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Government of Bengal
Education Department

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Memorandum on
Technical Education in
Bengal

By

John Sargent, M.A.

Educational Commissioner with the Government of India

Superintendent, Government Printing
Bengal Government Press, Alipore, Bengal
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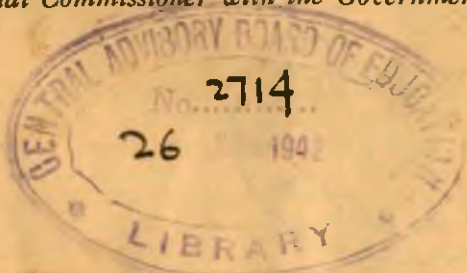
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Memorandum on Technical Education in Bengal.

A.—Introduction.

In response to the request of the Bengal Government, as set out in their letter of the 28th January 1939, for the advice of the Educational Commissioner with the Government of India in regard to certain matters affecting the development of technical education in the Presidency, I visited Calcutta on the 21st-23rd March and again on 3rd-10th October (including a visit to Darjeeling). My first visit was devoted to consultations with officers of the Bengal Government and to a preliminary exploration of the main issues involved so far as Calcutta and its environs are concerned. At my second visit I had the opportunity of seeing in greater detail the work of some of the existing institutions and of discussing with the officers already referred to the tentative conclusions at which I had arrived.

2. I should like to express my cordial thanks to Mr. H. S. E. Stevens, Secretary of the Agriculture and Industries Department, and to Dr. W. A. Jenkins, Officiating Director of Public Instruction, for placing their knowledge of local problems and local conditions so unreservedly at my disposal. I am also very grateful to Mr. S. C. Mitter, the Director of Industries, for the trouble he took to show me something of recent industrial developments as well as the interesting industrial museum which had just been opened.

B.—The Function of Technical Education.

3. The conception of the function of technical education, both as regards content and intention, has been considerably revised and enlarged in western countries during recent years. It seems desirable, therefore, to offer a few preliminary observations with regard to the general principles on which any scheme for the development of technical instruction should be based and to emphasise from the outset its two-fold character, firstly, as affording a link between education and industry, and secondly, as providing a form of mental training specially suited to certain types of intelligence.

4. The primary object of technical instruction remains, and is likely to remain, that of satisfying the need of industry and commerce for (1) skilled craftsmen, (2) intelligent foremen and executives and (3) research workers. During the last twenty years, however, there has been a widening of the content of the curriculum due on the one hand to increased demands on the part of industry, which have been created not only by greatly accentuated competition but also by the emergence of entirely new industries, and on the other hand to a somewhat tardy recognition on the part of those responsible for it that technical education, if it is to be really fertile, should include the study of design and distribution as well as the actual processes of manufacture. The industrial product of to-day to command a market must do its work efficiently, must be attractive to the purchaser, and must pass easily and cheaply from the producer to the consumer.

5. Moreover, the changes which are affecting the character of what is produced are also determining the training of those engaged in the production. The ranks of the skilled craftsmen, depleted by the advent of the machine and mass production, are being reinforced by the makers and menders of machines and machine tools. Training in precision work has already acquired an importance out of all proportion to the number of men so employed. New problems, again, both human and material, call for more sympathy, more imagination and a deeper insight into the processes they control from those placed in positions of authority. In his turn the research worker has not merely to concern himself with improvements along established lines, it is also his business now-a-days to explore how a dying industry may be revived or a new one created. It has been assumed, perhaps too readily, during the last fifty years, even by those who for social reasons deplore their extinction most keenly, that the small business and the cottage industry are bound to be eliminated by the large scale factory. Modern methods of distribution and marketing, however, now give grounds for hope that even in highly industrialised countries the small producer may survive and prosper alongside of his larger rival.

6. The obvious lesson implicit in these changes is that technical instruction to-day must be a wider and more liberal form of training than it has been in the past; it must comprehend the scientific principles underlying the processes of manufacture as well as the processes themselves; it must link up the sciences of production and business organisation with the arts of design and salesmanship. It must take cognisance also of social science in relation to the effect of industrial development on the life of a previously non-industrial community and it cannot even neglect the provision of purely cultural and recreational facilities as an antidote against mental and moral stagnation for those workers who are destined to remain the semi-skilled servants of the machine.

7. At the same time there is contributing towards the same enlarged conception a secondary function of technical instruction, the importance of which is being increasingly recognised abroad and has received striking emphasis in the recent report of the Consultative Committee of the English Board of Education (the Spens' Report). So-called technical subjects have been found to be capable of providing an all-round education or culture as distinct from a vocational training for the many people, not necessarily by any means the less intelligent, whose mental faculties are more actively stimulated and more fully satisfied by practical than by academic studies. In this sense the technical school or college has a valuable contribution to make towards the introduction of greater variety into education at its higher stages and towards satisfying the need of industry for a reasonable share of the best brains of the community, which under the influence of the conventional high school seek professional occupations and too often find unemployment. Further, it may provide many people who were not suited for or were prevented by the economic exigencies of life from taking a university course of the ordinary type, with knowledge of the things necessary to the fuller discharge of their duties as citizens or the more profitable employment of their leisure.

8. While the general influences affecting the development of technical education, which have been outlined above, have been felt most strongly hitherto in countries remote from India in distance, in material resources and in the social and economic conditions under

which the great mass of their people live, there is no reason to assume that their practical bearing on the future trend of technical education is irrelevant in this country. Indeed recent reports by competent observers on industrial problems in Bengal in particular leave one in little doubt that the very needs which the modern technical college in the western world is setting out to satisfy are even more insistent in the case of the Presidency. Nowhere probably is it more important to help the small business or the cottage industry, to increase the supply of skilled craftsmen and competent executives, to convert abundant raw materials to the service of the community which produces them and above all to check the flow of potentially creative intelligence through academic channels into the slough of unemployment.

C.—The Contents of a Technical College.

9. Considered from the point of view of the students, technical instruction will be either pre-employment or post-employment, that is it will either be directed to giving young people not yet at work a preliminary training which will prepare them for entry into industrial or commercial occupations or it will afford opportunities to those already in employment for increasing their skill as craftsmen, for fitting themselves to occupy positions of greater responsibility or for improving their all-round equipment as citizens as well as workers.

10. The size of the area to be served and the extent and nature of its industrial development will determine whether such instruction should be provided in one institution or in several. If in several, then similar considerations will indicate whether these institutions should each serve one industry or group of industries or whether there should be a central institution at which the more advanced work in all branches should be concentrated, with ancillary schools, conveniently distributed, which will relieve it of the more elementary work and feed it in turn with suitably prepared students. The question of monotronics *versus* polytechnics has been a controversial issue over a considerable period but in my opinion the polytechnic, wherever practicable and subject to certain exceptions to be mentioned below, has a strong balance of educational, industrial and economic argument in its favour.

11. It is indeed hardly necessary to elaborate the case for concentrating provision for technical instruction, and particularly the more advanced branches of it, under one roof. There is in the first place the factor of cost. Technical instruction is necessarily expensive, owing among other reasons to the large amount of practical work involved and the cost of the plant and apparatus required. The Bengal Government have already had experience of the high cost of small technical institutions, even when they are doing comparatively elementary work. Secondly, there is the importance of economising teaching power, since competent instructors in many of the more advanced technical subjects are always difficult to obtain. A third argument for centralisation arises from the fact that many technological courses overlap to a certain extent and in a large institution the same workshop or laboratory may be used by students taking different courses. The last but by no means the least important consideration is the benefit students derive from being brought into contact with others engaged in different occupations and studying different subjects.

12. The monotechnic is to be preferred only where an industry is highly localised, or where its needs are so complicated or peculiar that it is difficult to satisfy them in the same building as those of other industries or where the material to be dealt with, as in tanning, makes it an uncomfortable neighbour.

13. Accommodation should be provided in the polytechnic, whether it has ancillary institutions or not for (i) a full time day school for boys of the normal high school age and type whose training will be based on the assumption that they may rise ultimately to positions of responsibility (*cf.* Appendix which deals in detail with the Technical High School), (ii) part-time classes in the day and in the evening both for younger employees (including apprentices) and for older workers, and (iii) classes, full-time or part-time, for more advanced students and for research workers. Finally there should be provision for adult education of a non-vocational kind.

D.—Application of the General Principles set out above to Bengal.

14. What I was shewn and told during my visits and what I have read about the present industrial situation and the prospects of further development leave me in no doubt as to the need for an up-to-date technical institution of the first rank in Calcutta. The size of the population to be served and the variety of the industries already in existence make it equally clear that this institution should be of the polytechnic type.

15. While it should be planned in accordance with the general principles set out above, the actual courses to be provided and the balance to be preserved between them will have to be settled with strict regard to local conditions, not so much as they are to-day but as it is reasonable to expect them to be five or ten years hence. Some risks must of course be taken if there is to be any escape from the vicious circle in which many similar projects have perished, viz., that it is useless to train workers for industries that do not exist and hopeless to start new industries for which there are no trained workers. Fortunately there would appear to be sufficient data available in the Industries Department in regard to the needs both of established trades and of those which it is hoped to initiate or expand, to make it possible to reduce such risks to a minimum.

16. My present knowledge of Bengal industries is almost entirely secondhand. I saw something of their present range at the Industrial Museum but my information is derived mainly from publications of the Agriculture and Industries Department. The basic industry of agriculture I am bound to regard as outside my purview. It must have its own technical institutions to deal with its special problems. Inasmuch, however, as it produces a large proportion of the raw materials upon which other industries depend, the closest liaison between it and them is indispensable.

17. The next most important industry or group of industries would appear to be the spinning and weaving of jute and cotton textiles. In view of its size and of its complicated and special requirements this is usually regarded as a branch of technology which is more conveniently dealt with separately than as an overlarge department of a Central Technical Institution. In the present instance the general argument

for separation is reinforced by a practical consideration. The Government Weaving Institute at Serampur has some admirable modern buildings and up-to-date equipment; the site also is large enough to admit of such extensions as may be necessary to allow spinning as well as weaving to be introduced and some contact has already been established with the jute and cotton industries. In my opinion, therefore, Serampur should be developed as the main institute for textile technology. If and when the demand on the accommodation exceeds the capacity of the present site, the question of starting ancillary institutions to deal with the lower grades of instruction will need consideration. If this view is accepted, it seems to me important to take immediate steps (i) to strengthen further the contact between the Institute and the industries concerned, with a view to securing reasonable prospects of employment for students, (ii) in co-operation with the industries to provide training facilities for apprentices and others already in employment. Moreover, as these industries are not confined to large factories but extend widely into small-scale and cottage industries, an important function of the Serampur Institute will be to make the results of research and improvements generally known to these through peripatetic instructors, refresher courses and other means.

18. Tanning is a subject which for obvious reasons is better dealt with in a separate institution and as there is already a Tanning Institute, it is suggested that it should be developed into the main institution for the leather trades. So far as sericulture is concerned, I am inclined to recommend, subject to confirmation by more expert opinion, that this also should be treated separately, the location of the training centre being determined by the conditions required for the production of the raw material.

19. The other main industries of Bengal may be divided into—

- (1) Engineering, including Railway workshops and shipbuilding;
- (2) Food and Drink Industries, of which Rice and Tea employ the largest numbers at present;
- (3) Chemical Industries including Dyes, Manures, Oils and Fats, Paints, Matches, etc.;
- (4) Wood and Metal Industries not included under Engineering;
- (5) Stone, Glass and Pottery;
- (6) Paper and Printing.

Training for all these in the higher stages could appropriately be provided in a central institution, but considerations of space will make it necessary in most cases to relegate the junior courses to ancillary institutions.

20. In addition to the above, if the central institution is to fulfil the comprehensive function outlined at the beginning of this memorandum, it must also provide for the needs of the retail and distributive trades and for professions like banking and accountancy which are intimately connected with Industry and Commerce.

Here again the commercial department will probably have to confine itself to the more advanced stages of instruction. It is hardly necessary to call attention to the extremely inadequate character of the present provision for instruction in commercial subjects at all stages in a centre like Calcutta.

21. Finally it must cater for designers, not only of articles to be made but also of wrappings to contain them and posters to advertise them. The importance of design in industry can hardly be over-emphasised in these days. The Fine Arts appear to be adequately catered for at the School of Art and should be left there undisturbed, the central institution confining itself to the application of design to industrial and commercial purposes.

E.—The scope and size of the proposed College.

22. If it may be assumed that the need for a central technical institution of the type already outlined has been established, the next step will be to indicate with as much precision as is possible or desirable at this stage how many branches of technology will be required to deal with the industrial and commercial activities detailed above, and the minimum number of students for whom accommodation should be provided at the outset. The following suggestions assume—

- (i) that so far as possible all work of an advanced character, now being done at existing technical institutions in and around Calcutta, except those specifically referred to below, will be absorbed from the beginning in the proposed central institution; and
- (ii) that the institutions concerned will be retained either as feeders to the central institution or to deal with localised industries, at any rate until experience of the demands on the central institution shows which of them, if any, can be regarded as redundant. They also assume that for the reasons given in the preceding section it will be advisable to cater separately for the spinning and weaving of both jute and cotton textiles at all stages as well as for tanning and possibly for sericulture. Furthermore they are intended to be an indication of minimum requirements and not a comprehensive schedule.

23. **Nomenclature.**—The name given to a new institution is important for the purpose not only of defining as clearly as possible its status and aims but also of attracting public attention. In England technical institutions of the first rank are usually called colleges, irrespective of the question whether they are affiliated to universities or not. In India, however, the word “college”, so far as I am aware, is limited to institutions which are directly connected with universities. The name “institute”, which is a possible alternative, is unfortunately associated in England with institutions of the second grade and for that and other reasons should be avoided in the present case.

If my suggestion that the proposed institution should be in fact a polytechnic is adopted, it might be so named. The word “polytechnic” is associated with several technical institutions of the first rank in London and it is to be hoped that it would soon acquire an equally honourable significance in Calcutta.

24. **Size.**—The following suggestions are based on the assumption that in a city of the size of Calcutta the Polytechnic should be capable of accommodating 1,000-1,250 students at the same time or a sessional enrolment of approximately 4,000 full-time and part-time students combined.

25. **Principal Departments.**—The Polytechnic should contain the following principal departments:—

(1) *Science Department.*—This should be devoted almost exclusively to applied science. It will require three small laboratories for advanced work in Chemistry, Physics and Botany and five large laboratories for—

- (a) General Physics;
- (b) General Chemistry;
- (c) Botany and Biology;
- (d) Oils, Fats, etc.;
- (e) Building Science or Metallurgy.

(An Applied Mechanics Laboratory to be shared between the Civil and Mechanical Engineering Departments should be provided in or near the Workshop Block.) There should be two or, if possible, three lecture rooms.

(2) *Mechanical Engineering Department.*—This will require, in addition to the Applied Mechanics Laboratory referred to above, workshops for Metal, Wood, Machine Tools, Fitting, Heat treatment of Metals including Welding, Heat Engines, Automobile Repairs and a Foundry.

(3) *Electrical Engineering Department.*—It is assumed that the demand will be sufficient to justify a separate department from the beginning; if it is not, this department may be combined with the Mechanical Engineering Department. It will require, in addition to an electrical laboratory, workshops for installation and wiring, electrical machinery and probably a separate room for Telegraphy, Telephony and Wireless, with a small room for Photometry.

(4) *Civil Engineering Department.*—In the early stages provision may be made in this department for the Building Trades and in the Art Department for Architecture; ultimately a separate department for Architecture and the Building Trades may be found necessary. The initial accommodation should include a building science laboratory (unless the laboratory already suggested for the Science Department is sufficient), a wood and metal workshop (unless it is possible to share those belonging to the Mechanical Engineering Department), plumbing shop, and rooms for painting and decorating, cabinet making and wood-carving, brickwork and masonry.

The Engineering Departments will need between them four drawing offices and two lecture rooms.

(5) *Commercial Department.*—This will require in addition to ordinary class-rooms special rooms for typewriting, geography, commodities and retail trades. A shop window for display may be shared with the Art Department.

(6) *Art Department.*—This will be devoted mainly to industrial and commercial design. It will require in addition to several studios for General Design, Architectural Drawing, Poster work, etc., workshops for pottery, art metal work, silversmithing and light crafts. Printing is a most desirable addition but unless gifts or loans can be obtained from firms in the trade, the cost of obtaining and maintaining up-to-date plant is very heavy.

The use of the hall, class-rooms, staff-rooms, common rooms, dining rooms and of the facilities which it is hoped will be provided for Physical Training will be common to all departments.

26. It may also be useful to add some suggestions based on experience for the general lay-out of the buildings required to house an institution of this kind. These should consist of—

(1) A Main Block, in permanent construction, of two or more storeys. This should contain the main Assembly Hall with a large foyer suitable for exhibitions of work, the administrative offices, a committee room or rooms, the Principal's room, staff-rooms, common rooms for students, dining rooms and kitchens. The necessary class-rooms and those rooms which will be used for light crafts or other occupations not likely to disturb neighbouring classes may also be included in the Main Block. Most of the accommodation required for the Commercial and Art Departments will fall in this category.

(2) A Science Block with lecture rooms, which should be provided separate from but close to the Main Block. Unless space forbids, this should be provided on one floor in the first instance, but should be capable of extending upwards as and when extensions become necessary.

(3) A Workshop Block with Drawing Offices, which should be entirely separate from the Main and Science Blocks and should be sufficiently far away to avoid any disturbance to delicate instruments from the vibration caused by machinery. It should be built in light construction and be in skeleton form, so that partitions can easily be removed and the size of the shops adjusted to changing needs. It should also be so sited that lorries can approach and enter the shops to deliver or remove heavy machinery when required.

(4) A Physical Training and Recreational Block. Apart from the needs of the full-time students, many of the part-time students will be at work all day and their opportunities for keeping fit will otherwise be limited. The provision of reasonable facilities for physical and mental recreation cannot only be justified for its own sake; it will also be found to promote regular attendance and loyalty to the Polytechnic as a corporate entity providing for the all-round well-being of its members.

(5) Cloak rooms and lavatories should not be concentrated. As students will be arriving and leaving at all hours they should, to avoid unnecessary disturbance, be conveniently disposed throughout the buildings and as close to the entrances as possible.

27. The minimum site to contain the buildings described above will be about 7 acres. It will be very convenient if playing-fields can be provided adjoining or close to the Institution. In this case at least another 20 acres will be required. It is realised that for reasons given in paragraph 29 this may not be practicable.

F.—Technical Education for Women.

28. One of the most striking features of recent developments in the sphere of technical education in western countries has been the increased demand from women students. This demand has arisen to a large extent from the rapid increase in the number of women employed in industrial and commercial occupations. Such a situation has not yet manifested itself in Bengal.

Apart from this, however, the need for improving the efficiency and enlarging the outlook of the average housewife, particularly among the poorer classes, by providing her with facilities for instruction in Domestic subjects, Hygiene, Mothercraft, Sick Nursing, etc., is as apparent in Bengal as elsewhere in the world. I am advised, however, that social conditions in Bengal at the moment make it desirable to meet such a need by the provision of a separate institute or institutes for women rather than by the inclusion of a Women's Department in the Polytechnic. Reluctantly therefore I have omitted what under other circumstances I should have regarded as an essential part of any technical institution.

C.—Situation.

29. Although it may be anticipated that a number of students will come from a distance and will require hostel accommodation, the nature of a Technical Institute makes it certain that the great majority will be non-residential. It is therefore essential that the Institution should be accessible from the places where they work and where they live. This means a fairly central position and in a large city a site of the size required may be difficult to obtain at a reasonable cost or indeed at any cost. The present Calcutta Technical College is obviously unsuitable even if it could be extended. The Sibpur College is on the wrong side of the river and difficulties of another kind would probably make it impossible to secure the site and buildings occupied by the Jadavpur College for the proposed Polytechnic. I understand, however, that there is a possibility of securing a site of the requisite size in a reasonably convenient position.

H.—Cost.

30. A Technical College approximating in size and contents to the proposed Polytechnic has recently been built and equipped in England at a cost of £220,000 (buildings £170,000, equipment £50,000). The cost of building in Calcutta is likely to be somewhat less than in England, even after allowing for war prices, but this will not apply to the equipment. A very rough estimate of £225,000 or Rs. 30 lakhs is the best that can be given at this stage of the capital cost of the proposed Institution exclusive of the cost of the site.

It is still more difficult to arrive at any reliable estimate of the recurring cost of running such an Institution as a number of factors, at present unknown, will have to be taken into consideration. The first of these is the number of students who will be enrolled. So far as the Technical High School is concerned, the admission of two forms of about 25 each annually for a five or six-year course would mean ultimately between 250 and 300 students. Their cost per head might be taken as 25 per cent. higher than that of the cost per head in a normal high school owing to the additional expense involved by a more practical curriculum.

So far as the remainder of the students are concerned, the cost will depend on how many of them are full-time and how many part-time, on the number of weeks per year, days per week and hours per day during which the Polytechnic will be open and on the nature and stage of the studies which they will be pursuing. If, as has been suggested

elsewhere, the Polytechnic restricts itself so far as possible to studies of an advanced character, the number of students per class will necessarily be small, i.e., not more than ten in the more advanced classes, and the salaries offered to expert instructors will have to be attractive. The cost will also be affected by the nature as well as the stage of the instruction, e.g., the normal expenditure on classes in engineering or advanced crafts will be substantially higher than that of instruction in commercial subjects even at a comparable stage.

On the assumption, however, that the number of students occupying the building at any one time will be between 1,000 and 1,250, the gross non-recurring cost may be expected to fall between Rs. 2½ and Rs. 3¼ lakhs annually, against which there will be some off-set from fees. Here again it is difficult to estimate what the fee income is likely to be as, apart from the Technical High School, where the fees should approximate to those charged in normal high schools of good standing, fees in the case of the remaining students will have to be determined in relation partly to the subjects which they are taking and partly to their ability to pay. There will also be a certain amount of miscellaneous income from the sale of articles produced, services rendered to firms, and possible contributions from these and other sources. If and when the Government of Bengal have indicated their attitude towards the project as a whole, it will be possible to go into the matter in greater detail and prepare a more accurate estimate both of the capital and recurring charges. It should be emphasised, again, that the figures given in this paragraph are of the most approximate character.

I.—Administrative Arrangements.

31. The last issues of a general character which require consideration are—

- (i) the relation of the various activities of the Polytechnic to those of other educational institutions in the area;
- (ii) the best methods of securing and maintaining the active interest and practical support of industry and commerce;
- (iii) control and management.

With regard to (i), the proposed Technical High School will be an educational experiment and consequently will not conflict with the activities of any existing school. Part-time classes for persons employed in Industry are unquestionably the business of technical institutions and the only need for adjustment here will be between the Polytechnic and other technical institutions in the area. Senior full-time courses, however, which should ultimately extend at least up to degree standard, and research work, which will usually go far beyond it, must be considered in relation to what is being or is likely to be done by local universities in this respect. Useful contributions to industrial research have been and are being made by universities but the inclinations of a University tend naturally towards pure research and it would be difficult, even if it were desirable, for a University department to devote itself to the immediate service of Industry in the way that a technical institution can and should. This does not mean that the need for the closest co-operation between the University and the Polytechnic will not arise. The University should have direct representation on the Governing Body of the Polytechnic from the beginning and it is to be

hoped that in due course the Polytechnic will receive official recognition from the University. It is by no means uncommon in large western cities for a Technical College, controlled by the local administration, to be recognised by the local University as its technological department.

32. With regard to (ii), the success of the Polytechnic will be largely determined by the extent to which it is able to enlist and retain the practical interest and support of the business community. With this object in view the Governing Body should contain a substantial representation of industrial and commercial interests. Advisory Committees of businessmen should also be constituted in connection with the principal departments. In addition to these official contacts, the staff of the Polytechnic should be in close touch with local firms. Arrangements should be made for students to pay frequent visits to works and there should be an open invitation to industrialists to inspect the work of the Polytechnic. Every effort should be made to get large employers to show their interest by giving or lending up-to-date machinery and by releasing employees to take classes at the Polytechnic during ordinary working hours. Provision for the latter might well be made a condition in approved schemes of apprenticeship. Frequent exhibitions of students' work, open to the general public, should also be organised.

33. With regard to (iii), the Governing Body will necessarily contain, in addition to representatives of Industry and Commerce and of the University, nominees of the departments of Government responsible for its control. It is hardly necessary to emphasise the importance of giving the Education Department an effective voice in the general direction of the Polytechnic, inasmuch as its success must always be primarily dependent on its efficiency as an educational institution.

APPENDIX.

Technical High School.

General aims.—The general aims of a Technical High School will be to offer to pupils of the normal high school type an alternative form of higher education of a less academic character, which will allow a greater freedom of choice both to pupils and teachers and will comprise in the later stages grouped courses incorporating the principles of technology and of commerce. Technical skill and manual dexterity will not be pursued merely for their own sakes. The object will be to cultivate an interest in the wider problems of modern industry rather than in the technical difficulties of particular processes, so that the pupil upon entering employment will bring to bear an interest in his trade or profession not confined only to the office or workshop but embracing its more comprehensive aspects, whether economic, technical or sociological.

Age of admission and length of course.—In order to secure the right type of pupil it will be important to fix the age of admission not higher than that at which boys commonly enter upon other forms of post-primary education, i.e., about 11 plus. For the first three years (or possibly four if boys are admitted in any number before 11) the curriculum should be of a general character and on similar lines to those followed in a good middle school so that at the end of this stage pupils, whose particular bent or probable future occupation would best be met by a normal high school course, may be transferred without difficulty. This would at the same time facilitate transfers from as well as to high schools. After this stage a certain number of subjects of a practical character will be introduced into the curriculum but it should again be emphasised that the methods by which they will be approached will be primarily cultural and that the general education of the pupils in such subjects as the Mother Tongue, English, History, Geography and Mathematics will be correlated with but not subordinated to the practical instruction. As the number of grouped courses containing technical, commercial and art subjects will depend on the number of pupils admitted, their particular desires and aptitudes, as well as the needs of industry and commerce in the area which the school may be expected to serve, it will be undesirable to specify in too great a detail what these grouped courses will comprise, at any rate during the experimental stage. In any case this will be a matter for determination in the first instance by the Principal in consultation with his Heads of Departments. As a general indication, however, it may be taken that the properties of materials, the elements of engineering science, measured drawing and simple design will find a place in the technical course, while commercial geography, economic history and business practice will form part of the commercial course. This second stage would normally last for three years, the practical subjects occupying a progressively larger place during the last two years.

A very important question will arise in connection with the medium of instruction. As it is hoped that pupils leaving the school will ultimately attain to positions of responsibility in the business world, it is important that by the time they leave they should have a sound practical mastery of English, i.e., they should be able to read, speak and understand English as used by an educated Englishman. English

of this kind as distinct from the English of poets and classical writers should occupy a prominent place from the beginning of the course, but the stage at which and the subjects in which it should be used as the medium of instruction may be left for decision in the light of experience. Shorthand and typewriting, if the demand for them is sufficiently great, should be taught intensively towards the end of the course. It is realised that suitable text-books for some of the proposed subjects may not be available in Bengal. In such cases the school must satisfy its own needs by writing them or getting them written.

A further question is whether schools of this type should take an external leaving examination. There can be little doubt that pupils, parents and prospective employers will all look for some certificate that the course has been successfully completed, but external examinations must on no account be allowed to dominate the curriculum or restrict freedom to experiment.

It is essential that all pupils throughout should be provided with the same social and recreational amenities as they would enjoy at a good high school and emphasis should also be laid on the fact that the school aims at turning out adaptable well-educated boys rather than trained specialists for any particular branch of industry and commerce. If this objective is kept clearly in mind the intake of the school need not be determined by any statistical survey of the capacity of local industry to absorb leavers inasmuch as the normal leaver will be at least as adequately equipped as the high school leaver to find employment.

Placing of leavers in employment.—If schools of the type contemplated are to be regarded as additions to the provisions for higher education already made in schools of the accepted high school type, their products must increase the number of juveniles seeking employment of a progressive and attractive kind. If, however, their main object is to provide instruction which will lead to more suitable employment for young people who would remain in any case at some kind of school until 17 or 18, the numerical aspect of the effect of their output on the labour market becomes less important. The general question, however, of suitable employment for boys (and girls) leaving school, and particularly for those who have been kept there at some sacrifice by their parents with the hope of their making a better start in life, requires careful study. It is a valid criticism of the present educational system that it produces an article and does not concern itself whether the finished product finds a market and if it finds one, whether it fetches what it is worth. From this point of view also it is essential that the new type of school, because it is new, should enlist the active interest and support of industry and commerce from the beginning and that what it stands for and what it offers should be made known at every opportunity to the public at large. A Careers Bureau will form a necessary part of the organisation. Steps should also be taken to ascertain not only from the principal employers of labour in the area but also from Government Departments which might find suitable recruits in the type of boy produced by a school of this kind and from municipal undertakings with similar needs the approximate number of leavers they would be prepared to take on annually.

Possible modification in the organisation of the Technical High School during the transitional stage.—It will be observed that the suggested course for the Technical High School is designed to cover six years beginning from the age of eleven plus. This means that the

normal boy will complete the course at about the age of seventeen. I am aware that at the present time, not only in Bengal but also in India generally, boys are accustomed to complete their high school course and even to enter universities at a much younger age. I believe, however, that modern educational opinion in India is coming to regard the truncation of the high school course and the unduly early commencement of the university course as undesirable and that before very long it will be the exception rather than the rule for a boy to start a university career before the age of seventeen. I feel, therefore, that the length of the course suggested for the Technical High School should stand, though during the period of transition it may be necessary to shorten the second stage of the course, at any rate for the abler boys, from three years to two. This may involve a certain amount of adjustment in the curriculum at the earlier stage, though it is to be hoped that the need for this will only be temporary.

