

NATURE

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RECRUITMENT AND TRAINING OF TEACHERS

TECHNICAL COLLEGES AND SCHOOLS

FOR many months past the pages of NATURE have referred to the great demands that will be made upon the industrial resources of Great Britain in post-war years and the consequent need for trained technicians and technologists to cope with the gigantic problems involved. Though the general character of the requirements of the situation have been surveyed by a variety of industrial, commercial, professional and educational bodies, it remains largely to the Board of Education to promote and later implement specific proposals for bringing about the necessary improvements in education and training schemes in order to relate them to the practical and social needs of the community in the best possible way. It is therefore gratifying to find that the recent McNair Report* not only gives a courageous and penetrating analysis of present deficiencies in the training of technical teachers (Part III, p. 108) but also advances bold suggestions for tackling what is stated to be "a comparatively new field of enquiry"

The keynote is struck when the report urges that "the standard of technical training which can be offered to those already in, or about to enter, industry, necessarily depends upon an adequate supply of teachers of high capacity and with personal experience of current practice. This fact is basic. Technical teachers, regarded collectively, constitute a key group in industrial development, yet their importance has hitherto been scarcely recognised even by those industries which most directly depend upon them for a supply of trained workers."

As in other fields of education, so in the technical field, greatly increased numbers of teachers will be required to implement the new Education Bill; indeed for the compulsory part-time requirements alone some 2,000-3,000 teachers of the ordinary technical and commercial subjects will be required. To these must be added "some thousands of additional teachers" for the older industries, for example, building, not to speak of the needs of the newer industries such as "plastics and large-scale catering" and many aspects of commerce, for example, marketing and export, which have as yet scarcely been considered. A further most urgent matter is the desirability of lightening the load of the present teachers so that they may be able to carry out research or make essential contacts with industry whereby their teaching may become vitalized and stimulating. These are only a few among the many factors which make it necessary to provide for large increases in the recruitment of technical teachers and render it important to frame schemes of training whereby the recruits may not only become efficient teachers but also be enabled to bring into the lecture room and laboratory a realism which unfortunately is frequently lacking to-day.

Witnesses from the chemical industry told the

*See also NATURE of May 20, p. 601, and May 27, p. 629.

Committee that many teachers of chemistry, in spite of their academic attainments, have insufficient knowledge of industry to adapt their methods to the needs of students; in courses for the building industry many of the higher teaching posts are held by architects who have had little or no experience of practical building and allied trades; textile industrialists often find that even graduates in technology are lacking in the groundwork of the fundamental sciences associated with their work. This latter criticism is also supported by the engineering world. "Commercial" teaching is often of a low order due to the use of antiquated systems and old-fashioned methods of instruction—a state of affairs which is inexcusable in view of the remarkable strides that have taken place in industrial administration in the last twenty years.

Worst of all, it is found that many technical teachers are ill-equipped to teach adolescents, and when it is remembered that, due to the association of junior technical schools with senior colleges, a given teacher under present conditions may have to teach boys of thirteen at one part of the day and lecture to honours degree students at another, it is seen that nothing short of a revolutionary treatment of the whole problem of the training of technical teachers will suffice.

The McNair Committee must be heartily congratulated for facing up honestly to these defects. It is true, of course, that some of the major deficiencies will disappear automatically upon the implementation of the Education Bill. Thus the junior technical school will be recognized for what it is, namely, an aspect of secondary education, and, as such, will come under secondary school regulations. The view that its past success is due to its pupils being taught by the same instructors as for senior students is, on examination, scarcely tenable. The McNair Report, therefore, in discussing the training of technical teachers, recognizes that "The establishment of compulsory part-time education with its vocational studies, and the provision of junior technical and commercial schools as a normal part of secondary education, will change the pattern of technical education and a much larger number of teachers of technical subjects will be required".

Little need be said about the recruitment of technical teachers in the past, for the majority seem to have drifted thither through the force of circumstances, there being no *ad hoc* recruiting ground or training available. Moreover, "the supply of technical subjects teachers ebbed and flowed with the prosperity or decline of industry. Teaching was to some extent a safe refuge from economic storms and, conversely, recruitment declined when teachers were most in demand". What about future recruitment? Clearly, this will depend on making the conditions attractive and laying down a definite policy for higher technical education. It is perhaps in reference to this that the McNair Report reaches the high-water mark of realism, for it bases its recommendations upon the closest collaboration between industry, commerce and technical education. A supply of good and appropriate buildings and equipment, salary scales and opportunities of promotion comparable

with those of industry, possibilities of frequent interchange between teaching and industry, not neglecting opportunities for gaining overseas experience and ample facilities for carrying out research, are among the improvements in conditions that are envisaged. "But however many and varied the opportunities for interesting work and experience may be in theory, teachers will not in practice take advantage of them unless the root obstacle is removed. That obstacle is that many teachers in technical and commercial colleges, and especially the more responsible members of the staff, are heavily loaded with teaching duties. They have no time to spare. . . . Some local education authorities or governing bodies impose too narrow an interpretation of what constitutes a full-time appointment."

It must not be assumed that because there will be a great shortage of technical teachers therefore all comers must necessarily be welcomed, for it has to be recognized that teaching is an art and demands a certain aptness and attitude of mind, for even mediocre success. The "elusive qualities of personality" are difficult to describe and assess, but apart from these there are four other qualifications which ideally every teacher should possess, and to these must be added a fifth in the case of the technical teacher, namely, (1) a general education which fits him to be an acceptable teaching member of an educational institution, (2) a high standard of knowledge of his subject, or of skill in his craft, (3) the ability to teach, (4) an appreciation of the relation of his own subject to other realms of knowledge and of his educational institution to society at large and, especially, (5) an intimate acquaintance with his subject in its industrial or commercial setting, if possible through the practical experience of having played a significant part in industry or commerce. The report makes it clear that without a high standard of knowledge of his special subject or skill and an awareness of its industrial or commercial applications, a teacher has no proper place in a technical college. With this we must fully agree. Some good work as a teacher, however, might be done by one who was thus qualified but whose general education was somewhat shaky; this applies only to older persons who by virtue of wisdom and experience in other fields of human interest may be able to give useful teaching service, but for young teachers the full professional equipment is necessary. The point is, however, of importance in connexion with the emergency training schemes for dealing with the great demands for teachers in the immediate post-war years, and may conceivably be considered in connexion with the release of Service personnel, many of whom during the war period have had experience akin to that of teaching, for example, as responsible N.C.O.s or as service instructors.

The above emphasis on the importance of the possession of good technical qualifications does not imply that technical education is concerned wholly with imparting some 'skill', whether mental or practical; on the contrary, the training is only the medium through which a particular attitude to life and the world in general is developed, that is to say,

we must distinguish carefully between 'education' on one hand and 'training' on the other. It is true that the two cannot be entirely separated, but unfortunately it is possible so to stress the training that the educational process becomes of secondary importance, to the great disadvantage of the student. The report does well to emphasize this fundamental matter; indeed, the whole outlook of the report is refreshingly vitalized by its insistence on the *educational* functions of technical colleges. "The good technical teacher is no mere technician; he is also an interpreter of the modern world".

Quite the most inspired section on the training of technical teachers is that dealing with the part which industry must play. It is full of new ideas which, if carried out, will put technical education on a very high plane. Evidence shows that industry is ready and willing to play its part, and war-time contacts between colleges and industry have done not a little towards forging a close bond between the two. The nature of the bond is such that technical education and industry are co-equals. It is not therefore appropriate that the Board of Education should act as prime mover in securing co-operation but rather that the well-established and highly responsible professional institutions should take the initiative as intermediaries. These institutions already possess considerable experience of educational work and include among their members both teachers and acknowledged leaders of industry. They command the respect of all parties and between them cover a large part of the whole field divided up into its natural economic and technological units. Probably the formation of small standing advisory committees would be an effective means of keeping continuously in view the changing situation. The colleges themselves should be so closely linked with local industry that some of the teachers may even be associated with production in all its phases. Large firms might from time to time provide lecture courses and demonstrations in design and manufacturing processes. Experiments on these lines made to date have had remarkable success despite reluctance on the part of some industrialists to encourage the spread of their specialist knowledge. Furthermore, the release by industry of high-grade staff for part-time work in technical colleges would have advantages on both sides and would be of inestimable value to technical education, giving much-needed inspiration from the most powerful source from which the technical teacher can draw. What has been said about co-operation between the factories and the colleges applies equally to co-operation with research associations, which would confer great benefits upon technical teachers by holding refresher courses and visits to their laboratories for selected personnel.

A word must now be said regarding the arrangements for the actual training courses. "There is no generally accepted body of doctrine on the training of technical teachers, nor on the best methods of teaching some of the many subjects to the diverse types of students". The experience gained in Board of Education short courses has naturally been extremely suggestive, but there is still room for much

further experiment. The report makes the valuable suggestion that "The time is now ripe for selected technical and commercial colleges and schools in association with teacher-training institutions to experiment . . . systematically and on a comprehensive scale". This training should, however, not be isolated from that of other teachers, and therefore should be undertaken by the area authority recommended elsewhere in the report, which should, for this purpose, include representatives of technical education in its constitution. The major part of the training should be carried out before the teacher begins to practise, for which purpose generous financial provision should be made, and in order to render the scheme flexible so as to deal with the vast range of interests involved, the course should be broken into units of comparatively short duration, for example, (1) education, (2) teaching, (3) study of the 'student', (4) industrial and commercial contacts. By conducting the course in conjunction with technical colleges, the services of experienced teachers would thus be effectively drawn upon and segregation of trainees would be avoided. "A liberal provision of refresher courses to make up for the comparatively short duration of the initial training period" would, of course, be necessary and would at the same time serve to correct any acquired errors of teaching technique and give encouragement to the young trainee.

It will be seen from the above that the McNair Report is a document of the greatest significance to technical education and one carefully calculated to remove the stigma resting upon it at present, namely, that "Technical education in this country has never received the attention it deserves and there has hitherto been no systematic provision for the recruitment or training of technical teachers".

In view of the key importance of technical education in our future national development, immediate steps should therefore be taken to provide the conditions for the implementation of the report at the earliest possible date.

HIGH POLYMERS

High Polymers

By Raymond M. Fuoss, J. Abere, W. O. Baker, Henry Eyring, John D. Ferry, Paul J. Flory, C. S. Fuller, G. Goldfinger, R. A. Harman, Maurice L. Huggins, H. M. Hulbert, H. Mark, H. Naidus, Charles C. Price, John Rehner, Jr., Robert Simha and A. V. Tobolsky. (*Annals of the New York Academy of Sciences*, Vol. 44, Article 4.) Pp. 263-444. (New York: New York Academy of Sciences, 1943.)

IN spite of the difficulty in prosecuting academic work on high polymers during the War, there has almost been a flood of literature, both books and discussions, on this topic. The reason is not far to seek. In the immediate pre-war years the subject was just getting into its stride, and though the rate of progress has naturally been drastically cut down, many workers have been able to make a substantial contribution when an opportunity for discussion has arisen. In the volume under review, the Physics and