford, otherwise take any of the ordinary edible oils, without any treatment, as the next best. It is interesting to recall that as early as 1930, during the symposium on the same subject held in Bangalore, Mr. P. Ramaswami Ayyar, of the Indian Institute of Science, put forward the same view. He suggested a blending of the vegetable oils followed by a suitable treatment so as to invest the mixture with the flavour of natural ghee. It is regrettable that this rationalised suggestion has not been adopted.

The Government and their departments of health will have to make these facts widely known in the larger interests of public health.

* A critical summary of the proceedings of a symposium on the subject held during the Science Congress Week at Bangalore, 1946.