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Administration, Finance, Control and Inspection

The aims and objectives of a country's educational system determine such matters as priorities and emphases in technician education as a whole and in the curriculum in particular, the education, conditions of service, qualifications and status of teachers, and the examinations taken by students. Different political interpretations of authority, democracy, discipline, and freedom affect the roles of the governing bodies of technical colleges and of academic boards, staff associations, students' unions, principals, heads of departments, and teachers.

College government is a subtle and complex matter. The modern trend is to appoint an independent, broadly-based governing body containing some elected representatives of the local government authority, the principal and some members of the staff and student body, some nominated officials, and strong representation of the various organs of industry and commerce, including professional and employers' associations and trade unions. This body is made legally responsible for the general running of the college, and is given considerable autonomy and decision-making powers over the design, planning, organization, and resourcing of courses, over internal administration and management, and over the spending of the budget within the limitations imposed by central and local government and the salaried executive.

The legal instrument of government for a college establishes the governing body, lays down its composition, duties and powers, and describes how it should be run. It also sets out the roles of the principal and the academic and administrative staff and the conditions for their appointment and dismissal.

A governing body of about 20, including co-opted members who can make a particular contribution at a particular time, is normally considered to be about the right representative size without being too large to impede action. One of its main functions will be to increase public confidence in the college and in the appropriateness and the quality of the technical education given to the students. Another will be to approve estimates and formulate long-term proposals for

growth and development, introducing new objectives where necessary to match change and innovation in industry and business. The governing body should not be involved with the details of decision making for the day-to-day control or direction of the institution, or with too much committee work.

It will normally set up a committee to appoint the principal and senior teaching and administrative staff, and will delegate to the principal responsibility for appointing other teaching and non-teaching staff.

Academic Board

In smaller colleges offering a limited range of work, it may be possible for the principal to have complete responsibility under the governing body for all actions and decisions taken within the college. In larger colleges offering a wide range of work, it is not possible for the principal to be the sole decision maker or to be personally concerned in all aspects of college activity. Direct involvement presents too great a demand, and the principal has to rely on the knowledge, experience and wisdom of an academic board composed of some of the members of his staff.

The academic board is a formal structure for deciding college academic policy and general development. It is an independent body having executive powers in certain well-defined areas of college activity and advisory powers in others. It plans the pattern and balance of teaching between different areas of study in the college, as for example between theory subjects and practical subjects in particular kinds and levels of technician courses. It is responsible for the procedure for the admission of students, and – within the framework of the appropriate regulations – for the overall structure of the patterns of assessing and examining them, and for monitoring and evaluating their progress. It reviews departmental estimates of expenditure, advises the governing body on matters where academic policy involves financial commitment, and allocates expenditure to departments when it is provided as a consolidated sum. Appropriate members of the academic board participate in making teaching staff appointments.

An academic board must be of a size commensurate with its tasks. Fifteen is probably about the right number. Membership should include all heads of academic departments and representatives of the teaching staff and students. The senior administrative officer is normally the secretary both to the academic board and to the governing body. A college should also have a staff council consisting of all academic members of staff which can make staff views available, submit items for the agenda of the academic board, and be kept fully informed about academic policy and its implementation.

The Role of the Principal

The principal is responsible to the governing body, of which he is normally a member, for the effective use and management of resources and for the discipline of the college. He is the pivot of the college organization. However, it is not his function to diminish or constrain the responsibility or accountability of other members of the academic or administration staff. The principal cannot know or

do everything, and by retaining too much control of administrative detail he can, in effect, have too *little* control of policy. Usually he is given authority by the governing body to make appointments below that of head of department, and is chairman of the college disciplinary committee which has representatives of the governing body, the academic board, the teaching staff and the student body and which makes decisions on matters of discipline. In consultation with the academic board he does the long-range thinking, he prepares, reviews and presents plans to the governing body for the academic development of the college, and he implements plans when the governing body's decisions have been made. Within the college he has a well-recognized leadership role. This is not based so much on formal power as on an ability to deal effectively with people and enable them to get and give satisfaction in their jobs. His success will depend on the status which he personally establishes with his peers as a creative educational thinker who is able to encourage and integrate the ideas and energies of the college into a constructive, coherent policy.

The Role of the Head of Department

The head of a department in a college is concerned with three broad groups of activities: the administration of the department, the organization of teaching in the department, and the teaching which goes on within the department. Many of the administrative decisions made by a college affect his work. For example, decisions have to be made about whether open access for teaching staff, students and visitors to the head of department is necessary or desirable; what kinds of interviewing should be undertaken by the head or by teaching staff qualified to be counsellors; how much routine statistical and clerical work needs to be done by the head, and how much can be delegated to a trained secretary.

Among the responsibilities of the head of department are the maintenance of student records within the record system decided upon by the academic board, and the preparation of confidential references and open testimonials to prospective employers. Also within a framework of policy decided upon by the academic board, and under the general direction of the principal, he must undertake selection and induction of full-time and part-time teaching staff, and arrange for their further education, training and professional development. He must help the academic board to decide where research of any kind should be undertaken or encouraged, what areas of technician education and training activity ought to be studied by which teachers, and who should be responsible for guidance and supervision. He needs to know the extent of his responsibility for education and training policy-making at college level and to communicate the policy effectively to the staff in his department. He must make his contribution to reports such as the principal's annual report, open-day speeches, and reports to academic advisory committees, boards of studies, employers, and parents.

The head of department must also create and establish an organization for maintaining close and regular liaison with industry at technician teacher level. He has to develop techniques for teachers to report their industrial experiences to

one another so that teaching is always industrially applicable. He has to organize special *ad hoc* courses requested by local industry, and decide the level and technical content of courses that are within his province, taking into account the resources of his department and the specialist staff that must be hired from outside the college.

Service on examining and professional bodies is another part of a head of department's professional functions, and he needs to be allowed adequate time to do justice to the task. The number of meetings should be rationalized and organized to suit periods when college departmental pressures are not too intense. The number of committee and sub-committee meetings should be kept to a minimum if busy heads of departments are to be available.

A head of department should rightly be involved in any new building programme, but unless his involvement can be kept within reasonable bounds it can consume too much time to the detriment of education and training.

Policy guidance can help him to determine how much time to spend on these matters, on co-ordinating an examination time-table with other departments, on compiling examination returns, on public relations work, on correspondence, on liaison with secondary schools in the area, and on making the general public technical education conscious.

Organization of teaching

This area of responsibility covers such activities as student enrolment, time-tables, deployment of staff, co-ordination of teaching, organization of teachers' work, staff meetings, and the organization of library, laboratory, and practical room work.

The problems of enrolment are well known to heads of departments. They include the mechanics of enrolling large numbers of students in a few days and of providing adequate vocational educational guidance in the course of a short interview. A number of questions arise on these occasions. Can the guidance be allocated to other teachers? How far does inadequate guidance at enrolment correlate with wastage, examination failures and lack of enthusiasm for technical education? How useful and applicable are secondary school records and headmaster's reports for allocating students to courses? How can the teachers in a specialist department study the techniques used for compiling school records and interpret the information satisfactorily? What correlations are there between school and college entrance examinations and achievement on the course? What are interviews intended to elicit, and how far are they successful? How far should parents of students be involved at the enrolment stage? How far is integration possible among all the agencies concerned with a student starting on vocational education as a preparation for his working life (school teachers, headmaster, youth service officer, youth employment officer, head of department and his staff, industrial training officer, and parents)? How is all the information collected, made available in one place, interpreted, and acted upon in an objective way?

For the head of department, compiling time-tables is an important, complex and time-consuming task. It involves making decisions about the number of classes that he himself should take, bearing in mind his other duties including those of supervision, and the levels at which senior and junior staff should operate to deploy their skills and experience most effectively.

Co-ordination of teaching is a topic which stimulates much discussion among heads of departments. Points of view vary tremendously. Some heads believe that once a teacher is given a syllabus he should be allowed complete freedom of action without supervision of any kind. Others think fairly close supervision is necessary – indeed, that all other duties are subsidiary to it. In addition, the responsibility for co-ordinating the subject teaching within a department, and achieving co-ordination between one department and another, are matters of great importance. How, for example, do heads decide what topics in mathematics will be taught, and in what sequence? How should science topics be related to laboratory and workshop projects? What practical exercises need to be synchronized with theory classes? What methods have proved effective in correlating theory, laboratory and workshop teaching? How can the head ensure that the teaching in his department is properly co-ordinated with particular stages of on or off the job industrial training? Should the head of department decide on a course of study regardless of industrial training, or should industry set the pace for college education? Unless definite and objective points of view exist on these issues it is difficult to co-ordinate college education and industrial training, no matter whether it is on or off the job.

Heads of departments often express a desire to be more involved in the educational process than in the routines of administration. For example, they would like to spend more time with teachers in the preparation of detailed schemes of work, in improving methods of assessment and the maintenance of student records, in diagnosing and overcoming learning problems, and in appraising the effectiveness of different teaching methods. With the expansion of technical education, these and similar matters are likely to increase in importance as the number of new and less experienced teachers grows.

Selecting and arranging industrial visits consume much of the head's time. The work involves deciding which visits are most appropriate at different stages and levels of a particular course, what purposes the visits are to serve, how they are planned and followed up, and how they are co-ordinated with class teaching.

Teaching

The head of department's job description should spell out his professional responsibilities with regard to the teachers and the organization and supervision of teaching in his department. He in turn must inform teachers of their responsibilities. For example, the individual teacher must know to whom he is directly responsible for his work, where to seek advice, information, and assistance, what administrative regulations prevail for staff within the college and within the department, and, generally, what is 'done' and what is 'not done'.

Though few teachers may wish to take part in policy making, all want to understand the processes for effectively transmitting and communicating the policy decisions which affect them. For example, technical teachers like having regular meetings with employers and industrial training officers to discuss mutual interests. Many like to go into industry on an informal regular basis. Others seek opportunities for particular kinds of practical experience and familiarization activities during vacation periods, or paid leave of absence for specific projects within industry. They need to know the head's views on close liaison between the department and industry, and how he intends to obtain it. Does he consider it appropriate only to senior staff, and is he prepared to modify teachers' time-tables to allow for it? Teachers also want to know the part they are expected to play in administration and organization. Many have no interest in either: they are concerned only with teaching and consider it an unreasonable encroachment on their professional commitments when a head of department unloads on them part of his administrative chores. Much of the work, they claim, is trivial and could be undertaken equally effectively by clerks. Senior staff in particular resent having comparatively routine administrative tasks given to them. They feel that they gained their seniority on the basis of high academic qualifications and successful teaching experience, and that they should therefore be fully occupied with teaching.

Other matters on which teachers wish to be informed are the financial arrangements in the department, the ordering of equipment, shared equipment and the procedure for exchange, and the arrangements for obtaining books and other materials for the library. They expect to be consulted about time-table planning, and resent being fitted into a predetermined pattern regardless of their preferences. They want a fairly stable time-table which makes the most effective use of their training and experience. They need time for preparation and marking, and reasonable study and workroom facilities, storage space, classroom furniture and equipment, apparatus, materials and teaching aids. Less experienced teachers should have smaller classes which are easier to teach, co-operative and keen to learn. Even at the risk of having to cancel classes or turn away a request from industry, no teacher should be expected to teach a subject in which he is neither qualified nor interested (e.g. an electrical engineer to teach welding).

The policy for the tutorial staff development programme (i.e. on- and off-the-job further education in special technical subject knowledge, industrial experience and professional training) is the responsibility of the academic board and the principal with the approval of the governing body. The head of department is responsible for its planning, organization, monitoring, and evaluation. The academic board, the principal and the heads of departments need to ensure that the educational and social environment of the college and its departments provide an environment encouraging to individual self-development and professional development. This involves a continuous review of staff to assess their performance, achievements, capabilities and potential in relation to their opportunities for development. Promotion to a particular job should be based on merit alone.

It should be open to all who have the technical qualifications and knowledge, the industrial and professional experience and expertise, the emotional strength, and the psychological make-up to do the particular job concerned. The individual teacher should be kept informed about his promotion prospects and the factors influencing them. He should know whose advice to seek regarding action to prepare for promotion. He should be told frankly when it becomes clear to the head of department that there is little prospect of promotion within the department. More often than not, teachers prefer even adverse criticism to no expression of opinion at all: silence, or an ambivalent attitude by a head of department or the principal, tends to create stress, rumour, anxiety about job security, and a feeling that positive leadership is lacking.

College Management

Direct application of management methods may be suitable for industry but it is not necessarily appropriate for the management of the network of human relations, the financial resources, the equipment and the accommodation of a college. Colleges are not homogeneous, and no single system of administration and management techniques can be applied to them all. This does not mean that the principles of management should be rejected. The governing body as the board of directors (the top authority in the management hierarchy of the college organization) decides what technician education and training work the college is to do, what size the college will be, and what resources of finance, teaching and non-teaching manpower, accommodation, equipment and materials it will need to do the job. The principal is chief executive officer, with responsibility for the central direction of the college. He and the heads of departments and the senior administrative officer constitute the management team which integrates the activities of the separate departments and makes full use of the various kinds of administrative expertise existing in the college. The management team must be sensitive to pressures from outside (e.g. from government, schools, industry, and examining and professional bodies), and from within the college. The team must also determine the specific educational and training objectives for the college and the strategies and tactics required to achieve them, and be flexible enough to cope with growth, innovation, changes in the organization and content of courses and in the composition of the student body.

Finance and Budgeting

It is difficult to measure the effectiveness of a technical college on a cost/value basis. The financial data are often not available in a form to fit them easily into a framework for policy purposes. For this reason many countries and international agencies have set up special units to measure and evaluate the cost of education, and of each different sector of education, in relation to national economic and social objectives. Where technician education is concerned, these units can consider such matters as the effect that the financial structure of the national education service has on the activities and actions of an individual technical college; methods of evaluating the final output from technician education

and training courses; methods of planning, organizing, resourcing, financing, administering, managing and monitoring courses to ensure that the trained manpower outputs and the financial inputs are right; ways of assessing whether teaching and non-teaching staff time, student time, accommodation and equipment can be more effectively and more fully utilized; the comparative cost benefit to society of a student in full-time or equivalent part-time technician education; and devising means for ensuring close control over capital and recurrent expenditure to ensure that technician and other education programmes conform to government priorities.

As most capital investment decisions involve a time lead of several years, most colleges prepare their development plans in the form of a five-year rolling programme. Estimates and data cover at least the actual expenditure for the previous year, the revised estimates for the current year, and estimates for the forthcoming year. The five-year programme is built up from projections of courses to be mounted and the numbers and types of students to be catered for. It is the framework within which the detailed annual budget for the college is prepared.

Budgeting

The estimates for the development plan are drawn up by the principal of the college together with the heads of the departments and some of the teaching and non-teaching staff. Each expenditure head must be built up from the basic requirements of particular items. After discussion with the individuals and committees concerned, and making any necessary modifications, the principal consolidates the information under such headings as maintenance of classes (which includes teachers' salaries, superannuation, equipment, accommodation, consumable stores, transport for students and other relevant items); and administration (which includes salaries and other expenses for the registrar and other administrative officers, clerks, and secretaries), as well as office equipment, maintenance, and other expenses. These headings are not mutually exclusive. For example, it is not possible to allocate the cost of the principal, the heads of departments and key teachers entirely to the maintenance of courses and classes on the one hand or to administrative duties on the other.

When complete, the estimates of anticipated income and expenditure, together with relevant information about staff and students, are submitted by the principal to the governing body about a year in advance of the new financial year. Individual items are approved, rejected, or deferred.

Budgeting in this way can be considered as an instrument of planning. It consists of three interacting functions. The first of these is concerned with obtaining as much information as possible about the costs of a particular project and building, and comparing it with the probable effect of obtaining the same end by other means. The second involves compiling estimates for the principal, the academic board and the governing body of the college. The third consists of making decisions about the acceptance, rejection, or deferment of the items in the estimates, of formulating the rolling plan for the development of the college, and of identifying where responsibility lies.

Costing

When the framework of courses has been established, the governing body has to consider the estimates and decide on the inputs to be allocated to particular programmes. This involves policy choices about how available resources are to be used, about reviews of programmes, and about assessing the contribution that each programme makes to achieving the college's objectives for providing technicians for industry. An increase in one programme can quite legitimately mean a decrease in another.

Estimates should therefore be prepared in such a way that they facilitate comparison between departments and even between different colleges doing the same kind of work. They should enable cost differences between courses, classes, class hours, teacher contact hours, and individual student hours to be analysed. For this reason, in preparing the budget the principal should involve all those who are responsible for any aspect of budgetary control, and ensure that they are fully aware of the financial regulations and procedures of the college and the financial limits within which they are to work.

Because salaries, wages, insurance, and superannuation represent about two-thirds of the gross expenditure of most technical colleges, these costs must be considered with special care. Practical management, based on modern, scientific management techniques — such as surveys, operational research, work study, organization and method — can be applied to appraising and obtaining economic efficiency whilst at the same time enhancing the quality of the courses and the employment prospects of those who take them. The total cost of the staff required is based on the actual cost per class hour. The costing unit in common use is the student hour. It is calculated from the number of full-time students (and full-time equivalent students) enrolled, and the actual student hours for each department for each session. Class contact and teaching hours, separated into different levels of work and numbers of teaching staff and ancillary staff on each grade, can be shown for each department.

If economies are needed, one way of achieving them is to increase the proportion of the working week that is spent by the average teacher in class contact. (This may involve reducing the research time granted to staff — particularly to staff who are paid the highest salaries.) Another way is to increase the size of classes, and a third is to increase the number of teaching weeks in the year. All suffer the drawback that they can easily lead to lowering the quality of teaching, and in this respect administrative economies (such as the maximum utilization of space described on page 107, and improved stores control and buying procedures) are to be preferred.

Routines

Every college has to carry out certain routine tasks which, nevertheless, require organization and management. They include:

1. Enrolment, which constitutes a significant part of the administrative work at the beginning of the session. This task, which provides a source of

essential information about the students, can be undertaken by clerks and may even be mechanized, either by punch cards or by computer techniques.

2. Progressive and detailed records of individual students.
3. Statistical returns for the college authorities and other appropriate bodies.
4. The collection of fees and disbursement of funds in accordance with any regulations that may exist.
5. Registers of attendance. Most government authorities will direct how these should be maintained in order that the appropriate financial grants may be paid to the college.
6. Secretarial and other services for the governing body, academic board, boards of studies, advisory and other committees.
7. Time-tabling, which is essentially a management task. A time-tabling system should show the arrangement and distribution of courses and classes; the loading and location of teaching staff; and the loading of rooms in terms of time, subject, and student numbers.

Inspection

Technical education is concerned as much with the development of character as with education and training for earning a living so that the individual can make a responsible contribution to the economic, social, and cultural development of the society in which he lives. The problems of technical education are therefore complex. They vary from country to country and from one district to another depending on the pace of social and industrial development, the availability and expansion of primary and secondary education, and the attitudes of parents, teachers, employers and adolescents to the value and status of technical education and training for technician jobs in the various fields of employment.

It is within this complex framework that the inspector has to operate. He has to assist colleges in achieving their objectives. He has to work with teachers and help them to develop improved methods of teaching technical subjects so that their students will acquire the knowledge, skills and attitudes they will need to obtain employment and be productive in industry. It is not his job to usurp the functions of the teaching staff or to issue instructions or directions to principals. Though he does make assessments, it is not his main task to evaluate the manpower output of a technician course against predetermined standards. Instead, he should concentrate on offering advice and suggestions on action that could improve the quality of the work in the college.

Full-scale formal inspections followed by a formal written report are now conducted only in exceptional circumstances, as, for example, when they are required by a government ministry or requested by a teachers' association. Their purpose is to enquire into every aspect of the work of the college, and to examine its buildings and equipment.

To do this, a panel of inspectors is appointed. They hold a wide range of discussions and consultations, and see the work being done in the lecture

theatres, classrooms, laboratories, workshops, library, and resources for learning centre. They consider the quality of human relationships that exist within the college and between the college and those organizations with which it is associated. They look at the curriculum of the various courses and programmes, and study such matters as the effectiveness of deployment of teaching and ancillary staff, development programmes for teaching and non-teaching staff, the utilization of space and equipment, teachers' records of work, student records, student counselling, examinations and standards, liaison and involvement with industry, and the management of accommodation.

Before any report is written, the inspection team should have full discussions with the governing body, partly to ensure that nothing in the report comes as a surprise to them and partly to secure their active support in implementing the recommendations. The report itself should in no way detract from the status of the college, the principal, or any members of the staff and student bodies.

Full inspections are unsatisfactory because they construct a profile of a college at a single point in time, because they do not last long enough to do the job properly and because they take place too infrequently to keep abreast of changing circumstances. More creative, constructive and effective work is achieved by means of visits of inspectors and advisers. These provide similar opportunities for discussion, support, advice (and sometimes criticism) but because no report is involved they build up more productive colleague-to-colleague relationships and closer liaison between the staffs of colleges and the inspectors.

The functions of an inspector of technical education are wide and far reaching in their coverage and responsibilities. He is the link in the partnership between the central government administration, the local government administration, the governing body, and the college staff. He interprets the views and wishes of the ministry of education, he provides specialist professional advice and information, and contributes ideas about new approaches and techniques for technician courses and the resourcing, administration and management of technical colleges.

In some countries inspectors have administrative duties and advisory functions; in others they are recruited or seconded on a short-term basis as full-time advisers or consultants; and in others inspection and administration are considered to be two different things, and inspectors are employed for the maintenance and development of educational standards and do not have administrative duties. The full-time inspectorate is the simpler arrangement, but its success depends on having clear job descriptions and a clear delineation of functions, duties and procedures. In either case specialist inspectors have a wider perspective than any college principal and teaching staff in advising on such matters as technician curriculum development, staff development programmes, forward thinking and planning for new kinds of technician course, and ideas about the internal organization, resourcing, and management of technical colleges.

The role of the inspector has changed. Nowadays he spends much more time

than in the past working with others in technical education, industry, professional and examining bodies, and research organizations, so as to acquire and exchange information on new needs, on curriculum reform and on standards in technical education.

A list of the duties of specialist inspectors employed by local authorities in Britain appears in a report *The Advisory Service in the Local Authority* (National Association of Inspectors of Schools and Education Advisers: Britain). It includes: (a) organizing the appointment of new entrants to the teaching profession; (b) the appointment, deployment, and promotion of teachers; (c) advising governing bodies on the appointment of senior staff; (d) inspecting and reporting on the work of teachers who are candidates for promotion; (e) maintaining an education staff development and training plan; (f) the establishment, development and running of teachers' centres; (g) teachers' courses; (h) curriculum development, research findings, new books and materials; (i) advice on internal organization; (j) briefing architects for new buildings; and (k) community relations.

The inspector has to communicate ideas, proposals and suggestions to educational authorities, governing bodies and teachers in such a way that he convinces them that he is a professional who knows what he is talking about. His reasoning has to be good. His appraisals must be more than generalizations, and his judgements must be more than assertions of personal conviction. The inspector should understand the values of the people with whom he has to deal, and appreciate what the work of teaching technician students involves. He should know exactly what the teachers and students are trying to accomplish, how best to tackle the job, and why one teaching method is more efficient than another. He must be able to stimulate development in ways of improving the quality and effectiveness of technician teaching and learning.

As a disseminator of new knowledge, the inspector should be allowed adequate time to keep abreast of current thinking and developments in the theory and practice of education and the associated field of psychology, behavioural sciences, organization and management, economics, and educational technology. He should be encouraged to develop and deepen any special interest he has in particular areas of the technical college curriculum. He should have opportunities for personal research and group research projects. Writing papers on particular educational themes, addressing specialist conferences, and participating in teachers' courses are important functions for which time and resources should be made available to the inspector

Technical Education Research and Development

In the past, research into technical education was generally neglected. It had little status or prestige, and it gained little support from principals and heads of departments. There are signs that this position is tending to change. No one can deny that there are many fields in which research is needed. The suggestions that follow indicate the range of studies from which selections can be made, in some cases by trained research workers, and in others by the staffs of the colleges themselves.

1. *Selection for Courses*

ADMISSION QUALIFICATIONS

(a) How far does success in a school subject (e.g. mathematics, science, drawing, practical subjects, native language) correlate with success in a technician subject at first-year level?

(b) What is a measure of a good standard of general education and how does it correlate with success in technical subjects and courses and in industrial training?

(c) What aptitudes are required, and how do they correlate with success in technical subjects and courses and in industrial training?

(d) How far does general intelligence correlate with subject and course success? For which technician courses does a student need to have more than average intelligence? In what technician courses and to what level is success possible with intelligence levels below average?

(e) What personal qualities correlate with success at different levels in different courses?

VALUE OF RECORDS FROM PREVIOUS SECONDARY SCHOOLS

(a) What kinds of record are provided from schools, how are they compiled, how is the information validated, and how reliable and objective are the reports? What are their limitations and how could they be modified to be of more value in giving educational guidance at the technical college enrolment stage?

(b) How can inspectors and advisers become more expert in the techniques of educational and vocational guidance in relation to technical courses?

2. *Variety Within Classes*

VARIETY IN ATTAINMENT

(a) What previous mathematical knowledge is needed before a student starts a technical college course in mathematics?

(b) What techniques can be used to fill in any gaps existing in a student's knowledge before he embarks on a technical course proper?

VARIETY IN ABILITY

(a) What tests exist, and what tests are needed to ascertain individual levels of ability and attainment in different subjects at different levels?

(b) What techniques are most successful in ensuring that the brightest students work as intensively and as quickly as possible to reach the required levels in their technical studies?

(c) What techniques are most successful in ensuring that the least bright have a reasonable chance of reaching the minimum pass level?

VARIETY IN TRAINING

(a) Should students who are taking the same course but who are destined to take up different forms of employment (e.g. one in the drawing office, another on operating machines, another on routine maintenance) be given the same exercises and take the same examinations? If not, what should be done to ensure

that they cover the course successfully?

(b) How can the effect of industrial training on technical college progress in individual subjects be measured? Are compensations desirable? If so, how are they to be evolved and applied?

(c) If it is necessary to practice industrial skills in the technical college, should all students be practising them in the same way at the same time, and if not, what modifications are necessary and how can they be introduced?

3. *Co-ordination with Industry*

(a) How can a technical teacher best learn about the day-to-day programme of students who are engaged or will be engaged on technician tasks in local industry? How can college education be co-ordinated with industrial training so that theory is related directly to practice?

(b) What are the functions of advisory committees and how can the committees be made more effective?

(c) What are the particular values to be attached to different types of industrial experience for technical teachers for the purposes of teaching at different levels on various courses? After how many years does industrial experience cease to be relevant and valuable without refreshment?

4. *Teaching Methods*

EFFECTIVENESS

How can effectiveness of a teaching method be best evaluated: (i) by various types of examinations and other forms of assessment? (ii) in the application of learning to industrial operations (e.g. the relative merits of lectures, lessons, projects, discussions, assignments, case studies, role playing, programmed learning, CCTV, and team teaching techniques)? and (iii) in terms of active learning?

TIME AND JOB ANALYSIS

How can technical syllabuses be converted into schemes of work so that teachers can plan their work on a sensible basis?

TEACHING AIDS

How should the use of demonstration experiments, teaching models, film strips, film, diagrams, and other devices be mixed or put in sequence to raise the quality of technical class teaching?

LESSON PREPARATION

What lesson notes would help technical teachers to improve the quality of their teaching?

5. *Libraries*

What are the relative merits of reference books and textbooks for various subjects at different levels of technician education?

6. *Technical Education as a Subject*

How did any particular technical college start, and what personalities, factors, sequence of events have affected its development?

There can be no doubt that the need for technical education research exists, and that there are enough young technical teachers in any college to make a start. What is often lacking is professional leadership, official encouragement, and an organization to co-ordinate effort. A research committee of persons of established reputation and calibre can advise principals, heads of departments and industry about the best way to proceed. They should also give whatever help they can towards the publication of the results whenever they make a contribution to the thinking and practice of technical education. As things are at present, problems are too often either ignored altogether or approached by rule-of-thumb methods, solved by the mystique of age or divine inspiration, or dealt with in an authoritarian way which industry would not tolerate.

Included among the research activities requiring greater resources than exist in the average technical college are: (a) devising new patterns of technician education and training courses tailored for particular occupations in new and modernizing industries; (b) an analysis of specialist technician occupations and of specialist technician jobs; (c) time taken and time necessary to educate and train different kinds of technician; techniques of accelerated technician education and training; adult technician training and retraining; the development of self-pacing learning programmes; (d) technician education for women; (e) the general pattern of industrial employment in the country, and the immediate and future needs for technician manpower; (f) identification and definition of emerging technologies; (g) the best use of its technicians in industry; (h) the status of technicians in the industrial organizations and in society; (i) design of technical college buildings, and laboratory and workshop equipment for technician courses; (j) the design, furnishing and stocking of technical college libraries; (k) the teaching and non-teaching staffing establishment of a technician education and training institution; (l) the decision-making process for capital investment programmes; (m) planning and managing the economic and effective use of resources of technician teaching and non-teaching manpower, accommodation and equipment in colleges; (n) the content and organization of schemes of practical training for technicians where industrial development is not at a stage to train technician manpower by the traditional methods of industrialized countries; (o) the development of mobile instruction units; (p) the development of correspondence courses for technician education and training; (q) educational measurement; (r) technical subjects in the secondary curriculum; and (s) courses for principals, heads of departments, and other members of the academic and administrative staff.

Though the selection of the priorities for investigation and research will differ from country to country, the principle that research is essential is universally true. In short, unless proper research-based evidence is available, much of the vast investment in technical college buildings, equipment and staff salaries may be wasted and opportunities to improve the quality of technical education will be lost.