

7 Technical Education Needs

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In this contribution, Suresh Munbodh identifies some of the more important factors that act on the need for, and the delivery of, technical education in small states. He views technical education in a broad sense, recognising the end product of technical and vocational training as a person able to enter the world of employment as a productive worker, yet with the flexibility to stop, start and change in accordance with labour market requirements. If an integrated approach to development is required, this must apply to technical education too.

After a brief consideration of a number of external factors, attention is given to a wide range of internal factors, ranging from political and industrial contexts through to curriculum, materials and examinations, to financing, language and mobility. He concludes, that however small a country may be, there is no alternative to a high level of professionalism and planning if technical education is to serve the needs of society and the economy efficiently.

The wider economic context

Most small Commonwealth countries have gained independence during the last two decades. As former British colonies they were

geared to the production of primary products, mono-agricultural economies producing goods such as sugar, fish, bananas and ground-nuts. After independence there was a realisation that such economic profiles would not be appropriate if newly established development objectives were to be met. Economic diversification was essential. Consequently, many countries have moved into the industrial and service sectors.

A study of the development of the world's industrial countries shows that they all moved gradually from an economy based on agriculture to one based on industry and services. The same process is taking place in many developing countries but with a major difference. The industrial countries had a guaranteed market for their products. Many had colonies in which to sell their produce, or had a big enough local market to sustain their industries. Today, the developing countries do not enjoy the same advantages. Resources for development are scarcer, and developing nations have to depend on the sale of their products to the industrial nations to earn foreign exchange in order to pay for their imports and obtain any surplus necessary for investment. The irony in all this is that the prices of both the exports and the imports of developing countries are fixed by the industrial nations. This situation only exacerbates the problem of development in the developing world. The smaller countries in particular are more exposed to fluctuations in world trade than are their larger colleagues, but small states have also to operate within smaller margins of error in order to retain some degree of economic stability.

Clearly small states cannot aim at producing everything they need as their limited local markets render production costly. They are dependent on external markets. With many industrial countries adopting protectionist measures, entry of manufactured as well as agricultural goods produced by the developing countries is becoming more difficult. Consequently, the struggle of the smaller nations to develop is becoming harder.

World trade plays an important role in the development of most countries, but it is disproportionately influential in its effect on small

developing states. In some small countries multinationals and the development of Export Processing Zones are important in directing the ways in which economic development is taking place. Competition amongst developing countries to attract multinationals leads to countries providing more and more concessions including duty free facilities, tax holidays, expatriation of investment and profits and cheap and trained labour. Such competition is greatly to the advantage of the investors who become more 'mobile'. The small states are exposed to this mobility. The closure of a factory or an industry may completely upset economic development and the employment situation. In these situations small states are relatively helpless. Thus the need for a flexible workforce able in some part to respond to such uncertainty. The identification of these needs is only the beginning of the long path leading to the development of technical education.

Small states are also part of a 'smaller world' brought about by rapid improvements in communication. Small nations cannot be spared from the influences of modern technology. Radio and television have reached the remotest corners of the earth. People are exposed to what is happening in industrial countries. This exposure creates desires and aspirations which cannot be met. At worst the new forms of communication may be used to destabilise small states politically.

Isolation as well as closeness to continental mainlands may also have adverse effects on the development of small countries. Countries like the Bahamas, close to the USA, or Malta, close to Italy, may suffer from the influence of the metropolitan culture. On the other hand small states in the Indian Ocean and the Pacific have difficulties in accessing their goods and services to the rest of the world. Such situations restrict the development of these countries as good communication is essential for economic growth.

The national context

To the uncertainties associated with the international economic scene are a range of internal factors many of which are inextricably linked with the openness of small state economies.

Unemployment and bureaucracy

A common factor is the problem of unemployment. Formerly it was uneducated unemployment; today increasingly it is 'educated' unemployment. The degree of unemployment varies from country to country and with different political systems. Many countries, in the hope of amortising the effect of unemployment, have absorbed a large number of people in the public sector with many underemployed. In some cases such policies have an adverse effect on the productivity of the system and only add to the complexity of the national bureaucracy, slowing down development, especially innovation.

Industrial policy

Very few small states have been able to put up a coherent policy for industrial development. Those that have managed to achieve something in this respect are on the upper end of the scale of smallness, e.g. Mauritius. As a consequence many small states have enunciated policies to promote the development of technical education without, in many cases, defining their industrial policy. Incentives and guidelines for the development of industries have often been lacking. In many instances policy for the development of technical education is not related to linkages between training and industry. Thus technical education has been unable to develop at the school level alone lacking the support of the world of work.

Type of industries established

Foreign investors and multinationals, attracted to small states, are establishing 'footloose' and 'screwdriver' industries which have a high labour component in their products. Investors are interested in sectors requiring a very low skill component in the production of the goods, therefore the component of the labour force requiring technical education is rarely beyond 10-15 per cent. Such a scenario is a major constraint in the cost-effective provision of technical

education. In many instances the small number of technicians required renders the local running of courses in technical education extremely costly.

Planning the education system

Educational planning is becoming more complex. It is very difficult for small states to employ specialists in different sectors to plan the education system. Such states have to make do with whatever resources they have, or have recourse to expatriates. In small states, committed generalists perform all the functions, with planning divisions/sections usually made up of two or three people.

On the whole small states have an easier task in providing basic education for their people. Enrolment ratios are relatively high (Table 1). However, the planning of education at the secondary level is rendered more difficult because of smallness of scale. Consequently the planning of technical education has suffered. The planners have very often not been able to provide for the small numbers of technical manpower required at any particular time in a variable and unstable employment environment.

Students after some secondary education have looked for opportunities for studies either in the wider region or in distant countries. Many, after their studies, do not go back as they find more remunerative jobs in more developed countries. This causes an inevitable brain drain from the small developing states to countries offering better opportunities. Such a situation is not favourable for the economic growth of the small states; the industrial sector suffers, and with it technical education.

Some small states still have to rely on expatriates to teach at the secondary level. They have also inherited a pattern of education which has not encouraged the learning of technical subjects and an ambience that has even slowed down the development of technical education. Manual work has been looked down upon and technical education has, most of the time, been associated with manual work.

Table 1: Primary Enrolment Ratios (1979-82)

Country	Enrolment ratios	Country	Enrolment ratios
Antigua & Barbuda	80 (B)	Malta	110
Bahamas	99	Mauritius	112 (C)
Barbados	115	Nauru	NA
Belize	85 (A)	St Kitts-Nevis	NA
Botswana	102	St Lucia	95
Brunei	NA	St Vincent & the Grenadines	90
Cyprus	84	Seychelles	95
Dominica	123	Solomon Islands	60
Fiji	109	Swaziland	110
Gambia	69	Tonga	77
Grenada	108	Trinidad & Tobago	91
Guyana	95	Tuvalu	NA
Kiribati	100	Vanuatu	NA
Lesotho	104	Western Samoa	91
Maldives	61		

Source: *Commonwealth Factbook 1985*

Notes: A - 1970 C - 1983

B - 1977

Technical education and training

Industries, in order to establish themselves in small states, have been those requiring basic education in the training of the craftsmen needed. Such training was traditionally provided by the employers on the job. Today any attempt to provide modern technical education

goes against the grain of beliefs of people who tend to confuse it with vocational training. Many small countries have for long included in their plans the diversification of the education system and the elevation of technical education within it. However, the promotion of technical education in schools has often failed because of the established beliefs enunciated above. Employers, and society at large, need to understand the difference between technical education and vocational training. While this confusion exists, it will slow down the evolution of broad-based technical education.

The administration of technical education

The delivery of technical education - like other forms of education - is affected, advantageously and disadvantageously by 'smallness'. The disadvantages may be summarised as:

- 1 Pressure on the system to provide courses in all the skills needed by the economy;
- 2 Exposure of the system to criticism in case of failure; any failure may cast long shadows on present and future action;
- 3 Shortage of professionals in the system for its management. The size does not permit the recruitment of specialists for the different sectors e.g. for budgeting, curriculum development, evaluation and supervision.

However there are several advantages:

- 1 It is small and manageable;
- 2 Its objectives are known, and communication is easier; once inertia is overcome, momentum for change is easily maintained;
- 3 Success stories are more easily and quickly achieved and publicised;
- 4 It can more easily win public support if the public is convinced of its objectives.

Furthermore, small states may have at the most just one or two technical institutions and the fate of technical education very much depends on the leadership and management style of the head of the institution. Small states have to choose the head from locally available cadres and in many instances the wrong choice of head has been responsible for limiting the effective development of technical education.

Provision of materials and equipment

The teaching of technical subjects requires the use of appropriate equipment and materials. Rapidly changing technology soon renders obsolete the equipment in use in schools and colleges. Expensive equipment is bought for the launching of technical subjects. This equipment is soon out of use because of new models already on the market and also because of lack of maintenance. In small states the problem is worsened as the number of items of such equipment required is so small that local representatives are difficult to find and spare parts are virtually unobtainable. The non-availability of spare parts coupled with the lack of proper maintenance technicians reduce the life span of expensive equipment. The non-lubrication of a machine, or its improper use, considerably diminishes its life.

In cases where equipment is available, the lack of materials and tools renders its utilisation difficult. The location of many small countries, and their budgetary and financial procedures, require that imports have to be planned at least two years in advance. Very often orders are not satisfied as major suppliers are not interested in the small quantities ordered.

Such problems call for advance planning and budgeting. Not many of the small states use a rolling budgetary system going over a period of two to three years. Hence, more often than not, institutions providing technical education are short of equipment, materials and tools.

The curriculum

As in most ex-British colonies the curriculum at the primary and secondary levels invariably follows the British model of academic

education in mathematics, language, art, science and social studies. Technical education, whenever it has been introduced, has suffered the consequences of this context. The inherited organisation and management of the curriculum has not been conducive to the development of technical education. Like its 'academic' counterpart, the technical curriculum has been an imported one governed by external examinations.

A major criticism of secondary school curricula in small states is that they have been too academic and operated against practical talents. Employers in the industrialised countries on the other hand want more and more people who have the ability to learn to get on well with others, to communicate, to be reliable, basically numerate and understand how wealth is created.

There are attempts throughout the world today to try to make the curriculum more relevant to the world of work. Employers feel that it is unrealistic to continue to separate general and vocational education, for it is necessary to assimilate the scientific knowledge upon which techniques of production are based.

The curriculum has to be consumer-oriented. Its planners and developer should move out of their four walls into the outside world, to decide on the new directions to be given to the objectives as well as to the content. Unfortunately many of the institutions involved are cut off from the real world and produce curricula which are neither related to the needs of the country nor integrated.

A major challenge facing all countries, including the small states, is how to integrate the development of scientific, mathematical, linguistic, social and technical skills and abilities within the school curriculum. The small states are again at a disadvantage because sufficient expertise to do such a complicated job may not be locally available.

The unavailability of equipment and materials which are essential for proper implementation is a common problem in small states. Consequently teachers prepare their lessons according to the equipment and materials available. This leads to a dichotomy between school and the outside world where industries may be using

the latest technology. In consequence technical institutions find themselves teaching an obsolete curriculum. Furthermore, the curriculum is governed by external examinations which prevent it from adapting itself to local needs, and is based on the acquisition and use of equipment and materials that are alien to the context.

Technical education for girls

As in large states, in small ones girls and women have traditionally kept away from technical subjects thinking that such an education is more suited for boys. In the past the techniques and technology used required physical strength but today the situation has changed and most technical jobs can be performed just as well by a female as a male. However, despite the fact that more and more technical schools are open to both sexes, still fewer girls join. At the Lycee Polytechnique in Mauritius, out of a school population of 350 in 1987 there are only six girls. A greater effort should be made, through the mass media, to attract more girls to technical education. It may even, in the first instance, be necessary to reserve a certain number of places for girls where the allocation is on a competitive basis; that is to say, to operate positive discrimination in their favour.

Teacher training and teacher supply

Small states are mostly young nations. Often they did not have any teacher training institutions at the time of independence. Those which have established such institutions have based them on models which exist in the industrialised countries, therefore training teachers for general rather than technical education. Almost none of the small states of the Commonwealth have a teacher training institution for technical education. In many instances, teachers of technical subjects, who usually have lower academic qualifications, have very little training in their field. Such teachers tend to struggle on their own and teach in an amateurish way, developing only the lower skills and abilities in their students. This again has led to the relegation of technical education to a lower status. Those who are qualified to join the training institutions find better opportunities in the private sector.

Ultimately the quality of teachers of technical education suffers and consequently the quality of pupils choosing technical education suffers as well. This leads to a vicious circle whereby only pupils of lower academic ability are directed to technical streams. It is some of these pupils who later become teachers of technical subjects.

In many small states, as the education system does not provide for technical education, it is difficult if not impossible to obtain qualified people to be trained to be teachers. Some countries have recruited teachers with fewer qualifications than for general education and given them lower pay. Obviously this has had a negative effect on the choice of technical subjects by pupils.

The examination system

Examinations control to a great extent the learning occurring in formal education. Major curricular reforms in industrialised countries did not meet with the expected success as examinations did not change fast enough. In the small states dependence on external examinations (e.g. University of Cambridge Examinations Syndicate and the University of London) has been a major issue of the post-independence years. Many of the countries have their own examinations at the end of the primary cycle but still carry on with external examinations at the 'O' and 'A' levels. The main reason for the reluctance to change is the so-called 'international standard' and recognition of the marketability of certificates. Some localisation/regionalisation of examinations has started with the establishment of the Caribbean Examinations Council (CXC), the South Pacific Board for Educational Assessment and the Mauritius Examinations Syndicate.

In the technical field the City and Guilds of London Institute (CGLI) and the London Chamber of Commerce and Industry (LCCI) are the two main bodies responsible for examinations. Very often the curriculum taught to meet the objectives of these examinations is not relevant to the needs of the countries. Here also the examinations need localisation/regionalisation. However the small number of candidates involved may not warrant the cost of skilled

teachers, assessors and local teaching materials and therefore some dependence will inevitably continue. In any case countries may not wish to lose an external qualification and the opportunities this affords overseas.

The equivalence and recognition of certificates

Internal co-operation is essential for accelerating the social and economic development of small states. The comparability and equivalence of the certificates awarded by the local/regional examination bodies with those existing in the industrial countries will facilitate the trend towards localisation of the curriculum.

The official equivalence of certificates, be it in the academic or technical subjects, is essential for students who have to travel overseas either for further studies or even for employment. The task of establishing equivalence amongst the certificates awarded by the different bodies is both complex and delicate.

An information base has to be built up and circulated to all the states to reveal the features the different institutions have in common and the equivalence of the courses they are providing at the national, regional and international levels. Such information would provide support to those choosing technical education and help to attract more able students.

The workplace

The output from technical streams or institutions is expected to enter the world of work and start production immediately. This is not always the case with those graduating from general education. Technical education is managed and organised along the lines of general education whenever it is under state control and very quickly it gets out of touch with the workplace. The older the institution grows the greater the tendency for it to be cut off from the real world of work.

Since 1970 many attempts have been made in developing countries curricula so as to include technical and vocational subjects. This has involved heavier investment in terms of workshops,

laboratories, equipment and materials in so-called 'diversified schools'. However, it would seem that very often the diversified schools recruited poorer quality students; the cost per student was higher in the diversified schools; and students do not find jobs more easily, nor do they earn more.

It is clear that, as with 'general' schools, technical schools and colleges neither create jobs nor fix salaries and in any case the output from the different types of schools competes for the same jobs. While the studies giving rise to these findings were not carried out in small countries, the problems they highlight are all too familiar in such locations where smallness of scale and fragile economies make correspondence between formal education and employment even more difficult to achieve.

The financing of technical education

Technical education is more expensive than general education. Apart from higher capital investment, its running costs are two to three times higher in terms of both the lower average class size for pedagogical and safety reasons and for the 'experimental' nature of the subjects involved. In addition, books and audio-visual aids for technical education are not produced on a large scale and are therefore disproportionately expensive.

Different formulae have been tried to finance technical education, comprising: productive work included in the school curriculum; the school undertaking private work; sponsorship by private firms; and having students pay for the materials.

However none seems to have been very successful. More experiments are being tried in respect of enhanced links with industry and increasing community participation, that is to say: involving industrialists as well as parents in financing technical education. Such an approach is proving relatively more successful as it tends to lower the burden of heavy investment and make the system more locally responsive. In spite of the heavier investment required by technical education, Chion A. Leong in a study carried out in Trinidad and Tobago observes that the output from vocational schools, '... did not

consider what they learnt at school to be closely related or related at all to what they had to do on the job'.

It would seem that special financing for technical education is not a productive approach. If this means that the funding of this aspect of provision would be better done as part of an integrated system then small states addressing their problems of scale might well lead the way in developing a new model.

Links with industry

Technical education unlike academic or general education requires a constant dynamic link with industry, if it is to survive. Very often the absence of such links makes technical certificates merely an additional paper qualification.

Cases of the failure of technical education in small states to link meaningfully with industry abound. However, a few success stories do also exist such as the case of the Lycee Polytechnique in Mauritius. In that case the employers were involved in the project right from its feasibility study. They participated in designing the courses to be offered; in the drafting of the curriculum; in the setting and carrying out of the examinations; in producing short training courses for students and staff; and most importantly in giving an image of the institution to the public. Industrialists still form part of the standing committee which reviews the curriculum each year. Such on-going links enable the institution to grow in harmony with the community it serves and this in turn promotes the image of technical education.

The language issue

The diversity of languages spoken in many small states is another important issue. The post-independence years have seen a revival of the vernacular and other languages and the culture of those who were colonised. English in many cases has become a second language. Some countries like Western Samoa are extending the use of the vernacular right through the primary school. Different formulae have been tried in the different states as to the level at which the vernacular and English should be introduced and none of the small countries has succeeded in resolving the language issue. Mauritius, for example, has

a three language policy - English, French and an Oriental Language - right from the first year of primary school.

Whatever the language policy, it affects technical education to a considerable extent. Most of the books and audio-visual aids are either in English or in French. A knowledge of one of these two languages is essential for the development of technical education and to keep up with progress in the technical and technological fields.

Audio-visual aids

Technology is developing too fast for small states which can neither avoid the influence of such development, nor keep up with it. They simply cannot avail themselves of all the modern technology to aid learning, especially in technical education, because of the high cost and logistics involved.

The islands in the archipelago states and the remote villages in the larger states all face an extra problem of isolation and experience particular problems in the supply of audio-visual aids. Consequently the technical education teachers have to take care of this additional dimension and should be equipped to prepare the most suitable aids to accelerate learning. Just a duplicating machine and a photocopying machine, properly used and maintained, can be of great help to the technical education teacher and student. Such facilities enable teachers to provide students with relevant learning materials as books are very often not available. Whilst distance education can contribute a great deal to technical education in states where electricity supply, radio and television are easily available, it may be more appropriate for the schools to be provided with slide projectors, radio-cassettes, video sets and tapes to help the students in their learning of technical subjects.

Mobility and co-operation

Technical education more than general education calls for regional and international co-operation. Such co-operation should help the exchange of staff and students to maximise utilisation of expensive facilities and thereby to lower costs. No small country can provide for all its technical needs because of the high cost involved. Hence

cooperation amongst technical institutions along the basis of the University of the South Pacific (USP) or the University of West Indies (UWI) should provide additional leverage in promoting technical education. Regional co-operation, using an efficient information system, with data readily available to individual states is essential for meeting the manpower requirements of the small states and especially the planning involved in that. The small states will have to live with the unemployment problem for years to come and will not be able to contain the mobility of students and others who are always seeking better opportunities overseas.

Conclusion

The small member states of the Commonwealth are more often than not faced with more problems than the larger developing countries. Their size does not usually allow them to have local expertise for the planning and programming of their technical education needs which have to be carried out by expatriates not very familiar with local social economic and cultural contexts. Technical education is costly and any project which fails leaves a bad taste for future action. Careful analysis of past experience has shown that a multiplicity of factors have to be considered in the identification of technical education needs. Recommendations based on what is happening elsewhere and intuition have not always proved to be workable.

The small states, because of their size, and in some cases isolation and dependence, have needs particular to themselves. They cannot be treated merely as a reduction of the larger states.

Research has not yet been able to recognise explicitly the link between schooling and jobs and experts such as Oxenham feel that these countries should set about educational reforms with less attention to manpower needs and much more attention to high quality schooling from Grade 1. Training for jobs should be left for the job-givers - the employers. In any case, experience has shown that the introduction of technical education in an amateurish way, in the

general school curriculum, has been costly and unproductive.

Technical education gives good results where it is professionally planned, managed and organised with a real link with the world of work. Investing in technical education in small states needs careful planning and succeeds only in the hands of the committed. The establishment of regional links, to make better use of the available resources, will not only help in reducing costs but will make the provision of technical education more effective and efficient. Small states should bear in mind that the education and work linkage, however differently conceived, is a key to their success.