Education Division documents. No. 22

Practical Subjects in Kenyan Academic Secondary Schools:

Background Papers

by Christopher Cumming, Martin Davies, Kevin Lillis, Ben Nyagah

SIDA August 1985

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PREFACE

In the 1960's and the beginning of the 1970's, all economic trends pointed upwards. Optimism was great in the developed as well as in the less developed world. The less developed countries should replicate the development in the developed world and the gap should thereby rapidly decrease.

Investment projects were conceived in all areas and supported by the donors. Education was one of the most important areas for such investment. An important factor for development was to educate the people to read and write. In order to be able to modernise the economy, 'practical' subjects should be taught on all levels. 'Diversification' of secondary as well as primary education was an important measure.

Kenya was one of the many countries that implemented such diversification programmes. Part of this programme, 'Industrial Education', received Swedish support from 1969 to 1982.

Since the diversification programmes were started, the development optimism has changed towards a greater degree of pessimism or 'realism'. Trends do not anymore point upwards. Development funds are scarce; and funds for the running of existing programmes do not suffice. 'Diversification' of schools has become, relatively speaking, too expensive; and a number of cost-benefit studies have thrown doubt on the relevance of such projects, at least as they were conceived in the early 1970's.

As a contribution to the international pedagogical discussion, SIDA engaged the University of London Institute of Education to make an in-depth evaluation of the Swedish-supported 'Industrial Education Project' in Kenya. The result of this evaluation has given SIDA important feedback on issues which have to be discussed in a number of new or ongoing projects all over the world. I am also convinced that many others - responsible authorities in developing countries as well as donor agencies - can make use of the conclusions and recommendations of this study. The study is presented as an Education Division Document in three parts: General Report, Tracer Study, and Background Papers.

Lennart Wohlgemuth
Stockholm, 27 June 1985

NOTE FROM THE EDITOR

This volume presents a selection of background papers prepared for the Evaluation of Industrial Education in Kenya. They all appear in a condensed and edited version of their original form. Priority has been given to those papers which in discussion and data go far beyond those aspects which could be included in the General Report for the Evaluation or in Anders Närman's separately published Tracer Study report. Thus, several otherwise very valuable reports have not been included in this selection. In particular, Daniel Sifuna provided detailed data on examination results at Industrial Education schools - data which were extensively utilised in the General Report. Similarly, much use was made in the General Report of material from those background papers by Martin Davies and Ben Nyagah which are not included in the present selection.

Kevin Lillis' review of relevant international literature is essential reading for those who are interested in the wider implications for international debate of the findings in the General Report and the Tracer Study, not least because our present findings deviate in several respects from previous international experience so aptly summarised in Lillis' review.

Martin Davies' study of I.E. teaching methods was conceived by him on top of other hectic tasks, during the early part of the round of school visits which he, Ben Nyagah, and I conducted. He similarly 'improvised' on top of other contributions his tracer study of I.E. woodwork students whom he had taught at Nyandarua Secondary School 10 years earlier. He traced successfully every single one of this class of 14 students. Because of the length of time since these students took their 'O' Level exam, this small scale tracer study usefully complements Anders Närman's large scale tracer/follow-up studies.

Ben Nyagah's report gives detailed information on the very aspect which SIDA's assistance to I.E. had as its prime target: buildings, equipment, and tools. The report - and the data collected for it - provides the Inspectorate with much detail about the condition of I.E. 'hardware' at each school visited.

Finally, Christopher Cumming's study, based upon only 2 weeks of fieldwork, makes maximum use of scarce data to answer questions relating to the cost of the Industrial Education subjects and of Swedish assistance to it.

Department of Education in Developing Countries
University of London Institute of Education
August, 1985

Jon Lauglo
Editor and Project Director

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CONSTRAINTS ON THE IMPLEMENTATION OF DIVERSIFIED CURRICULA

A REVIEW OF EXPERIENCE IN DEVELOPING COUNTRIES

BY

KEVIN M. LILLIS

The history of the formal education systems in almost all developing countries reveals attempts to reform secondary education away from its dominant academic norm into 'diversified' directions. These have taken forms which suggest a number of patterns (Lillis and Hogan, 1981, 1983):

(a) attempts to vocationalize schools by integrating work (often of an agricultural kind) and study throughout the system;

(b) attempts to establish school structures (like technical schools) parallel to existing academic schools;

(c) attempts to create a component (compulsory or optional) within an otherwise academic core curriculum;

(d) attempts to develop non-formal education.

A range of goals have been formulated. They range from the teaching of relevant skills, values, attitudes and knowledge for modern sectors or agrarian employment; to solutions to unemployment and urban immigration problems.

By and large, these programmes have failed to achieve such goals. They have experienced a wide range of implementation problems (Lillis and Hogan, 1981, 1983). Both in developed and developing countries, the various forms of diversified education both within and outside school (Grabe, 1973) have been in vogue, as a response to economic, class and ideological imperatives (Benavot, 1983). A range of propositions exist about the implementation and outcomes of these attempts within developing countries which may be summarized as follows:

1) Rejection by Parents and Students

1.1 Academic education is considered or found to provide a route to better jobs and incomes than forms of diversified education. The latter is therefore seen as providing an inadequate return on investment. This leads to the related hypothesis by observers that educational change, such as curricular reform, cannot produce those attitudinal and occupational changes which are largely determined by the socio-economic system.

1.2 Diversified education is seen as an intrinsically illegitimate or second class form of education.

1.3 The "modern" methods and practices acquired by students cannot be utilised because of parent resistance or lack of resources. This in turn has a back-wash effect on present and potential students and their parents.

2) Rejection by Teachers and Administrators

2.1 Teachers view education as the selection and training of an elite. They belong to this elite themselves, and they regard diversified education as an illegitimate or second class form which also threatens their own status.

2.2 Teachers feel they cannot teach realistic practical skills in the school situation.

2.3 Teachers feel they do not have the appropriate skills for teaching diversified education.

2.4 Books and equipment are alternatively:

a) inferior;

b) too sophisticated;

c) lacking.

3) Rejection by Employers

3.1 The skills taught by diversified education are out of date because it cannot keep abreast of technological change.

3.2 Such practical skills are badly taught. What employers want is a good level of basic academic education on which they can build occupational skills.

4) Poor Implementation

4.1 Resources are not properly deployed.

4.2 There is a lack of political will, leadership and of efficient administrative decision-making and procedures.

5) Selection and Control

5.1 The selection and examination procedures in use are inappropriate to diversified education.

6) The Future

Despite the foregoing causes of rejection and failure, it may be that these arose in the colonial and immediate post-independence eras in developing countries but are not eternally valid. During the period in question there was an immediately perceived need for administrative and clerical workers who were rewarded in proportion to their scarcity. As this gap closes, and if, additionally, the returns to "practical" vocations improve, diversified education may become more favourably received.

Given that range of summarised propositions, this paper uses the extant documentation to examine the experience of diversified education within three of the forms (a) (b) (c) suggested initially, offering broader details of the constraints on (a) agricultural education and education for rural development, (b) technical education and allied forms, and (c) prevocational education.

Throughout, the study elaborates the dynamics and forces that have constrained the implementation of these programmes. It follows Lillis and Hogan (1981, 1983) in arguing that the forces and constraints appear to be generalisable across the suggested forms, but specific forces and constraints may also operate upon specific strands of practical education, e.g., industrial education. The attempt is made to penetrate the rhetoric of programme goals. Thus, much of the emphasis is upon the demise of programmes. But the conclusion nevertheless suggests some of the broader dimensions that might be considered for more successful implementation.

The study adopts an international perspective, although the attempt is made to provide a Kenyan focus. It is however important to stress the limited availability of either Kenyan focussed literature or discussions of industrial education within the context of developing countries. The focus of the paper is the post-primary level within schools.

1 AGRICULTURAL EDUCATION

There has been a long history of agricultural education in developing countries. For example, agriculture has been taught within the schools of East Africa for well over fifty years and in the schools of the Caribbean for over 100 years, beginning from various isolated experiments in mission schools and becoming officially established in the school curriculum at several phases in the slow development of colonial education. Since Independence, agriculture has been reintroduced as a separate subject within many educational systems. With reference to this commentary one may point to Kenya, Uganda, Tanzania, Malawi and Zambia. It has sometimes occurred at the upper primary level, but more commonly as a distinct and technically oriented stream in secondary school (Moris, 1971).

Throughout this history of experimentation and adaptation, agriculture has been a controversial subject (King, 1971). From the beginning, the subject has been the focus for continuous argument, in the respective Ministries of Education, within the schools themselves, and in the home communities of the pupils. This argument has brought to the surface conflicts between rival philosophies of education, between alternative structures of training, between competing scientific professions and the technical professions, and between parents, pupils and school administrators over the issue of the control of the content of schooling (Moris, 1971).

Moris (1971) argues that this background explains why much of the early writing about agriculture in education has a normative flavour, either disparaging or extolling its relevance, suitablility and effectiveness in preparing students for the world they face when they leave school. Only more recently has the literature concentrated upon the difficulties in implementing these programmes.

Reasons for 'Failure'

Evidence suggests that innovations in West Africa were subject to the same difficulties, and that, therefore, the hypotheses relating to the demise of such curricular orientations are relevant to that region also (cf Foster, 1965 (a); Lewis, 1954; Mason, 1959; Wilson, 1963).

The half-European, half-native experiment in Tanganyika, 1927 did not work in practice becasue "neither pupils nor natives wanted the half-and-half education...Those who wanted the old, native education could get it in their homes" (Morrison, 1976). The reasons are elaborated in the commentary below:

> First, educational administrators had neither sufficient information nor adequate skills and equipment (to integrate schools and rural development). Second, many teachers, especially Africans, were themselves refugees from rural life and thus ineffective agents of programmes designed to persuade youths that their destiny lay in working the land. And, finally, parents and pupils exerted strong pressure on teachers to concentrate on the academic material on which examinations were based...Although many Africans consistently rejected Western educational forms it did not take others long to perceive that education was the means of entry to a new occupational structure established by the Europeans...To a pupil himself, education meant an escape from the poverty of the near-subsistence farm to better housing, food and other amenities...(Morrison)

Foster (1965a) reinforces this analysis and claims that British colonial authorities, as the dominant elite, became a group which young Africans sought to emulate. He notes that three characteristics of this elite were significant for the type of education which parents and pupils demanded. It had virtual monopoly over formal education of a particular type. It confined itself primarily to a narrow range of occupations of an administrative variety; and it was internally stratified on the basis of occupational and formal educational criteria. As a result, Africans aspiring to jobs like those held by the Europeans, sought an education similar to that enjoyed by members of the elite. Many Africans felt that attempts to gear educational systems to the traditional and/or rural environments as in the Phelps-Stokes Reports in the 1920's (Jones 1923 and 1925) were means of perpetuating the inferior status of their race. Even those who accepted these developments as desirable in principle felt that the pace of agricultural change was too slow to make farming an attractive occupation, particularly as few Europeans were seen to be engaged in manual labour. Hence, despite apparent attempts to formulate programmes which adapted Western educational forms to the colonial administrators' perceptions of African needs, there emerged a gradual appreciation by Africans of the relationship between the Western educational model and the closely-linked factors of occupational recruitment, social status and material well-being.

In relation to experiments towards the implementation of the Middle School Agricultural programme in Tanganyika in the 1950's, Dodd (1969) cites five reasons for failure:

> (i) Educational: The syllabus for practical agriculture was too rigid ...it made too little allowance for regional variations...The guidance provided was inadequate... Education Officers sometimes lacked the necessary knowledge, and the specialist officers sometimes lacked the desired interest...Some of the books available were inadequate...(though it can hardly be argued that there was a shortage of books or that books on agriculture were worse than for other subjects)...There were weaknesses in the teaching... there was a shortage (but not very serious) of Agricultural Instructors...Some teachers were unsympathetic to the whole idea of the Syllabus...others could not handle the job of correlating their subject to the core of practical agriculture...teachers who were strangers to the locality of the school sometimes found local agricultural problems beyond their comprehension...Some teachers used extra work on the farm as...punishment...Agriculture was not an examination subject in the Standard VIII exams, which lowered its prestige.

But Dodd also argues that these educational weaknesses were no worse than for other areas of the curriculum and that listing them as we did the Fuggles Couchman Report (1958) gave the misleading impression that these were the reasons for the failure of the programme.

> (ii) Political: There rose arguments and accusations that the syllabus was deliberately designed to provide a special kind of inferior education for Africans...it should be recognised that the Syllabus was introduced by a colonial administration without any serious consultation with the population or its leaders.

But, argues Dodd, the fact that it was introduced by a colonial administration is of less importance than the fact that given the agricultural and economic conditions of the time, it was likely to be unpopular anyway:

"After all, much that was taught in the formal educational system of the time was accepted, and indeed even became popular, even though it was imposed by the colonial rulers."

(iii) Agricultural: When primary school graduates went back to their parents' land, they found that their parents were either unwilling to fragment their holdings or to listen to their offsprings' advice concerning the "modern" methods of agriculture which the youngsters had been taught at school.

(iv) Economic: The parents who had invested so much in their son's education...were most reluctant to accept as a result of their investment the return of their son to the homestead...where boys went into farming from middle schools by preference, it was because in those areas more money could be made from the cultivation of cash crops than from employment in lowly clerical posts.

He quotes the case of one out of nine schools in Songea District in 1957-58 successfully producing farmers but "only because it was in an area where at that time quantities of money could be made through the cultivation and sale of coffee."

(v) Parental attitudes to schooling: It is not surprising that in the 1950's the majority of parents saw the way out of the traditional village economy was through the primary and middle school system. As long as more cash could be obtained through further education - or indeed as long as there appeared to be a chance that this was so - both parents and pupils were keen to follow that road. Parents and teachers all over the world have used the education system as a means of improvement.

Dodd (1969) continues: "it would appear that the basic reason why the agricultural syllabus failed was that it was seeking an educational solution to a problem that is not fundamentally educational."

Other commentators argue similarly (Schiefelbein 1979, Russell 1974). It could be true of vocational experiments as a whole.

Post-Independence Developments: Education for Self-Reliance

The post-Independence re-introduction of agricultural education in East Africa is most frequently associated with "Education for Self-Reliance" in Tanzania. But the decision to re-introduce a practical emphasis within the curriculum had been taken by several governments. Vocational Agriculture was an important proposal in Kenya, for example - but it never flourished.

The clearest example of a policy of agriculturally oriented educational programme firmly integrated with a radical, post-independence, climate is that of Nyerere's 'Education for Self-Reliance', which has been well documented. He advocated a revolution in education to match that in politics. The use of schools as an escape route from agriculture and the village was to be ended. The focus was on creating self-reliant social units permeated by the ideals of socialism. The curriculum was to encourage a closer proximity between vocational aspirations and realities. Classrooms and work were to be linked through a transformation in teaching-learning methods which built on experimentation and actual experience. New and appropriate methods of selecting and grading students were needed; and the status of formal examinations was to be downgraded in the eyes of both Government and

public.

This was a system-wide attempt at vocationalisation. It showed an awareness of the major factors which need to be considered in planning a radical innovation: an over-arching value system, a shift in norms and aspirations in the community, a community-problem-focussed curriculum, activity methods and experiment-based learning, and radical alterations in the selection/assessment system. The strongly Marxist orientation should be noted. Academic institutions were seen not merely as irrelevent but as elitist enclaves generating political, managerial and technocratic elites divorced from the masses. Ultimate success depended upon the growth of proletarian consciousness amongst the people.

The Implementation of Education for Self-Reliance*

Morrison records that:

> Surprise and confusion were the initial reactions amongst most people concerned with education to the publication of 'Education for Self-Reliance'. For although the Minister and his Principal Secretary were undoubtedly aware of the details, officials in the Education Division of the Ministry apparently had not been consulted.

Within a month of ESR, a major conference had been held to brief senior educationalists on necessary steps to be taken to implement the new policies. But as Cameron and Dodd (1970) report, despite endorsement of the policies, few participants offered many practical suggestions. Some were against the proposals and the Director of Agriculture noted that: "Experience has shown that the key to better teaching lies in the better training of teachers rather than in the manipulation of the curriculum."

The Constraints

Morrison (1976) analyses the prospects of "Education for Self-Reliance" in terms of these questions:

(i) Does the government have the necessary resources and capabilities?

Mwingira (1969) noted the difficulties of implementing the school agricultural policy. "One can find little scope for optimism."

(a) Shortage of textbooks, materials and equipment retarded the process of curriculum revision.

(b) Lack of detailed agricultural knowledge and shortage of implements was a constraint in 1967 when many schools entered rapidly into a state of confusion in response to the President's urgent appeal. It remains a constraint. (This problem is likely to be associated with most attempts at vocational education.)

(c) The intellectual limitations of teachers and their uncritical acceptance of Western values (as well as their antipathy towards their jobs, the Government and its policies). (Are "Western values" operationally really equated with academic versus vocational learning?)

(d) The commitment, ability and inimical attitude of members of the administration.

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*See inter alia Hinzen and Hunsdorfer, 1979; Adams, 1981.

(e) The inefficient structures for effective decision-making within the Ministry.

(ii) Are the innovations in policy winning sufficiently wide acceptance to clear the way for their implementation?

"A key issue", feels Morrison "is the integration of education and rural life, for it is on this foundation that the proposals concerning co-operative endeavour, democratic planning and participation in nation-building rest."

2 TECHNICAL EDUCATION

Most Third World systems attempt some form of integration of academic and vocational schooling, but the patterns vary with circumstance (e.g. Comprehensive, Technical, Trade, Continuation, Business schools). All have a priority orientation in the direction of the creation of manpower for socio-economic growth, in situations where lower-level school graduates cannot be absorbed at higher levels and thus where the need is to produce employable workers with intermediate skills - while, at the same time attempting to re-orientate student aspirations in these directions. Within these programmes, it is possible to identify a range of constraints across a variety of geographical areas. There are discussions of the experiences in Asia (cf APEID, 1982; UNESCO Bangkok, 1980; Verma et al, 1980; Sinclair and Lillis, 1980; Belbase, 1981; National Education Commission, Bangkok, 1980). There are similar discussions of programmes in Latin America (cf Ducci, 1980; Schiefelbein, 1979; Corvalan, 1977; Urquidi, 1982). Here, however, exemplification is confined to Africa.

King (1977) makes the interesting observation that it is dangerous to assume unchanging attitudes to vocational education. For example, all the main primary schools in Kenya until the mid 1930's were strongly vocational in that pupils were indentured on entry and the curriculum focussed on goals relevant to their vocations as was the case 50 years previously in Jamaica (D'Oyley and Murray, 1979). This policy was occasioned by the determination of the European settlers to replace expensive Indian skilled labour with that of cheaper African artisans. It apparently resulted in the production of a schooled elite with aspirations towards self employment and social 'betterment' until the world recession caused the abandonment of the scheme. Even the post-primary Trade and Technical Schools which continued through the 1930's and 40's found their products inacceptable by the 1950's to the majority of Kenyan industry which preferred to recruit lower down the educational system and develop the necessary skills on-the-job. However, the Education Department's reaction was in the direction of further upgrading through more certification, more theory and longer courses, thus narrowing further the market for school graduates. Moreover, renewed attempts at vocationalisation through integration at Primary School aimed at ensuring that less than 10% of the cohort went on to secondary school. This tiny percentage never had any difficulty in finding jobs and so did not need the superfluous vocational element.

As noted earlier, Africa saw a swing towards academic curricula immediately before Independence. The importance of the vocational curriculum was left to exhortation. However, within two years of Independence, there was in Kenya a Primary School leaver crisis. Many children had wholly unrealistic aspirations and no skills at a time of massive industrial expansion and Africanisation policy. By 1973-74, there was fierce competition amongst

Primary School leavers for entry to the hitherto low-status Technical Schools as a result of widespread re-appraisal of job prospects from the academic Secondary School. The result was both an upgrading and a formalisation of technical education, combining many academic subjects with carefully assessed theoretical and practical work leading to a new East African Certificate of Education (Technical).

The differential status of vocational education in various countries (King, 1978) may relate to the state of their industrial development and to the existence of alternative methods of producing skills. Throughout the Third World, formally skilled and apprenticed workers remain a small minority of the total skilled workforce. However, where a small sector of modern,often foreign-owned, enterprises exists, it is often easier for the products of Secondary Technical Schools to find employment - though obviously only only an a very small scale. King (1978) argues that in many countries the low status of secondary technical schools derives mainly from unclear career outcomes. This affects both the recruitment of students and the way subjects are taught. Kenyan technical education may be one exception in that it is a popular choice amongst primary leavers. The curriculum is intended to relate firmly to the work context and to the chance of further training. In this way, the programme finds itself offering basic trade practices to an extremely talented elite.

> This group only appear to be taking carpentry, metalwork and building: in fact the technical content might as well be Latin, since they see themselves being prepared for the norms and conditions of work in the privileged state and company sectors.

King notes perceptively that "the social context in which skills are picked up is much more crucial than the technical content of a particular skill."

Mikkelsen (1977) sets out to examine the extensive attempts to impart technical knowledge and skills to part of the labour force in order to throw light on the formation of labour qualifications in developing countries. The working hypothesis was that the formation of labour qualifications depends not only upon the work of technical training situations but upon prevailing modes of production, by the composition of technology and by the divisions of labour in industry. Mikkelsen studied the process of skill formation as it related to the structure of industry and the consequent requirements for qualified labour. Her study focuses upon industrial training and education in the light of overall industrial development trends in Kenya, and considers the problem of the success of the technical education programme in determining the conditions for its leavers' employment possibilities.

Two major issues arising from this research may reflect the possibilities of long-term success of technical education:

(i) The political economy of Kenya which is dominated by subsistence economy and by an narrow but growing modern industrial sector, limits the possibilities for creating employable technical qualifications in the labour force in accordance with the full aims of the industrial training programme. The necessity to relate the output and types of trained labour at various levels in the industrial education system, which includes industry's own training programmes, to unpredictable changing needs entails within it "an unsolved adequacy problem".

(ii) The forms and contents of training build heavily on experiences gained in industrial countries where industrial education and training have been an integral part of technological development and closely related to changing relations of production. Although the technical education curricula are internationally adjusted to the specific context, needs and structures in the economy, the technological background on which the schemes have been developed still directs them towards the needs of a modern industrial sector. They are only incidentally, if at all, appropriate for the rural economy.

The Constraints

Much of the discussion in the published literature suggests that policy makers often have high expectations from programmes of technical education. Yet, an important theme within the literature are the operational constraints. Eight clusters of inter-related barriers, which are similar to those identified within the sphere of agricultural education by Dodd (1969) and by Morrison (1976), indicate key problem areas for technical/industrial/vocational education planners. These are not vastly dissimilar from those suggested by a recent UNESCO (1983) review.

(i) The nature of the teaching force. As with the work/study programme, a critical factor in failure has been the availability of suitable teachers. Few have occupational experience. Many are themselves the products of the schools with which they teach, (Niehoff and Wilder, 1974) or are recruited from Teachers' Colleges or Universities and are ignorant of industrial and agricultural demands and methods. Their personal goals are often for higher qualifications since the Civil Service insists on academic qualifications for teaching appointments.

(ii) Other aspects of resource problems include: suitable textbooks in the indigenous languages; old and inappropriate equipment (Fuller 1976); inappropriate technology - especially associated with funded projects - resulting in schools possessing unused equipment far more sophisticated than that in local factories. But it should be noted that, at the other end of the spectrum where indigenous tools are used, problems of finding appropriate jobs also arise (Ministry of Education , Bangkok, 1971); high costs and low returns compared with other types of secondary education (Fuller op cit), and its lack of recognition as a socio-economic investment (NIER 1968).

(iii) The academic. The nature of the students poses many problems. The entry selecting process is often based on academic qualifications with the result that, e.g. in one Thai agricultural school, only 20% of the intake came from families with first-hand experience of farming. The great majority saw vocational education simply as an alternative route to the same sort of further education as academic streams offered.

(iv) The curriculum. The curriculum itself is afflicted with "anarchy" (Benoit, 1974). There is confusion over whether the "practical" stream curriculum is pre-vocational or preparatory, i.e. actually transmitting the necessary entrance skills (Niehoff and Wilder, 1974). The proportions of time on the timetable show marked skews towards the academic subjects, leaving insufficient time to achieve work-experience goals and generating further gaps between the schooling and the reality of work. The pedagogy tends to be academic and inflexible, incapable of adjusting to change or variety in accord with local conditions, and constrained often by standardised equipment and rigid timetabling (Sato, 1974). The curriculum is often

irrelevant to employers' needs; and the linkages between training organizations and employers are very limited (Hanson, 1971).

(v) Assessment. The skill and associated theory are at a considerable remove from any practical application. In an intensely selective skill institution, the theoretical content will increasingly predominate over the manipulative skills aspect. The impact of many training programmes is diluted through being tied to inappropriate leaving examinations (Niehoff and Wilder, 1974). Although vocational validation systems exist, in practice the curriculum is determined by considerations of selection for further education (Ahmed and Coombs, 1975).

(vi) Job prospects. Job prospects are reduced by the students' inadequate preparation by their theoretical knowledge acquired at the expense of practical skills and experience, by their acceptable attitudes in relation to occupational ethics and requirements (Niehoff and Wilder, 1974), by the consequential low likelihood of their being employed in their specialisms and the resulting 'backwash' effect causing high dropout rates and absenteeism (Fuller, 1976). Oxtoby (1977) reiterates Foster's (1965b) view that the dysfunctional nature of vocational education and training may be the result of lack of information regarding the use which qualified people make of their education and the consequent provision of courses which prepare people either for jobs which do not exist or which fail to match the expectations and attainments of the candidates. He provides data which indicate that unemployment rate amongst the output of vocational schools is as great as that among other school leavers. After conducting a tracer study of 400 polytechnic leavers, designed to compare the skills and attitudes generated by the educational system in Barbados with actual requirements, he concluded that a substantial proportion of them are not immediately successful in securing employment, either because suitable vacancies do not exist or because people seeking work are unaware of appropriate vacancies.

(vii) School status. Criteria for school evaluation often focus on the number of graduates gaining access to further education rather than on the number of jobs found. This is strengthened by the low success rates of job applications due to students' inflated salarys expectations, and because the small business sector seeks recruits from lower down the education system. Furthermore, even large scale business prefers, in principle, general education and adaptability to the products of vocational streams. Accordingly, even if technically oriented curricula appear to have become more popular with parents and pupils in some cases, there is no hard evidence that they have become more popular with employers.

(ix) Socio-economic structural factors. Societal constraints remain paramount. The social structure and values remain antipathetic towards manual labour with consequent high priority for academic education and 'white collar' aspirations (NIER, 1968). Other socio-economic factors cited as determining employment opportunities are (Niehoff and Wilder 1974): the lag of indutrial growth in the country, the static situation in industrial development, the lack of coherent employment policies, and the modern sector's preference for training its own employees which denies vocational school graduates access to these positions regardless of manpower needs. Oxtoby (1977) also discusses: (a) the central problem of job creation, (b) the necessity for the priority development of agriculture and land reform, (c) the narrowing of differentials between urban and rural income as elements of any strategy ensuring the success of the diversification of education. That strategy must include policies aimed at changing the attitudes of young people who view rural occupations and living as low

status. He quotes the Commonwealth Secretariat Report (1975):

> The occupations carry the stigma associated with any type of work both arduous and unremunerative. Any new strategy for the rural areas and the involvement of young people in it needs to be based upon a wide-ranging set of decisions about land-use and accessibility, credit loan schemes, training in skills and the promotion of positive attitudes towards the land.

Oxtoby's view is that this highlights the importance of providing types of education and training which not only develop vocational skills relevant to likely employment opportunities, but also hold out the hope of bringing the aspirations of youth into line with these openings. For example, Barbados is committed to diversified education, but the main priorities have not been clarified. From his own research comparing skills and attitudes generated by the education system in Barbados with actual requirements he concludes that in the Caribbean:

> there is strong support for the idea of expanding educational provisions for young people on a full-time basis and for making education more employment-oriented, even to the extent of making trades training courses available as part of the secondary school curriculum. But there is relatively little emphasis on the expansion of apprenticeship schemes or other types of non-formal opportunities.

One implication Oxtoby draws is that although the educational system should attempt to gear itself to the needs of the economy and the labour market, it is necessary to be sufficiently flexible to cope with rapid fluctuations. Additional courses for pre-employment vocational education can only be justified if steps are taken to ensure thay are sufficiently broad-based to produce versatile young workers capable of entering any one of a range of possible occupations.

3 PRE-VOCATIONAL STUDIES

The notion of 'pre-vocational studies' features prominently in recent reforms in many developing countries. For example, the recent restructuring and reorientation of Nigerian education places pre-vocational studies at the core of intended reforms of junior secondary and senior secondary education. (Nigeria Ministry of Education, 1981).

This section discusses the problems associated with the implementation of pre-vocational studies in the context of Sri Lanka in the 1970's. It may well be that discussions of the attempt to inject a practical component into an otherwise academic curriculum has particular pertinence for industrial education in Kenya. Pre-vocational studies in Sri Lanka aimed at creating a compulsory practical component of a core curriculum. As in Nigeria, the practical component was 'injected' into the existing curriculum with no claim that the school has become vocationalised. Secondly, the stress was not on the production of job skills per se. The attempt was made to develop 'integrated studies' as well as to orient the school towards local opportunities for self-employment. The dimensions of pre-vocational studies in Sri Lanka are portrayed by Aiyadesa (1976), Fernando (1974), da Silva (1978) and Wanasinghe (1982). Here the focus is upon the operational constraints that led to its demise. The fate of the Sri Lanka innovation is shared by many similar attempted innovations aimed at 'pre-vocationalising' the curriculum in developing countries. The

reasons for the demise of pre-vocational studies in Sri Lanka has also many parallels in other programmes.

Reasons for the Demise of Pre-vocational Studies

Pessimism about the future of pre-vocational studies was expressed by Dore (1973). The 1972 strategy, he felt, arose from the realisation that the previous academic approach alienated pupils from the realities of the employment situation. There were two assumptions underlying the strategy. These were:

> the defect of the previous system was a primarily cognitive one.Children learned little about the productive possibilities of agriculture.
>
> If they did learn these possibilities, they would prefer to be farmers or horticulturalists or cottage industrialists to having coventional 'jobs'.

Dore felt that success for the 1972 strategy would depend upon attitudinal as well as cognitive changes to overcome the major dysfunctions of schooling. But he foresaw that "the process of intellectualisation, based upon a new kind of formalism", would reinforce those dysfunctions. His second major reservation involved the distortions likely to result from using examinations as a selection lever.

Wijemanne's (1975) commentary upon the problems of implementation highlighted:

(i) The relationship between the school curriculum and community work prospects, and the difficulty of persuading students to pursue pre-vocational training in occupations of low technology and income level.

(ii) Resistance from teachers "long accustomed to conventional guides, texts and teaching aids within traditional academic subjects"... "its organisational inflexibilities" (timetable, classes, grades, large numbers).

(iii) Examination constraints: incomplete evaluative criteria and public expectation that the curriculum would be examined.

(iv) Costs: the problem of matching available funds against resources and needs and the principle of self-reliance as opposed to dependence on the state.

(v) The limitation of the curriculum: not to be viewed as a substitute for occupational training or a means of employment generation.

Pre-vocational studies became reduced to the status of an option rather than compulsory subject partly on the grounds that:

> "pre-vocational studies, aesthetic studies and physical education, which have now ceased to be compulsory, were subjects that students should not be forced to follow, still worse, tested on, since no child has the same aptitude for them...in addition physically handicapped children suffered (under the previous system) since they were made to sit for some of these subjects..."

Conclusion

Reasons for the partial demise of pre-vocational studies appear to be related to:

(i) Lack of clarity in their specification. Though the interpretation placed on them was that they should be merely an 'exposure' rather than a 'vocational training' appears as the original intention, this was apparently never widely understood. Many critics, therefore, attracted strong support for the view that such 'vocational' training had no place in schools and that pupils should not be channelled into occupations in this way.

(ii) The constraints imposed by examinations. The original intention of allowing each school to develop its own programmes in pre-vocational studies allowed more than 80 courses to materialize. Insistence on formally examining such courses, and not even permitting local 'moderation' effectively reduced to a small number the courses that could be offered and constrained any assessment of practical skills and abilities. The overriding concern for a 'fair', i.e. nationally comparable and controlled examination, straitjacketed the programmes, encouraged formalistic approaches and limited scope by their emphasis on examinable knowledge in written texts.

(iii) Elite influential interest groups argued that such pre-vocational studies were: often irrelevant to the future of their children, distracted them from more important academic subjects, and largely worthless because they dealt with 'commonsense knowledge.'

In rural areas opinion moved against pre-vocational studies too. Parents felt thay were not sending their children to school to learn 'traditional' crafts, etc., which they had access to outside the school. For such parents, the school primarily provides an opportunity to allow their children not to end up in traditional occupations. The teachers in the school often did not know as much about agriculture, etc., as did its practitioners and it was difficult to co-opt artisans to teach in schools. They were not 'qualified' and, in some cases, they may legitimately have wished to keep valuable skills and knowledge of particular occupations within their kin group. Certain occupations and therefore pre-vocational studies courses, remain the preserve of caste-based groups and therefore not attractive or accessible to others.

Pre-vocational studies, therefore, encountered massive problems in implementation. New governments which aspired to resurrect educational standards to internationally comparable levels, to promote the formation of competent elites, and to lessen criticism of the educational system, therefore chose the simplest course open to resolve the problem. By reducing the importance of pre-vocational studies to that of an optional subject and continuing to incorporate it within a primarily academic education system, the painless equilibrium which characterised related curricula (e.g. woodwork and metalwork) before 1972 could be restored. It would take an optimist to judge that such a policy would lead to any really important or significant pupil outcomes.

An empirical evaluation of the project (Abeysekera, 1982) identifies similar constraints operating against the implementation of the goals of prevocational education. But within such constraints, Abeysekera (1982) suggests some positive, albeit transient, outcomes: Students were positively learning manual skills. They were learning about vocation and producing articles of saleable standards. However, pre-vocational studies did not become integrated

with other curricular offerings. He also argues that it did not achieve its attitudinal objectives and never achieved adequate assessment procedures. Teachers and principals did respond favourably and participated in the development of pre-vocational studies. But parents responded less favourably, regarding pre-vocational studies as a threat to their children's social and geographical mobility.

In sum, Wanasinghe (1982) argues that the reforms lost the confidence of the general public, of the teaching profession and of the university. The reform demanded too much of the available teachers. It was poorly supported with curriculum materials, and it was dishonestly assessed. The crucial role of examinations procedures in inhibiting change has been stressed in the Sri Lankan context - as have the problems associated with any pragmatic attempts at reforms of the examination system within the existing economic, political and social contexts of Sri Lanka (Perera, L.S. and Rupasinghe, S., 1983).

In Nigeria, pre-vocational studies are at the heart of the contemporary plans for junior secondary education, but these subjects have yet (1985) to make any significant impact. Indeed at school level in one state, head-teachers appeared to believe it unlikely that they ever would (Lillis, 1983).

4 CONCLUSION

Much of the argument which points to reasons for the failure of attempts at diversification is brought out in debate on what is now well known as the 'vocational school fallacy' (Foster, 1965b; Blaug, 1973; Ahmed, 1975). Briefly, those who attack the plans to vocationalise schooling systems are attacking the view that the chief educational priority in developing areas is the creation of a fully integrated system of agricultural education within the framework of technical and vocational education, and that existing formal education structures are the chief determinant of attitudes hostile to the practice of rural agriculture and primarily responsible for rural and urban migration. They also attack the view that childrens' vocational aspirations can be altered by curricular changes, or that schools exercise a decisive influence upon the vocational aspirations of students. They argue that aspirations and the occupations children enter are determined almost exclusively by factors outside the schools. It follows that no amount of formal school-based vocational instruction alone will prevent rural-to-urban migration, reduce unemployment or affect the rate of economic development in LDCs. Important variables to consider are the structure of incentives within the economic system and the degree to which the institutional milieu is supportive of entrepreneurial activity - or the degree to which a fully planned economy exists.

Many diversified schemes in developing countries fail because they ignore these important variables and seek educational solutions to problems that are fundamentally not educational. The problems of vocational/technical/agricultural/industrial education are not primarily educational but intimately bound up with intricate economic, technical and social variables. Attempted changes should take into account that schools are not the main instrument of economic progress, despite the fact that the education system is the sector over which they have most control.

Woodhall (1979) argues that the basic conditions of most of the recent studies of the links between education and employment are that education cannot, by itself, solve the problems of unemployment and underemployment

of human resources. However, it can, if wrong decisions are made, make these problems worse both by using scarce resources in an inefficient and inequitable way, thus preventing their use for more profitable purposes, and by creating or maintaining unrealistic attitudes to work and unrealistic expectations concerning status and income.

> It is a question not only of traditional education systems which turn out graduates unprepared for the realities of work, it is also a question of the maladjustment of current technical and vocational education to real development needs (UNESCO, 1978).

Reorientating the curriculum to provide greater emphasis on agricultural or technical subjects may well sensitise students to the problems of work, of industry, of development, of the peasantry. It is, however, unlikely (Oxtoby, 1977) to have a major influence on occupational aspirations unless functional changes in the education system are accompanied by structural changes and reforms in labour market practices, by modifications in the pattern of wage rates and the introduction of specific employment-generating strategies. Assumptions about the influence of the educational system and of the school curriculum on student expectations and aspirations feature prominently in the literature on development planning. In their extreme form, they assert that there is something about formal education in the less developed countries which makes school leavers unemployable.

The literature produces repeated suggestions that many students see academic education as the best available education in the sense that it alone leads to the highest possible qualifications (e.g., Silvey, 1972). Where access to academic education is limited, diversified courses may become fully subscribed but only by students who feel that it is a second-best choice and see it as a temporary diversion from the main road to University. Moris (1966, 1971) suggested that further evidence for this could be gathered from the marked mobility between jobs in the early years of employment which may be a demonstration of a refusal to accept the 'terminal nature' of training. Results from Ghana and the Ivory Coast lead to a similar conclusion: Students avoid certain fields of training which it is felt lead to lower levels of employment.

Job aspirations do not coincide with employment opportunities. Substantial differences have been shown to exist between the inclinations of students and the occupational opportunities likely to be open to them. It would be optimistic to expect the two to be reasonably closely matched solely by manipulating wage and salary structures since there are many problems in matching manpower needs and education output. However, a clear imbalance between student preferences and trained manpower requirements has probable consequent effects on motivation, occupational life expectancy and calibre of work amongst those unwillingly recruited (Klingelhofer, 1967). Wellings' (1982) commentary on Kenya reveals the unrealistic and inappropriate occupational and educational aspirations and expectations of many secondary school students. They are related, he says, to inequalities in opportunity. He writes:

> They are on average unrealistic in that only a very small proportion of students are able to fulfil their ambitions. Comparisons between aspirations on the one hand, and likely entry rates on the various professions on the other hand consistently reveal wide disparities. Miller & Bibby (1969) for Ghana, McQueen (1969) and Adeyinka (1975) for Nigeria, Klingelhofer (1967) for Tanzania, and Zolberg (1976) for Mali report very similar findings in this respect. In the case of Kenya, although Maxwell (1969) and Somerset (1974) express some

reservations, the School Tracer Project of 1968 (Kinyanjui, 1971) demonstrated conclusively that preferences, in terms of occupations and education, were unrealistic in the light of the subsequent experiences of the school sample, a conclusion endorsed by Keller (1975) in a more recent investigation.

An unrecognized dimension of the problem of consonance between social aspirations and expectations on the one hand and educational vocationalisation on the other is the question of the meaning of the concept 'education' held by the target population. African, Caribbean and Asian evidence suggests that 'education' is seen as restricted to reading and writing activities. Technological development in most rural areas is still at too low a level of non-differentiation to suggest that there may be a useful body of theory supporting practice. It is therefore assumed that skills development occurs 'naturally', on-the-job. Thus diversified education runs the risk of being seen as an illegitimate extension of the concept of 'education.'

Care should be taken to relate this hypothesis solely to those tasks and crafts already carried on in the traditional sector to what may be called 'job training' and 'job improvement' foci. Where job creation is involved, e.g. in the training of girls in secretarial skills, no such inhibitors operate. Thus transition to the modern sector can generate new and accepted extensions of the concept 'education' but still, perhaps, within the reading and writing paradigm? Resistance, in Nigeria to the work of the Government Trade Centres shows, for example, not only an understandable dislike on the part of the students of being publicly designated a second-class citizen, but also a real disbelief in the 'educational' qualities claimed for a trades-based curriculum. These are exactly the criticisms levelled in Britain at many Secondary Modern programmes.

The use by advanced/capitalist/liberal/'Western' societies of education as control on social mobility and the association of academic curricula with high status as a matter of course, coupled with intense demands in LDC's for occupational, geographic and social mobility produce distoring forces in the education system. These political forces may pose potentially irresistible barriers to many vocationally-oriented programmes. This has been well illustrated in the Tanzanian case study but seems clearly related to all other attempts outside the agricultural sector.

These pressures were understandably powerful in the period following the achievement of national independence - bearing in mind that period coincided with a phase of relative economic boom in the capitalist world economies. But it does not necessarily follow that such forces are equally strong now or will be so in the future. The operation of 'price scissors' mechanisms may slow the growth of technology related to cash cropping in competitive situations in agriculture and thus block the growth of awareness of the utility of agricultural training. But at the same time, it could be that saturation in the political and administrative areas of the modern sector of the economy will force a redefinition of status by a socially mobile youth and their parents. Hence, the present may be a more favourable era than the recent past, for attempting further vocationalised innovation. Thus, while supporting Dodd's (1969) suggestion that vocationally oriented syllabi were "seeking an educational solution to a problem that is not fundamentally educational" in that the attraction of alternative curricular definitions to the traditional academic one are ultimately dependent on economic development, nevertheless, the current and future economic situations in the Third World, even if not actually demanding educational

redirections, may be more supportive of such experiments.

Heyneman (1978) calls in question the validity of vocationalisation for reasons of equity, practicability, and flexibility. As has been inferred above, there may be a better case for academic education than has been accepted: the value of 'literary' schooling, he says, "has played a prominent role in the economic development of (now) industrial societies". He goes on to suggest that the continued resistance of parents, pupils, teachers and employers to vocationalised programmes may be well-founded and raises some very significant questions about vocational curricula themselves: for example, how far can the classroom be adapted to complexities of skills actually practised in the work place? How far, despite all claims for individualised programmes, must all planned 'schooling' be standardised and formalised and thus made irrelevant to developing economies where the local situation is all and nationwide standards and practices are far from established?

Heyneman places much stress on costing, insisting that planners should consider how vocational curricula are "affordable in both comparative financial costs and cognitive opportunity costs". The utility of this approach however is suspect for two reasons: (a) It focuses on input costs - and here there are enormous difficulties; (b) It seems to have abandoned the necessary other part of the equation - that is, output yields. At the same time, there is insufficient knwoledge about the relationship between education and labour market practices (Blaug, 1973 and 1974; Schiefelbein, 1979). Insufficient is also known about the effects of education on values - especially the values necessary to promote economic growth and the expansion of employment (Blaug, 1973). Insufficient is also known about the contributions of specific programmes to industrialization and technical progess in developing countries (Avakov and Zagelfka, 1981).

Equally important is the relative lack of understanding of the dynamics of the links between education and industry/business/commerce/(UNESCO, 1983) or agriculture and production (Castles et al, 1982). Stress is placed (cf UNESCO, 1983) on establishing more workable links with firms, companies and business in order to smooth the complex and troublesome transition from school to work (Woodhall, 1983). A paramount need is an understanding of how apprenticeship schemes, co-operative work experience programmes, on-the-job supervision, shared education/work-time experience, etc., work in favour of <u>both</u> the students <u>and</u> business/industry/commerce/agriculture. As King (1978) suggests, this transition may not be eased by the different values and social contexts of school and of work in developing countries:

> Since the dominant and protected pattern of work in the multinational and parastatal sector has deeply influenced the skill sector in the schools, it is not surprising that they share an increasing number of features. Typically, in Africa, the status of the secondary school boy (or girl) anticipates that of the permanent worker. Unlike the primary school world with its dropping-out, repeating and overcrowding, the secondary entrant to the protected government school is secure. His financial worries are removed, dormitories and hostels are provided, especially in Anglophone Africa. And more important than the skill content of the course is the use of an international language as the medium of instruction, and the presence of a significant number of French, British or North American instructors. The impact of this relation between the most priviledged labour market and the secondary school system has meant that technical school objectives patterned after the industrial structures of the West have been radically altered after export to many Third World countries. For example, the notification

that the technical school of technical stream should be a short cycle, terminal provision, tracking children into tradesmen has been rejected in favour of equalising the length and context of both academic and technical training. Both academic and 'technical' graduates have their eyes on the same kind of work in the same kind of firm or public enterprise. Consequently, technical and vocational courses have lengthened to prity with the academic stream.

In these kinds of countries, therefore, what has been alleged of the relationship between schools and corporate capitalist firms in the West has to be stood on its head. The idea that the different personality traits of workers, middle level employees and executives are confirmed by differing school contexts, which thus help to reproduce the categories required, cannot be crudely applied to countries where the corporate and parastatal firms are in a tiny minority. According to this model, technical schools in the Third World ought, like their counterparts in the West, to be socialising skilled workers to be subordinate, dependable, and to have relatively low aspirations whereas in fact they are doing just the opposite. They are reinforcing the expectation that the school graduates will have considerable autonomy and mobility at work.

In this sense therefore, the cognitive dimension of such schools (a mundane syllabus of basic craft practice) is quite out of step with the non-cognitive, attitudinal dimension. The same might be said not only for the straight technical schools but also for many of the 'diversified' accredited schools which occur in countries with a very restricted secondary cycle. In purely curricular terms, they appear to be offering a rather heavy bias towards skilled work in agriculture, commerce and technical subjects, but unlike the diversified comprehensive schools of the West, the social context of the secondary school is exclusive, protected, and anticipates the work style of the small island of modern firms.

In conclusion, there is a great deal of accumulated hearsay but a poverty of grounded evaluation and empirical evidence relating to the experience of the vocationalisation of secondary education in the Third World. It must be a matter of concern that many policies have been formulated and decisions made on the basis of very little evaluative information from other experiences or on the basis of realistic feasibility students in the context of the intended diversification. A recent World Bank study of Columbia and Tanzania is a notable exception (Psacharopoulos 1985).

Such evaluative evidence as exists suggests that vocationalisation, in whatever form, serves only limited and very specifically defined aims in a very localised context. Whilst vocationalised training can have positive benefits and can increase the earnings potential of individuals (Godfrey, 1977; Puryear, 1979; Duberg, 1982; Schiefelbein and Farrell, 1982) it does not provide a solution or preventive to the problems of educated unemployment, unrealistic employment aspirations, or urban migration.

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HOW IS 'INDUSTRIAL EDUCATION' TAUGHT?

DOES THE WAY IT IS TAUGHT PROMOTE ITS OBJECTIVES?

BY

MARTIN DAVIES

Industrial Education as taught in Kenya's secondary schools is composed of the four subject areas of Wood Technology, Metal Technology, Power Mechanics Technology and Electrical Technology. Each of these areas of study has its own syllabus printed under separate cover. The syllabuses differ radically in subject content, but there is one distinct similarity. They are all very detailed in terms of what body of knowledge or particular skills the teacher is supposed to impart or develop.

Each subject syllabus is preceded by a set of specific objectives which relate closely to the subject material to be taught. These objectives are very tangible and help the teacher understand which aspects of the syllabus content are considered most important. Thus, the teacher is left with little doubt about what he is expected to teach. However, despite the considerable detail contained within the syllabuses, the teacher is given little indication on how the subject should be taught. For teacher there is only one official point of reference to which he can turn in order to gain an insight of how he should be teaching the subject and what kinds of traits the course is intended to generate within his students. The general introductory statement and general objectives of Industrial Education, rather than one of its component subjects, give the teacher some guidance.

For ease of reference, both the Introduction and General Objectives of Industrial Education are reproduced hereafter.

1 INDUSTRIAL EDUCATION

Introduction

It has become apparent that Kenya is rapidly taking her place in the modern world not only as a consumer of Industrial goods but as a producer as well. As Kenya youth take their place in this increasingly technical society, they must be prepared to participate as both informed producers and consumers. It is through the study of Industrial Education that the schools seek to acquaint Kenyan youth with the more practical aspects of a general education.

It must be noted that the study of Industrial Education is not void of other disciplines and set off as a separate entity. Rather it provides the means within which elements learned in the academic setting can be applied, reinforced, and supplemented. In addition, the pupil is given the opportunity to develop the ability to work with a minimum of personal direction and assistance and to develop his powers of creativity and initiative.

General Objectives of Industrial Education

1) To develop in each pupil an insight and understanding of industry and its place in our society.

2) To discover and develop personal talents in industrial technical fields.

3) To develop problem solving abilities related to the materials and processes of industry using an applied workshop approach.

4) To develop in each pupil a skill in the safe use and care of tools and machines.

5) To develop in each pupil an awareness of how he, as a consumer, can be efficient in the selection, care, and use of Industrial products.

From the foregoing there are a number of statements which are worthy of further examination as they have a direct influence on how the subject should be taught and what kind of student activity we should expect to find taking place within the Industrial Education workshops.

In the 'Introduction' it is stated that through the study of Industrial Education "the pupil is given the opportunity to develop the ability to work with a minimum of personal direction and assistance." Being an essentially practical subject, a lot of time spent in the Industrial Education workshops is devoted to the acquisition of skill in the safe and proper use of various tools and equipment. Obviously such skills will be developed more rapidly when there is a close interaction between the pupil and teacher. Careful demonstration and constant correction on the part of the teacher is required in order that the pupil adopt the correct techniques. This statement is therefore not linked to the acquisition of skills but rather to their utilization. Having taught the fundamental body of knowledge and provided the students with the necessary related skills the teacher should seek ways of allowing the students to utilize these resources "with a minimum of personal direction and assistance."

Again from the 'Introduction' we can read that Industrial Education is supposed to "develop powers of creativity and initiative." When we speak of developing powers of creativity, we are surely thinking in terms of more than the mere ability to make an article. The person who works to a predetermined specification so as to produce an exact replica cannot be said to be "creative". Creativity demands certain freedom being allowed the producer of the article in question. We should therefore expect the teacher to set tasks in such a way that the student is allowed freedom to express his individuality and creative abilities.

"Initiative" is another trait which is closely related to creativity in its demands on the manner in which the subject is taught. Again, a degree of freedom which allows the student to experiment and try out his own ideas, albeit under the watchful eye of the teacher, is essential. The student should be encouraged to apply his skills and knowledge to new situations and should not be supplied with ready-made solutions by the teacher.

From the 'general objectives' of Industrial Education we find that the subject is intended to:

> Develop problem solving abilities related to the materials and processes of industry using an applied workshop approach.

In order to become proficient in solving practical problems it is necessary that the student be exposed to such experiences. As such, a "problem solving" approach should be an integral feature of the Industrial Education course. The more opportunity the student gets to grapple with a problem and eventually find his own solution, the quicker he will develop a fund of experience which can be adapted to numerous different situations.

We have noted that the development of "creativity", "initiative" and "problem solving abilities" are amongst the main objectives of the Industrial Education course. If taken seriously, we should expect to find practical learning experiences, which assist to develop these characteristics, an integral part of the approach to teaching the subject. After all, such

traits cannot be taught in a theory lesson or learnt from a textbook. By their very nature they can only be acquired through active participation on the part of the students.

Many teachers, once qualified, and engaged in the day to day business of teaching, may make little or no reference to the objectives of the course. However, the statements of purpose of Industrial Education have been in existence ever since the subject was introduced in Kenyan secondary schools. Under such circumstances one would assume that the teacher training institutions would have paid particular attention to the objectives of the course for which they were preparing teachers. This would ensure that the training course included all the necessary skills, knowledge, experiences and attitudes which a teacher would require in order to successfully teach the course and meet the stated objectives.

We are now in a position to look at the realities of how Industrial Education is actually taught in the schools and to compare our findings with the expectations provided by the previous review of some of the objectives of the subject. Schools offering Industrial Education are provided with one of two combinations of facilities. These are either Wood/Metal or Power/ Mechanics/Electrical. These two types will be discussed separately.

2 WOOD/METAL

The Inspectorate recommendation on time allocation for the study of Industrial Education is six, forty minute periods per week devoted to both subject areas combined. It is further suggested that a minimum of four of these periods be devoted to practical workshop activities whilst the remainder are utilized for related theory and technical drawing.

In order to examine how closely schools were adhering to these recommendations data were collected from fourteen schools and are presented in Table 1.

Table 1: PERIOD ALLOCATION FOR FOURTEEN SCHOOLS OFFERING WOOD/METAL

(Each vertical column represents one school)

Form One	Practicals	4	4	4	4	4	4	4	4	4	4	4	2	2
	Theory	4	2	2	2	2	1	1	1	1	1	0	1	2	1
	Total	8	6	6	6	6	5	5	5	5	5	4	5	4	3
Form Two	Practicals	4	4	4	4	4	4	4	4	4	3	4	4	2	2
	Theory	4	2	2	2	2	1	1	1	1	2	2	1	2	1
	Total	8	6	6	6	6	5	5	5	5	5	6	5	4	3
Form Three	Practicals	4	4	4	4	4	4	4	5	4	4	4	4	4	4
	Theory	2	2	2	2	2	2	2	1	2	2	2	2	2	2
	Total	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Form Four	Practicals	4	4	4	4	4	4	4	5	4	4	4	4	4	4
	Theory	2	2	2	2	2	2	2	1	2	2	2	2	2	2
	Total	6	6	6	6	6	6	6	6	6	6	6	6	6	6

It can be noted that for a number of schools the full period allocation is not being made in forms one and two. In all cases this is due to the constraints of the timetable and the fact that at this level many schools like to offer as wide a range of subjects as possible. This policy necessitates the reduction in the recommended number of periods offered. Industrial

Education, being an optional subject at form three and four, with only one stream being allowed to pursue the course at that level, becomes a natural target for such cuts.

What is striking is that, without exception, all schools make a clear distinction between practical and theory lessons at all levels of the course. At form three and four level, all but one school allocate four periods for practical and two for theory. It is inconceivable that teachers can arrange to match the theory taught in the sessions set aside for them with the practical activities in the workshop for any given week. One is therefore led to infer, and this was verified by questioning of the teachers, that the majority of the theory covered at any time is unrelated with the 'project' being made in the workshops.

It is interesting to note that out of thirteen schools questioned, five of them admitted to teaching theory to half classes in forms one and two. This seems to be a great waste of human resources and an added cost to an already expensive subject.

The teaching of technical drawing had, in most cases, little relevance to its practical application. The use of board and tee square and the production of working drawings by the students were not evidenced. The current final theory examination places emphasis on the students' ability to draw various types of cut block or simple joint using different methods of representation without the aid of drawing instruments. This method of examination seems to account for the lack of real technical drawing skills being imparted in the areas of wood and metal.

In most cases teachers seemed to prefer to make their own drawings of the article to be produced by the student and then to duplicate it. In other schools large scale drawings were produced by the teacher and pasted on boards so that all students would have to refer to the same drawing when making a project. Such a system further reduces the work required of the teacher since the same drawing is used from one year to the next.

Wood and Metal Technology, being areas that deal with materials, naturally lend themselves to a 'project approach' when practical lessons are taught. Students are expected to manufacture various artefacts and in so doing gain the skills associated with each area. This system offers an ideal opportunity for students to develop powers of creativity, initiative and problem solving, which as we have seen are some of the overall goals of the subject.

A survey of the practical projects made in eleven schools offering Wood Technology and Metal Technology was carried out. For each subject area, ten of the schools were government maintained and one was harambee. All were fully staffed with teachers trained at either K.S.T.C. or K.T.T.C. All schools had entered candidates for the Kenya Certificate of Education examination in Industrial Education.

With the help of the teachers in each school, all projects made by the students during the four year Industrial Education course were classified according to the degree of freedom students were allowed in influencing the final design. This was done for both Wood and Metal. The four classifications that were used were as follows:

CLASS A

"All students make exactly the same project according to a given drawing."

Here the students are not allowed any opportunity whatsoever in influencing the final design of the project. Emphasis is placed on the correct and accurate use of tools in order to work to a fully dimensioned drawing using the techniques specified by the teacher.

CLASS B

"All students make the same project with an opportunity for small individual variations."

The degree of teacher dominance in this classification is not much less than in Class A. Student participation in the design process is nothing more than a token gesture and is limited to some surface decoration or shaping of a small area of the project.

The main emphasis and objective for making the project is still placed on learning to use tools correctly and accurately. The teacher provides close supervision and ensures that each student follows his instructions and uses the correct techniques.

CLASS C

"Problem solving approach. The teacher sets certain broad limits within which each student works in order to reach an individual result."

In this situation the teacher sets the task or problem but no ready made solution is provided. Each student, within certain limitations, is expected to actively participate in the design of an individual solution to the problem. Creativity and the ability to solve problems are all encouraged. Provided the teacher has taught the students correct tool usage and instilled in their minds the need for quality of workmanship, it is not necessary that standards of accuracy or quality of finish drop to any appreciable degree.

CLASS D

"Total freedom is given to the students both in terms of the task and design of the solution. The teacher acts as a guide and reference point only."

This is an extension of category "C". Students are now allowed the freedom of deciding on the problem itself as well as being resposible for a design solution. This approach demands a lot of the teacher, since he now has to act as an advisor to all students each of whom will be dealing with a different project. Such an approach can be an exciting and rewarding experience for both the teacher and the students. However, the success of such an approach will depend on availability of suitable materials and whether the students have been adequately prepared for such responsibilities.

Tables 2 and 3 indicate the type and number of projects that are being made in eleven schools offering wood and metal according to the classifications described.

Table 2: CLASSIFICATION OF STUDENT PROJECTS: WOOD

	All students make exactly the same project according to a given drawing.		All students make the same project with an opportunity for small individual variations.		Problem solving approach. Teacher sets certain broad limits within which each student works in order to reach an individual result.		Total freedom given to students both in terms of task and design of solution. Teacher acts as guide and reference point only.
	Category A		Category B		Category C		Category D
FORM 1	Name sign	x5	Cutting board	x4	Sign Board	x1	
	Pencil Stand	x3	Pencil Holder	x1			
	Chapati Board	x1	Sign Board	x1			
	Key Tag	x1	Tea Tray	x1			
	Wooden Spoon	x1	Book Rack	x1			
	Candle Stand	x1					
		12		8		1	
FORM 2	Chapati Board	x3	Chapati Board	x4	Rolling Pin	x1	
	Book Rack	x3	Bookstand	x3			
	Coat Hook	x2	Sign Board	x1			
	Stool	x1					
	Attache Case	x1					
	Rolling Pin	x1					
		11		8		1	
FORM 3	Tea Tray	x3	Tea Tray	x2	Bowl Turning	x2	
	Cabinet	x2	Chapati Board	x2	Chess Table	x1	
	Stool	x2	Attache Case	x2			
	Chapati Board	x1	Bookshelf	x2			
	Bookshelf	x1					
	Draughts Table	x1					
	Flour Sieve	x1					
	Prior Major Project	x1					
		12		8		3	
FORM 4	Jointing Practice	x2			Bowl Turning	x2	
	Cabinet	x1			Chessmen	x1	
	Toilet Roll Holder	x1					
	Chess Table	x1					
	Mock Project	x1					
		6		0		3	
	Total (41)		Total (24)		Total (8)		Total (0)

Table 3: CLASSIFICATION OF STUDENT PROJECTS: METAL

	All students make exactly the same project according to a given drawing.		All students make the same project with an opportunity for small individual variations.		Problem solving approach. Teacher sets certain broad limits within which each student works in order to reach an individual result.		Total freedom given to students both in terms of task and design of solution. Teacher acts as guide and reference point only.	
	Category A		Category B		Category C		Category D	
FORM 1	Key Tag	x6	Bottle Opener	x4				
	Bottle Opener	x4	Hasp & Staple	x1				
	Coat Hook	x2	Shoe Horn	x1				
	Coat Hanger	x1	Religious Cross	x1				
	Pin Tray	x1						
	Tooth Brush Rack	x1						
		15		7				
FORM 2	Hat & Coat Hook	x5	Flour Scoop	x2	Handle for box	x1		
	Bottle Opener	x2	Funnel	x1	Personal Initials	x1		
	Soap Dish	x2						
	Pin Tray	x1						
	Hinges	x1						
	Flour Scoop	x1						
	Mitre Plate	x1						
	Bookend	x1						
	Dust Pan	x1						
	Paint Scraper	x1						
	Try Square	x1						
		17		3		2		
FORM 3	Toolmakers Clamp	x3	Hot Stand	x2	Fork Jembe	x1		
	Adjustable Spanner	x2	Trowel	x1	Rake	x1		
	Hammer	x2	Toasting Fork	x1	Cooking Spatula	x1		
	Door Bolt	x2	Hacksaw	x1	Hollowed Bowl	x1		
	Hasp & Staple	x1	Ladle	x1				
	Door Hinge	x1	Mug	x1				
	Door Latch	x1						
	Hat & Coat Hook	x1						
	Sliding Bevel	x1						
	Fire shovel	x1						
	Trowel	x1						
		16		7		4		
FORM 4	Funnel	x3	Screwdriver	x1	Rake	x1	Any reasonable job	x1
	Prior major Project	x2	Spanner	x1	Spatula	x1		
	Oil Can	x1	Flour Scoop	x1	Screwdriver	x1		
	Centre Punch	x1						
	Hoe	x1						
	Line Winder	x1						
	Mitre Clamp	x1						
	Sugar Scoop	x1						
	Cannon Barrel	x1						
		12		3		3		1
	Total (60)		Total (20)		Total (9)		Total (1)	

Comparing the percentage of the total number of project in each of the four categories for wood and metal (Table 4), one finds that there is a small tendency towards allowing students greater freedom of expression in the area of wood rather than metal. This is probably accounted for by the fact that wood is an easier material to work with, rather than any conscious effort on the part of the teachers to adopt a more student oreinted approach to the practical work in this medium.

Table 4: TYPES OF STUDENT PROJECTS. PERCENTAGES

	A	B	C	D
Wood	Total 41 56%	Total 24 33%	Total 8 11%	Total 0 0%
Metal	Total 60 67%	Total 20 22%	Total 9 10%	Total 1 1%

What is striking is the fact that some 56% of the projects in wood and 67% of those in metal are totally teacher dominated (Category A) requiring the students to work to prepared drawings without the slightest opportunity for expressing themselves. One recalls that category "B" jobs only contained the barest minimum of freedom for students to influence the final design. Category "A" and "B" account together for almost 90% of all practical work undertaken in Industrial Education wood and metal workshops.

Despite what is stated in the introduction and general objectives of Industrial Education, students are not offered much opportunity to develop creativity, initiative and problem solving abilities - at least for the areas of Wood and Metal. What is strongly emphasized is ability to work accurately to given drawings using the correct procedure and tool technique.

In Wood Technology, the wood turning lathe does offer some small outlet for student creativity. At least four of the selected schools include bowl turning as an opportunity for students to work to their own designs. However, the extent to which the final shape is pre-determined is questionable. More than likely the design of the finished article evolves as the work progresses.

Again on the positive side, the vast majority of the work carried out in practical lessons consists of making articles which will be useful. This probably accounts for the popularity of certain items. For example, in wood, the chapati board is produced in all eleven schools and a sign board is made in a further eight of them. Book racks and shelves are other popular jobs made in many schools. In metal, the bottle opener is made in ten schools and a key tag in six. Very little evidence was reported or seen of ritual "exercises" such as filling or the making of joints in woodwork. Where such an activity was noticed, it was ususally in connection with preparation for the final practical examination piece.

Regarding examinations, a few schools did use the previous year's major project as a 'mock examination' or as the last job in form three/four. Since the major project has not been regularly changed each year, this means that some schools give their students a 'practice run' to gain an examination advantage.

Out of the eleven schools where information was collected on the type of project made by the students, two had an 'industrial education club'. Here

students were allowed much greater freedom in the practical work even to the extent of designing and making individual projects. In schools without clubs, many teachers when questioned expressed the opinion that a club was a more appropriate setting for allowing student participation in the designing of projects. To some teachers, the idea of allowing such freedom seemed incompatible with formal practical lessons.

Looking at the projects made on a school by school basis, the situation for the four categories of project is as shown in Figures 1 and 2.

Figure 1: NUMBER OF STUDENT PROJECTS AT DIFFERENT SCHOOLS: WOOD

Category "A"	Category "B"	Category "C"	Category "D"	Totals
xxxx	xxx	x		8
xxxxx	xx	x		8
xxxxx	xx	x		8
xx	xxxx	x		7
xxx	xxx	x		7
xxx	xxx	x		7
xxxx	xxx			7
xxxxx	xx			7
xxxxxx				6
x	xx	xx		5
xxx				3

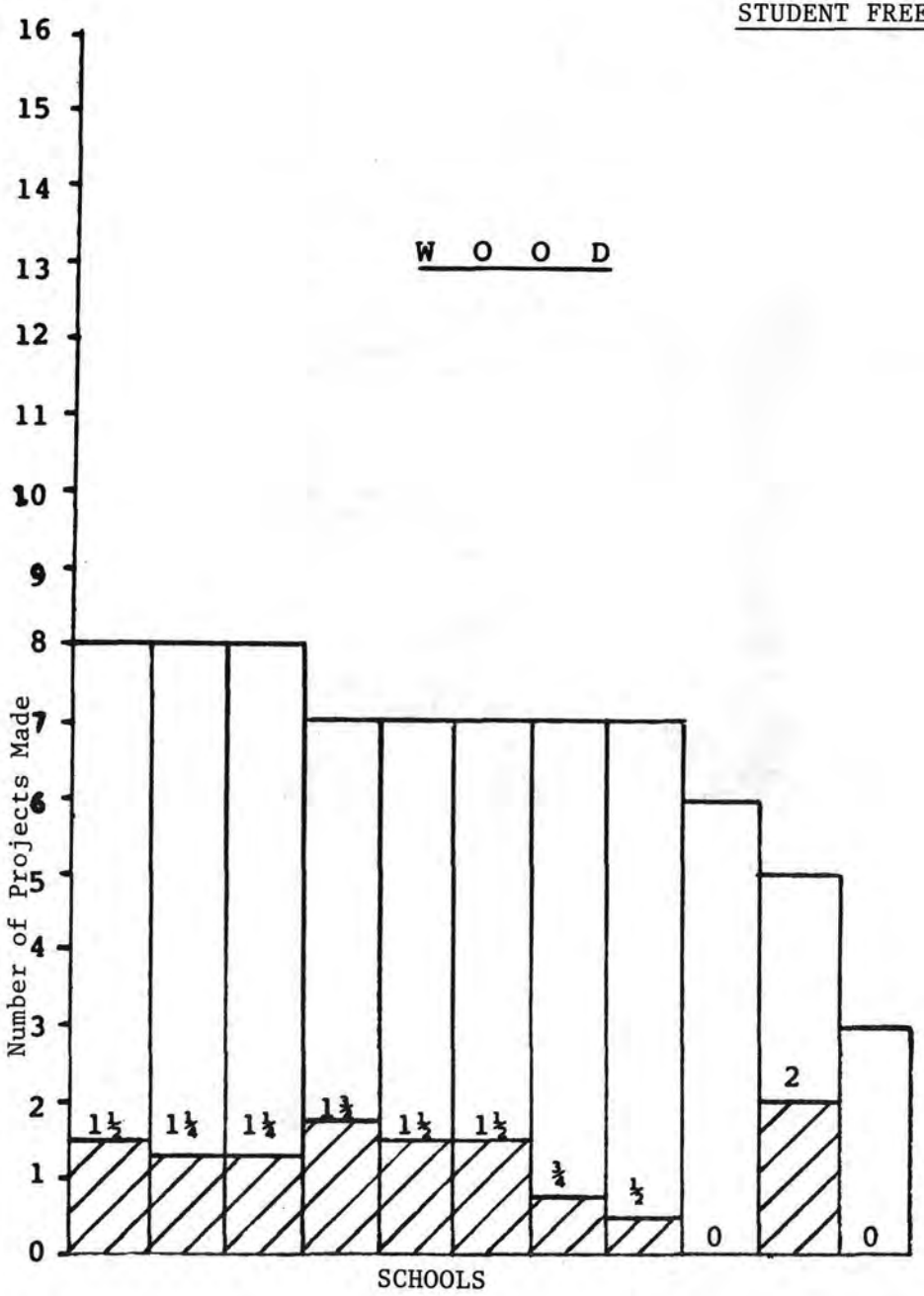
Figure 2: NUMBER OF STUDENT PROJECTS AS DIFFERENT SCHOOLS: METAL

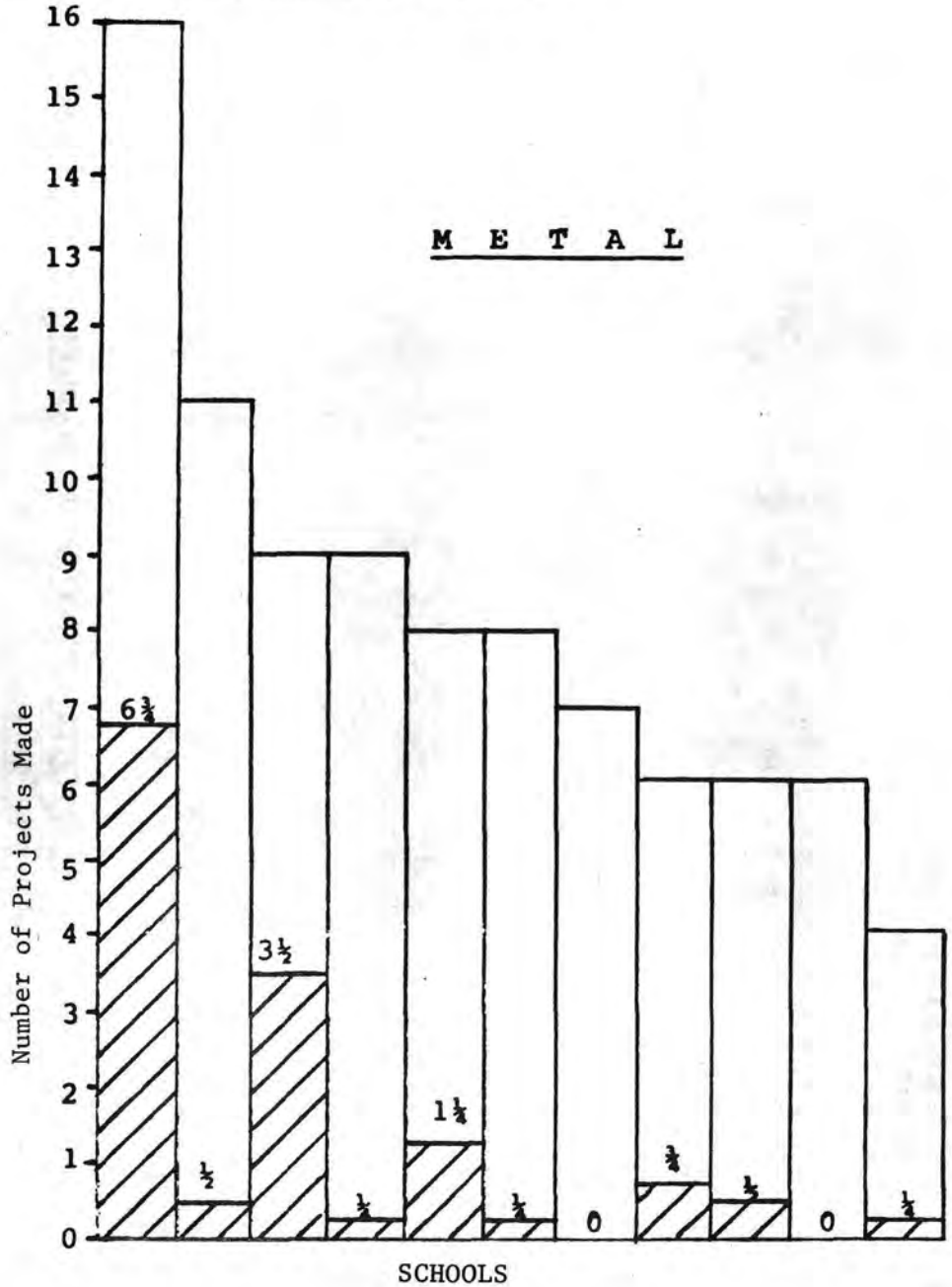
Category "A"	Category "B"	Category "C"	Category "D"	Totals
xxxxxx	xx	xxxxxxx	x	16
xxxxxxxxx	xx			11
xx	xxxxxxx			9
xxxxxxxx	x			9
xxxxx	xx	x		8
xxxxxxx	x			8
xxxxxxx				7
xxx	xxx			6
xxxx	xx			6
xxxxxx				6
xxx	x			4

In wood it can be seen that in most schools students make between six and eight projects over the four year course. One school made 5 and exceptionally one school only managed to make 3! No one school tends to stand out from the others in terms of allowing greater student freedom in the design of projects. It is, however, interesting to note that the school where students make the least number of projects also denies the students any freedom.

On the side of metal there is a much wider spread in the number of jobs attempted at the different schools. This ranges from a maximum of 16 to a minimum of 4, with 8 as the average. In metal, less time is required in the laborious process of bringing material to size than is the case for wood. As such the actual production process can begin much sooner and work progresses more rapidly. In Metal, unlike Wood, the school where students make the most projects is also the one that allows most freedom to the students in the process of designing.

Figure 3: A COMPARISON BY SCHOOL OF THE TOTAL NUMBER OF PROJECTS MADE AND THE WEIGHTED AVERAGE NUMBER OF PROJECTS WITH COMPLETE STUDENT FREEDOM





In order to further study whether there is any association between the number of projects made in each school and the degree of freedom allowed to students during the design and manufacturing process, the following procedure was adopted. Each of the four categories of project was allocated a weighted grade based on the proportion of freedom allowed to students. Thus all projects in category "A" which allowed no freedom whatsoever were graded . Projects within category "B" were given a grade of 1/4, those in category "C" were given 3/4 and finally those of category "D" were given a grade of 1.

Figure 3 shows the results. In the area of wood there is no obvious trend. In point of fact the school which completed only five projects over the four year course has the highest "freedom factor" with a weighted average of two projects which allowed total student freedom.

On the side of metal there is perhaps some tendency towards allowing more freedom when a greater number of projects are made. However, there are a number which do not conform to the general pattern. What is clear, yet again, is the fact that with one or two exceptions schools give the students little opportunity to actively participate in the designing of the projects. This is true for both areas of wood and metal.

In summary, the overall approach to the teaching of Industrial Education Wood Technology and Metal Technology can be described as "traditional". As such, the main emphasis of the course is placed on developing the students' ability in the accurate use of tools and the application of appropriate techniques in the manufacture of various "projects". However, teachers demonstrated care in selecting projects which would be useful and would adequately motivate students. Although some teachers were sympathetic to the idea of students being allowed more freedom in designing of the projects, few seemed willing to take on the added responsibilities that this would entail.

Consequently, the vast majority of the student projects are made according to prepared drawings and are thus teacher dominated. This results in a situation where practical lessons are realtively easy to control but where student creativity is severely inhibited.

3 POWER MECHANICS/ELECTRICAL

Details were collected from five schools offering the power/electrical course and appear in Table 4.

Concerning the total number of periods taught a similar pattern to that noted for the wood/metal schools is apparent. In forms one and two the recommended allocation of six periods per week is not always met. Once again, the limitations of a 40/42 period week and the offering of a broad curriculum in forms one and two in many schools takes its toll on the number of periods left for Industrial Education.

But when one looks at the apportionment between practical and theoretical lessons, there is a striking contrast with the policy adopted in the wood and metal areas. In wood and metal, without exception, all schools made a distinction between theory and practical lessons. Table 4 shows that in the power and electrical schools many have not distinguished between the two. This is particularly the case at the form four level of the course. Even in those schools which indicated an allocation for pratical and theory lessons many teachers hastened to add that this was only a rough approximation for the purposes of the evaluation.

Table 4: PERIOD ALLOCATION FOR FIVE SCHOOLS OFFERING POWER/ELECTRICAL

(Each vertical column represents one school)

Form One	Practicals	-	3	3	5	-
	Theory	-	2	2	1	-
	Total	6	5	5	5	4
Form Two	Practicals	4	3	3	4	-
	Theory	2	2	2	1	-
	Total	6	5	5	5	6
Form Three	Practicals	3	-	-	4	-
	Theory	3	-	-	2	-
	Total	6	6	6	6	6
Form Four	Practicals	-	-	-	4	-
	Theory	-	-	-	2	-
	Total	6	6	6	6	6

What became quite clear was that in the areas of Power Mechanics and Electrical there was a very predominant tendency for the teachers to integrate the theory and the practical aspects of the course. When questioned more closely on this matter teachers readily admitted that it was difficult, if not sometimes impossible, to teach certain topics in either a purely practical or theoretical way.

The approach to the teaching of both Power Mechanics and Electrical is perhaps most aptly described as "experimental" and resembles the methodology used in the teaching of a practical science subject. A new syllabus topic is usually introduced to the students by the teacher first covering the related theory. The proposition, or principle in question, is then verified either by a demonstration on the part of the teacher or by the students themselves usually working in small groups of two or four persons. This type of lesson format is particularly evident in the area of electricity and probably accounts for the difficulty in differentiating between period allocation for practical and theory lessons.

The subject areas of Power Mechanics Technology and Electrical Technology can be described as "a small engine course" and "a basic electricity and electronics course" respectively. As such the possibility of students developing the type of attributes referred to in the introduction and general objectives for Industrial Education, seems remote.

It is much more difficult, although not impossible, to adopt a 'project approach' to the teaching of these two subjects. It is conceivable that a number of situations could be devised by the teacher where students could be encouraged to think and act creatively and where initiative and the ability to work without direct supervision could be encouraged.

In electricity there are many small projects such as an electric bell, simple electric motor, etc., which could be constructed by students from basic materials. This could be done on either an individual or group basis depending on the resources available. For Power Mechanics, the field is perhaps more restrictive but not to the extent of entirely precluding such activities. The construction of a simple steam jet engine or other models could offer an outlet for student creativity.

Owing to the more theoretical nature of power and particularly electricity, there is much less time for project activities even if they were to be encouraged. Added to this is the fact that both of these areas deal mainly with manufactured components. In many cases there is only one 'proper' way of installing or otherwise utilizing these components - thus severely diminishing any opportunity for creative expression.

Since a lot of equipment used and worked upon in the power and electrical workshops is either delicate or expensive, the teacher must be constantly vigilant to ensure that accidental damage is kept to a bare minimum. This need for constant checking on the part of the teacher means that students are not often given the opportunity to "work with a minimum of personal direction and assistance". This is particularly the case in form one and two where students have not acquired the necessary "feel" for care and checking before carrying out some operations. Since the majority of students will not proceed with the course beyond this level, it means that they will never get the chance of developing this attribute since they will always be under the close supervision of the teacher.

The existence of an 'industrial education club' was much more prevalent in the Power and Electrical schools. Again, as was the case with Wood/Metal, teachers felt that the club offered students an opportunity to work on their own projects. However, the teachers themselves readily admitted that the cost of many basic components required for this type of work in the areas of power and electricity prohibited such activities being carried far. Most club sessions seemed to be devoted to following up on topics covered in regular class time or in assisting the teacher in the maintenance of certain pieces of equipment.

Teachers of Power and Electrical made much greater use of the "Schemes of Work" prepared at the Kenya Institute of Education for use in these two subject areas than was the case in wood/metal schools. In many workshops visited these documents could be seen to be readily at hand in the teachers' office area. Generally speaking, teachers of Power and Electrical have been in the field for a much shorter time than is the case for most Wood/Metal teachers. Consequently, having less experience of teaching, they may feel a greater need to refer to the 'accepted' norms. Also it should be borne in mind that in the case of Power and Electrical, the schemes of work have only been in the schools since 1981 whereas those for Wood and Metal were released many years ago. From questioning the teachers, those teaching in the areas of wood/metal were generally less aware of the existence of such documents. However, for both classes of teachers the vast majority thought of such publications as 'guidelines' to assist the teacher in forming his own individually suited scheme of work.

All Power/Electricity schools questioned taught students the use of basic metalworking tools in form one and some of them also in form two. During this time the students made a 'project' similar to those found in the metal schools at this level. In one instance a number of metal 'projects' were also made at form three and four level resulting in a total of four jobs being completed within the four year course.

Power and Electrical schools showed a greater tendency to 'sandwich' courses at the form one and two level than was the case with those offering wood and metal. A system where students took two terms of metalworking, two terms of power and two terms of electrical, or some similar arrangement, was often in evidence.

Technical drawing using the full range of instruments and covering a lot more techniques was very much in evidence in the power and electrical workshops. This is probably accounted for by the fact that it is covered in greater detail in these syllabuses than it is for those of wood and metal. Also one of the 'stations' in the final practical examination for power and electrical always requires the use of board and tee square. One complaint raised by teachers was that the drawing questions included in the theory paper for Power and Electrical Technology were irrelevant since they were more closely related to drawing skills required in Wood and Metal. For wood and metal examinations technical drawing is tested by means of a theory paper where students answer either by sketching or using a straight edge on grid paper provided. Not to be overlooked is the fact that all teachers of Power and Electrical have been trained at K.T.T.C. where they are required to have already obtained, or to sit for, at least a credit pass in "O" level Technical Drawing. Teachers of Power and Electrical probably feel more proficient in this area than their predominantly K.S.T.C. trained counterparts in the areas of wood and metal. Naturally enough, teachers will tend to emphasize those aspects which they feel most confident in.

Both Power and Mechanics and Electrical were centered in pieces of equipment which, all teachers questioned felt, were indispensable to the successful teaching of the respective course. In the case of Power the item in question was the "Clinton (Newton)" single cylinder, four stroke petrol engine. For all schools this piece of equipment formed the basis for most practical work throughout forms one and two and for a great proportion of form three.

On the side of Electrical the 'Lab-Volt' kits numbers 501 and 506 formed the core of the practical course and were considered by most teachers to be essential. This same equipment is in use at K.T.T.C. as part of their course for teachers of Electrical Technology and probably explains, to a large extent, why it is so popular amongst the teachers. Not to be overlooked is the fact that the kits are supported by manuals which detail experiments that can be performed by the students thus offering the teachers ready-made practical lessons.

The Longmans Malaysia set of books on "Industrial Arts" are used as the standard text for the teaching of Power and Electricity at form one and two level. There are two books dealing with power and two on the subject of electricity. Those for power are particularly appropriate since the "Clinton" engines supplied to school receive good coverage. For electricity, the book "Introduction to Electricity and Electronics" is also available in all schools for use at form three and four level. In addition, it must not be forgotten that all the schools have the 'Lab-Volt' manuals that come supplied with the kits. This standardization in the use of certain texts has a very unifying influence on the way in which the two courses are taught in the different schools. In some cases, the textbook almost becomes the scheme of work with teachers working through chapter by chapter.

A number of teachers expressed the fact that students were particularly interested in, and motivated by, the subject of domestic installation wiring which is covered at the form three and four level of the Electrical Technology syllabus. The reason for this was stated to be that it dealt with an area of electrical practice with which the students were all familiar. Also components required for this type of work are readily available and can be utilized time and again thus allowing schools to build up reasonable stocks. In these circumstances, every student is able to experience the 'hands on' situation. Students interest was also said to be high in the area of electronics but the scarcity of components and their high cost is

severely limiting factor in the extent to which can do any real practical work.

A number of teachers expressed the opinion that the theoretical aspects of some of the Electrical Technology course was a duplication of that covered in Physics and Chemistry. This was related particularly to the topics of "what is electricity" and "how is it generated".

In the area of Power Mechanics evidence of a 'station system' being used for practical sessions at some stage of the from three and four levels of the course was noted in two of the five schools probed on this matter. In this method students are divided into small groups and perform a different task during each practical session after which they rotate to the next station.

Lastly, we should not forget what most typifies the teaching of Industrial Education Power Mechanics and Electrical Technologies. That is that for much of the practical work students must follow explicit instructions. These will either come on a manual. Quite often there is only one way to perform a certain operation. Allowing students to experiment with equipment could often lead to a potentially dangerous situation. Also the risk of damage being caused to equipment or components would be great.

4 CONCLUSION

In final conclusion it is apparent that the way in which Industrial Education is taught in Kenya schools is unlikely to bring about the attainment of a number of the stated objectives of the course.

In addition to the reasons already stated, the following factors also influenced the growth of this situation.

The 'examination syndrome' has for many teachers an inordinate control on the type of activity which they feel is proper for the subject. Anything which will not directly assist in obtaining higher grades in the final examination stands little chance of being incorporated in what is taught or what the teachers will encourage. Of course, it is possible to question the necessity of an examination at all or of the appropriateness of the present system to the stated objectives. However, it would seem, at least for the present time, that some form of final examination is necessary if the subject is to retain parity of esteem with other subjects.

The syllabus content for the various subject areas does not adequately reflect the stated aims and objectives of the Industrial Education course. As a result of this, despite the great efforts that are made by teachers in covering the syllabus content they can still fail in attaining the expected changes in students' attitudes and abilities.

During the course of questioning of teachers, it appeared that the teacher training institutions, both K.S.T.C. and K.T.T.C., may of necessity, pay too much attention to the development of practical skills and knowledge at the expense of subject philosophy and methodology. Teachers from both institutions stated that they had been given minimal opportunity to develop creative abilities themselves during their professional training. They are then put in the unenviable position of having to engender such attributes in their students without having had sufficient personal experience. Additionally, it may be mentioned that a few of the teachers questioned

who had taken either Industrial Education or Technical Education at secondary school expressed the opinion that they learnt very little in the way of new practical skills during their college course.

Finally, and not least of all, over the years there has been a general trend from the central administration for a more tightly structured, and many would say, restrictive approach to the subject. At various stages such things as phase testing, standardized projects, final major projects, coursework outlines, schemes of work, etc., have emanated from either the Inspectorate or the Kenya Institute of Education. Perhaps one of the unintentional results of this enthusiasm for accountability and giving of assistance to teachers has been that it has tended to subjugate their role. The need for the teachers himself to be creative and to innovate has been reduced. Teachers have only to follow the recommended procedures and norms to gain approval and recognition.

As has been noted, the realities of the teaching of Industrial Education may, in many respects, be far removed from the original intentions of introducing the subject into Kenyan secondary schools. However, the present teaching methodology has been shaped by many factors. Whilst it cannot be claimed that the way in which it is taught is totally successful in attaining all of the stated objectives, neither is it entirely a failure. There can be little doubt that, even with all its shortcomings, many students and teachers have come to understand themselves and their own abilities better through the study of this subject.

A LONG TERM TRACER STUDY

OF INDUSTRIAL EDUCATION STUDENTS

FROM NYANDARUA SECONDARY SCHOOL

BY

MARTIN DAVIES

This paper deals exclusively with the fourteen ex-students of Nyandarua Secondary School who, in 1974, sat for the first examination in "Industrial Education, Wood Technology" at school certificate level. Whilst the number of students in this study is small, the period of time since their East African Certificate of Education examination, as it was then known, is quite long. Almost exactly ten years have passed. As such, it is hoped that the tracing of this group of students and their responses to a questionnaire which was administered will shed some light on the long term effects of the study of Industrial Education.

1 A BRIEF HISTORY OF INDUSTRIAL EDUCATION AT NYANDARUA SECONDARY SCHOOL

In 1974, Nyandarua Secondary School only had one workshop and taught only Industrial Education Wood Technology. This was also the case in seven other government maintained secondary schools which had been provided with a single workshop through I.D.A. during 1968. The second workshop for Metal Technology was not built until 1976.

Therefore, the 1974 examination group were, during forms one and two, only exposed to one area of study in Industrial Education, instead of the normal two. Since the number of periods devoted to the subject also reduced from the recommended six, to three per week, no advantage was gained. If anything, the students were at a disadvantage compared with those from other schools which had double workshops and offered six periods per week split between two subject options. Students taking metal as well as wood in forms one and two would become more dexterous in manipulating tools since they spent more time engaged in practical workshop activities. This would have been of benefit to those who continued with Industrial Education at form three and four level. Further, schools with two workshops offering six periods per week were able to utilize two periods per week for theory and related technical drawing. The increased time spent on this latter aspect must have been particularly beneficial since it is an area which many children experience difficulty with.

Thus, from the point of view of facilities, Nyandarua was no better off than many of the other schools which had begun offering Industrial Education at the time. Within the school itself, Industrial Education had a particularly low status. Prior to 1974, as a non-examinable subject it was not held in high esteem by most teachers and students at the school. The reputation of the subject was further tarnished when students who had been led to expect the first "O" level examination in the subject to take place in 1973 were informed that it was to be postponed until 1974.

In a bid to break this poor image of the subject, a careful selection was made at the end of 1972 of those students who wished to take Industrial Education at form three and four level in anticipation of sitting for the first final examination now scheduled for 1974. Being a co-educational three stream entry school with only one Industrial Education workshop, it was decided that a maximum of twenty boys, or half of one class, would be allowed to take the subject at form three. Students were made aware that selection was to be based on the following criteria:

a) Performance in the end of second year theoretical paper in Industrial Education

   (This examination lasted 2½ hours and covered all work done during forms one and two).

b) Performance in practical work

(This was based on continuous assessment of all work done throughout form two only.)

c) Teacher's assessment of students suitability for the course

(This included such factors as general behaviour in the workshop, attitude to work, etc.)

In order to promote the image of the subject and boost the moral of succeeding students as fast as possible it was essential that this first group should perform well in the final examination. The original group consisted of sixteen students of which two were advised to take another option during the course of form three since their performance in Industrial Education was not up to expectations. All the remaining fourteen students were in 1984 successfully traced in the present study.

At the time, it was the policy of the school that the brighter students would take the separate options of Physics and Chemistry, whilst the remainder would be entered for Physical Science. Since the separate subject sciences demanded more periods than Physical Science it meant that students taking the former option were not allowed to take Industrial Education. As a result of this, many of the brighter students who also were talented in Industrial Education, opted for the science stream. Thus, the Industrial Education group was denied the inclusion of some of the best students. But, every effort was made to select the best of those that remained.

2 A PERSONAL PROFILE OF THE GROUP

Ethnic Origins

As a provincial government maintained secondary school in Nyandarua District of Central Province students were selected for form one places from within the province with the majority coming from the same district. With very few exceptions the whole of the student population, from form I to IV, were of the same tribe: Kikuyu. All fourteen of the 1974 Industrial Education students are of this tribe.

Age

It is common in Kenyan schools to find children in the same class having a wide range of ages. This occurs since there is no mandatory age when children must begin primary school and is also heightened by the frequency with which children repeat classes at primry level. The study group conforms to this norm as is shown in the following table which indicates their ages during 1970, the year in which they sat for the Certificate of Primary Education (C.P.E.)

Age during 1970, C.P.E. year

Age in years	12	13	14	15	16	17	18	19
No of students	1	1	2	2	6	-	1	1

Mean 15 years

C.P.E. Performance

Concerning performance in the C.P.E. examination there is quite a range from a low of 25 to a high of 34 on the 36 point scale.

Performance in C.P.E.

No. of points	25	26	27	28	29	30	31	32	33	34
No. of students	3	-	2	3	-	3	1	-	-	1

Mean 28

No. answer: one case.

Family Size

The picture corresponds with the general trend amongst Kenyans to have large families. The average number of siblings for each member of the group is 5½.

Number of siblings

No. of brothers	3	4	5	5	3	1	4	3	4	3	1	3	3	2
No. of sisters	2	2	3	3	3	2	2	2	4	1	4	0	1	2
Total	5	6	8	8	6	3	6	5	8	4	5	3	4	4

Home Environment

With the exception of two, who were born in the small towns of Githunguri and Nyahururu, the remainder of the group were all born in the rural areas of Central Province. All except for one who migrated with his father to Mombasa, attended primary school and sat for their C.P.E. in the same location as the place of their birth.

Parental Occupation

Farming is the dominant occupation of their parents. The following list shows the occupation of the respective fathers and mothers.

Occupation of father	Occcupation of mother
Farmer	Housewife
Farmer	Housewife
Farmer	Housewife
Farmer and sometime carpenter	Housewife
Farmer and sometime carpenter	Housewife
Carpenter and mason	Housewife
Forest labourer	Housewife
Butcher	Housewife
Secondary school teacher	Primary school teacher
Traffic controller, Kenya Railways	Medical sister
Deceased	School cook
Deceased	Farmer
Not applicable	Farmer
No response	Housewife

At least three of the group had fathers who were either fulltime or part time carpenters/masons. In addition, one has a father who worked with the forest department. Thus, at least some of the group were exposed to the idea of earning a living through working with wood prior to their admission to secondary school.

School Attainment of Parents

The following chart shows the level of school attainment of both parents for the group as a whole.

	Father	Mother
a) Did not attend primary school	3	6
b) Adult literacy course	1	3
c) Primary school 0-4 years	6	2
d) Primary school 0-7 years	1	1
e) Secondary education	2	2
f) University or equivalent	-	-
g) Not applicable	1	-
Total	14	14

The emerging pattern conforms to the trend that one might expect, for the males to obtain higher levels of education than the females. Of note is the fact that the four parents who obtained secondary education belong to the same two families.

Previous Experience of Working with Tools

The respondents were asked whether they had any previous experience of working with tools or materials utilized in Industrial Education before entering secondary school. Exactly half the group, including all four whose fathers were employed in occupations related to wood or woodworking on either a full or part time basis, answered in the affirmative. The tools and other items mentioned which they were familiar with included: pruning saw, hammer, nails, chisel, plane, drill, vice and try square. Two of them mentioned having assisted their fathers in constructing certain items.

In view of the details presented the personal profile of the group seems typical of what one might expect to find amongst students attending a provincial government maintained boarding school.

First Impressions of Industrial Education

The respondents were asked to state their first impressions of the Industrial Education worshops upon arrival at Nyandarua as a form one student in 1971. A few representative quotations from the responses received may help in illuminating what initially attracts students to this subject.

> Very impressive. The tools and machines (electric) were fascinating, more especially when they were in operation.
>
> I was very much impressed by the workshop tools which were very advanced, and at once I made a decision to be a participant in the subject if a chance offered.
>
> I felt reassured of my ambition to study technical work, I had failed to secure a place at Kabete Technical School.
>
> It offered self awareness in skills.
>
> It was fun.

The visual attractions of a fully equipped workshop make a strong positive impression on the minds of youngsters especially those from the rural areas with little or no previous experience of a technological nature.

Reasons for Deciding to take Industrial Education at "O" Level

At the end of form two these students had to make a decision on whether or not they would seek inclusion in the group that would continue with Industrial Education into form three and four and subsequently sit the "O" level examination. The reasoning given for wishing to continue with Industrial Education fall into two main divisions.

A) Better employment prospects

Out of the fourteen, ten of them mentioned, amongst others reasons, prospects of future employment. Typical of the responses are the folowing quotations:

I thought that if I missed employment elsewhere I could be self-employed.

I had to try to make my future better by having a kind of a trade, not just academics and things.

It was a very marketable subject.

At around the middle of form two a K.S.T.C. student advised me that I.E. was an advantage in joining K.S.T.C. and I was likely to be sent to Canada for further training.

B) Personal interest and ability

Six mentioned that it was their personal interest or ability in the subject which prompted them to continue with it. A few of their statements were:

I liked the subject and in general I enjoyed the opportunity of its practical work, that is working with various machines and designing articles.

It was my favourite subject and also my best.

To me it was an easy subject to pass.

Parental Influence and Attitude to Industrial Education

Only three of the fourteen stated that they consulted their parents on the decision to take Industrial Education as an examinable subject.

Asked what their parents reaction was to their taking Industrial Education, nine of the group reported positive sentiments as typified by the following quotations whilst the rest were non-commital.

They were happy since I could mend broken things at home.

They didn't have much understanding on I.E. They, however, appreciated the things that I took home.

They told me that I could be self employed in case I could miss a job of my choice.

Other Students' Impressions of Industrial Education

The fourteen respondents were asked what their peers, who were not taking Industrial Education at form three and four level, thought about the subject.

Only three felt that their peers had a positive attitude towards it; six stated that they had mixed feelings and five that they had a decidedly negative attitude. Sample quotations of these three categories are:

Positive

> Always with envy, especially when I.E. students were allowed to take their furniture home.

Mixed feelings

> Some viewed it to be of use to those less able academically, whilst some wished they did it.

Negative

> As a local, filthy, lowly paid and tiresome job. They had even given us a name as "Andu a miti", meaning people who work with logs.
>
> They thought that it was a waste of time. They also feared that it could end them as a carpenter, a job low for them.

Occupational Aspirations at the end of Form Four

In answer to the question...

> At the end of form four, what did you most want to do as an occupation?

...the responses were:

3...An Industrial Education teacher.
3...Some form of engineering.
3...Some job to do with the woodworking industry.
2...Proceed with studies.
1...A teacher.
1...An architect.
1...An apprentice.

Eleven of them mention an occupation that, in one way or another, is related to the technical skills as taught in Industrial Education. In reality, some 42% of the group went on to sit for "A" level examinations, with four of them proceeding directly into form V and another two entering as private candidates at a letr date.

Views Held on the Role of Industrial Education

The group was asked to state whether they thought of Industrial Education as part of general education or preparation for practical work. From the responses it is obvious that this question caused some confusion, however, it was possible to break down the answers into three broad classifications.

8... Preparation for practical work

The majority felt that it was essentially a vocational subject and supported their stance with statements such as:

> It's really preparation for practical work which gives confidence on self employment and an ambitious mind to explore the subject further.
>
> Preparation for practical work especially if you can get your own tools.

3... It served both purposes

Three felt that it was a combination of both and that it was not possible to make any clear distinction. Their comments were:

Generally it is preparation for practical work but its's knowledge can be very widely utilized, especially in private life where tools are available.

Both; the day to day practicalities involve minor uses of I.E. and if one intends to follow the workshop trades it is essential.

Every man should have knowledge in I.E. Only talented ones should be fully educated in I.E. to avoid flooding the market and for quality production.

3... Other response

The final three made responses which could not be classified into either of the previous groups since their comments were too general in nature.

It it interesting to note that none of the fourteen came out strongly in support of the view that Industrial Eduaction is part of general education.

3 THE APPLICABILITY OF THE STUDY OF INDUSTRIAL EDUCATION TO POST SECONDARY SCHOOL LIFE

The respondents were requested to answer to following question:

Has the study of Industrial Education at school in any way assisted you in getting any of the jobs you have held since leaving school?

The responses were:

8...Yes
6...No

For those who answered in the affirmative some of the ways in which they found I.E. to be of assistance in obtaining employment are illustrated by the following quotations:

It enabled me to be admitted at Muranga College of Technology as a mechanical engineering student.

I joined K.T.T.C. because of I.E....

Worked for three months with a building construction firm where I assisted a qualified carpenter and my foreknowledge of all the required tools gained me a good repute.

As a draughtsman with the Ministry of Works, Nakuru, with prior experience in technical drawing.

Present job (radiographer). It imparted creativity in me which is needed in radiographic projections. Safety with machines is also of much help to me.

I used to do a lot of painting at Kariobangi which was paying well.

After school I joined K.S.T.C. and graduated in Phsysics, I.E. and Mathematics: I have been teaching I.E. and Physics since.

Designing is part of the work that we do in the Kenya Posts and Telecommunications.

From the foregoing it can be seen that the ways in which I.E. has been of use in either getting a job or in the job itself are quite varied.

When asked whether they had at any time attempted to be self employed using the skills and knowledge acquired during the I.E. course the responses were:

6...Yes
8...No

For those answering in the affirmative the sort of work which they felt constituted self employment included:

> During "O" level vacation, made and sold furniture.
>
> Making household furniture for sale using some borrowed tools.
>
> I was making furniture, building at home and helping friends who haven't done I.E.
>
> During term holidays I do make sofa sets, coffee tables, etc.
>
> I constructed shelves, doors, windows and furniture for new premises.
>
> Making stools and tables in my uncle's workshop as soon as I left school.

None of the above can be considered to be serious attempts at self employment. Indeed the term "self employment" is seriously misunderstood in most cases. However, it appears as though a number of them did generate some income from these activities and for the rest of them they were certainly saved the expense of having to employ an artisan by carrying out their own building construction and furniture manufacture.

Whilst the term self employment has a very wide interpretation it is still an area which is much talked about in present day Kenya with its high unemployment rates. Naturally self employment under these circumstances has certain attractions even for our study group all of whom have been in waged employment. Their response to the question:

> Do you ever have thoughts about being self employed sometime in the future?

10...Yes, very much
4...Yes
0...Don't know
0...No
0...No, not at all

The type of self employed activity which the group would like to become involved in is particularly workshop oriented as indicated by the following stated preferences.

9...My own workshop
1...A hardware shop
1...A tools shop
1...Dealing with furniture and sale of pints
1...Electronics
1...General repairs

Whilst all express desire for self employment at some time in the future and

have a specific idea of which area they would like to work in, none of them in the ten years since having left school has had any long term success in such an enterprise.

The question,

> Have you ever made use of the skills and knowledge gained through I.E. in your present or past occupations?

was put to the group with the following results:

6... Yes, very much
4... Yes
2... Unsure
2... No
0... No,not at all

Although ten of the group answered this question in the affirmative their descriptions of the type of work that they have been engaged in reveals that for six of them it involved short term jobs and not their current long term occupations. For the remaining four, three utilize their I.E. skills in their jobs as teachers and one in his current employment with the mechanical engineering department of Metal Box Ltd.

For the two who are unsure, they are both primary school teachers, one of whom states it is not possible to be definite about this question since teaching at the primary level involves so many different activities.

The overall impression that one formulates from the responses to the previous question is that specific skills learnt in I.E. are not used in the current occupations of most of the group. The main exception to this trend is for those who are employed as teachers. The current occupations of all members of the group are shown below and full details of their post secondary career history is included in the appendix.

A) Government or parastatal employees

Primary school teacher
Primary school teacher
Primary school teacher
Industrial Education teacher, Wood/Metal
Industrial Education teacher, Power/Electrical, (seeking a job)
Office clerk, Ministry of Agriculture
Policeman
Personnel officer, Kenya Railways
Kenya Post and Telecommunications, repair and installation
Medical diagnostic radiographer, Ministry of Health
Undergoing teacher training course

B) Private

Banking clerk, Kenya Commercial Bank
Maintenance craftsman, Metal Box Ltd.
Sales representative, relations firm

If the above is anything of an indicator of the employment pattern of Kenyans quite obviously the government and related organisations are by far the largest single employer.

Out of the fourteen, a total of six are either holding a teaching qualification or are in the process of obtaining one. Of these, two are trained in Industrial Education, one in Wood/Metal at K.T.S.C. and the other in Power/Electrical at K.T.T.C. who is currently seeking employment following his recent return from the U.S.A. wherehe undertook further studies.

When it comes to making use of Industrial Education related skills in private life the group recorded another unanimous affirmative vote as shown by the responses indicated below.

9...Yes, very much
5...Yes
0...Unsure
0...No
0...No, not at all

The type of activities which have been attempted and the incidence of their mention by the group were as follows:

8...Furniture making
5...General repairs to household items
2...House construction
2...Painting and polishing
2...Drawing and making of house plans
1...Designing own furniture
1...Able to make critical judgements in purchasing furniture, etc.

Here, within the sphere of their private lives they have all found a use for I.E. with a number of the group mentioning more than one activity which they have performed using their expertise developed at school.

On the subject of what employers know about Industrial Education there was a general concensus that it was not very much, with eleven of the fourteen making negatively weighted comments typical of which were:

> They know very little about it.
>
> I think that they don't know enough, and what they know they ignore, they care much of quantity.
>
> From the few I have seen, none seem to know anything about it.
>
> I.E. to the employer is not very important as there are no recognised grades obtained to support ones knowledge.

For the remaining three respondents, one did not answer, one declined to answer, as he did not understand the question and the final one gave a positive impression by stating that employers feel that Industrial Education is...

> "...very important because one can be trained to be anything, e.g. engineer, an instructor, teacher, etc..."

Having been in the labour market for almost ten years one would assume that these ex-students of Industrial Education are correct in their general opinion that I.E. is not well understood or recognised by employers.

In concluding the questionnaire, the respondents were asked to state what

their future plans were concerning their occupations. Their responses are shown below.

8...Some form of self employment
3...To advance in the present occupation
3...Prefer to seek another job
2...No immediate plans

Once again the idea of self employment, although a very illusive goal, is strongly represented within the ambitions of the group.

4 CONCLUSION

Lastly, in order that each respondent had been given the opportunity to express his full feelings on the subject of Industrial Education they were requested to make any additional comments or observations which they felt strongly about, which may not have already been covered in the questionnaire. Seven of the group took advantage of this chance. Since these comments are not influenced by any leading question and represent the respondents' own thoughts, special importance is attached to them. For this reason, they are reproduced below with little or no editing.

> "Industrial Education should be emphasised more to our young people. To achieve this, it should be taught from lower primary school so that the correct potential can be tapped early enough. We hope that the 8:4:4 education programme is going to achieve this with the introduction of workshops, materials and incentives."
>
> (A primary school teacher.)

> "I.E. is being regarded today as a subject for academic drop outs. This is wrong. It should be a subject for bright students as creativity and imagination are very important in I.E. Drop outs can easily do clerical work; after all it is only copying and doing the same procedures day in, day out.
>
> Care should be taken to avoid too many people with Industrial Education because competition will make prices to go down and hence under-employment.
>
> Students should be given trade test certificates automatically based on their secondary school performance. That way they can be easily employed.
>
> Loans should be made available for those who want to start their own work."
>
> (Medical diagnostic radiographer.)

> "The fastly growing population in Kenya, at the rate of 4.1% is alarmingly high especially when the resources are taken into consideration. The purely academic education orientates the contemporary scholars towards white collar vocations. For this matter, the educational curriculum needs further revising to ensure that the school leavers at both "O" and "A" level are equipped with basic industrial skills to sustain their livelihood. This would check the rural-urban migration which is presently plagueing the urban concentrations today."
>
> (Teacher under training.)

"I'm very grateful for Industrial Education for the little knowledge I have which can help me in the future and wish that I could get a way to widen it.

As we have sat our "O" level in Industrial Education what is our fate in comparison with the government trade test?

Is there any way that I can further my knowledge in Industrial Education?

According ot my own view, you should stress more about Industrial Education and introduce it into more secondary schools."
(Sales representative.)

"Minor electrical and mechanical repairs should be introduced to many schools where there are no such facilities but these will very much depend on the school curriculum and budget. Also metal workshops and wood workshops should be very much encouraged since these are the basis of all future industrial working in Kenya."
(Kenya Posts and Telecommunications, worker.)

"Most headmasters feel that I.E. is there to increase their money problems. The money allocated for I.E. is NOT enough.

I think that better "Safety Pledges" should be designed so as to appear acceptable to potential employers. The Kenyan coat of arms should appear and the paper itself is very poor.

The K.N.E.C. is sending the cutting list and working diagram for the major project too late in the second term. This makes us buy very green timber which is difficult to use. Secondly, the projects are so demanding. Someone who can pass the practical should not get a grade 9."
(I.E. Wood/Metal Teacher.)

"I.E. is well defined in writing, but poorly set in the curriculum i.e. good objectives but poor in achieving these objectives. A form IV finishing in I.E. can't qualify for any technical institution like a technical school student whilst he also can't further his skills at "A" level.

Those that go to K.T.T.C. and graduate can't advance. They can't go for a Higher National Diploma or to the University. On these grounds I consider the programme in need of change.

Kenya is as well not a country where individuals will afford personal tools to use occasionally as is the case in the Western world. It must therefore either become a career or be of little use to those that go through the programme. The latter case is often the result for many. This suggests that the investment in I.E. has not helped a lot of those who go through the programme."
(I.E. Power/Electrical Teacher.)

Perhaps the most outstanding feature to emerge from this study is that the group believes that there is, and should be, a strong relationship between Industrial Education and incresed job opportunities, particularly in the area of self employment. This is a theme which has manifested itself time and time again in many of the responses to the various questions posed. The group also generally holds Industrial Education in esteem and see it as a

very worthwhile part of the academic school curriculum. However, none of them support it on the grounds of its own intrinsic value but rather because of its supposed advantage in the job market. In spite fo this reasoning, it is noteworthy that none of the group has experienced any long term success at self employment and not so many of them make use of their I.E. skills in their current employment.

Nonetheless, skills learnt in Industrial Education have been put to very good use by all of the group in their private lives. Their ability to cope with everyday practical problems and their general confidence in themselves as practically oriented people has definitely been of benefit.

Finally, it has been shown that it is the essentially practical nature of Industrial Education, with its opportunity for active student participation, which attracted many of the group to the subject. Although not directly questioned on the matter, a number of the group also mentioned that the opportunity to work independently, to design and make their own projects and develop and utilize their creative powers was much appreciated. In the light of such comments, these latter activities are perhaps worthy of greater emphasis in the current or future Industrial Education syllabuses.

THE CONDITION

OF INDUSTRIAL EDUCATION WORKSHOPS

AND EQUIPMENT

BY

BEN G. NYAGAH

The purpose of this paper is to provide information to the Industrial Education Evaluation Project team regarding:

(i) the condition of I.E. workshops as of June/July 1984.

(ii) the management and organization of the workshops by the I.E. teachers teaching the subject.

(iii) the state of maintenance and repair of the tools and equipment.

(iv) the adequacy of teaching materials, i.e. consumables, textbooks/library provision for the workshop.

1 BACKGROUND INFORMATION

One of the major activities of the Kenya-SIDA Project when it started in 1975 was to supply additional equipment and tools to those workshops built by the International Development Association (IDA) in order to meet the requirements of the developed Industrial Education syllabuses. The Kenya-SIDA Project built and equipped additional workshops to increase the number of I.E. workshops.

By June 1981 the Kenya-SIDA Project had completed supplying equipment and tools to sixty-nine I.E. workshops in the thirty-five Industrial Education Schools operating in the country. These workshops are distributed as follows with reference to the subject areas:

10 Power Mechanics Workshops

10 Electrical Workshops

24 Metal Technology Workshops

25 Wood Technology Workshops

The sixty-nine workshops fall into three categories:

(i) Those built by the International Development Association Project (IDA Project).

(ii) Those built by the Kenya-SIDA Project (Ministry of Works design type C 37).

(iii) Those old type of workshops found existing but renovated by the Kenya-SIDA Project to suit the I.E. requirements.

These sixty-nine workshops as mentioned earlier form the 35 I.E. schools with double workshops in metal/wood or Power Mechanics/Electricity with an exception of one school with only one Woodwork Technology Workshop.

In the thirty-five I.E. schools the three categories of workshops are as in Table 1.

Members of the I.E. Evaluation team visited those schools which in Table 1 are indicated by an asterisk, and used an observation schedule to check the condition of the I.E. workshops at these schools. Tables 2-5 are based on the data recorded by means of these schedules.

Table 1: THE TYPES OF WORKSHOPS AT I.E. SCHOOLS

SCHOOL	TYPE OF WORKSHOP	CATEGORY
Aquinas*	Metal	IDA
	Wood	IDA
Highway	Metal	Old
	Wood	Old
Ofafa*	Metal	SIDA C37
	Wood	IDA
Eastleigh*	Metal	Old
	Wood	Old
Nairobi	Metal	Old
	Wood	Old
Lenana*	Metal	Old
	Wood	Old
Upper Hill*	Metal	Old
	Wood	Old
Dagoretti	Metal	IDA
	Wood	IDA
Kijabe	Metal	
	Wood	IDA
Nyandarua	Metal	
	Wood	IDA
Nanyuki*	Metal	IDA
	Wood	IDA
Kagumo*	Metal	IDA
	Wood	IDA
Njiris	Metal	IDA
	Wood	IDA
Thika	Metal	SIDA C37
	Wood	IDA
Kitui*	Metal	IDA
	Wood	IDA
Nakuru Day*	Metal	SIDA C37
	Wood	IDA
Siakago*	Metal	SIDA C37
	Wood	IDA
Kenyatta*	Metal	SIDA C37
	Wood	IDA

Table 1: continued

SCHOOL	TYPE OF WORKSHOP	CATEGORY	
Tudor*	Metal	SIDA	C37
	Wood	SIDA	C37
Wajir	Metal	SIDA	C37
	Wood	SIDA	C37
Kisii*	Metal	SIDA	C37
	Wood	SIDA	C37
Emusire*	Metal	SIDA	C37
	Wood	IDA	
Kisumu*	Metal	Old	
	Wood	Old	
Chavakali	Wood	Old	
Homa Bay	Metal	IDA	
	Wood	IDA	
Chania*	Power	SIDA	C37
	Electricity	SIDA	C37
Kakamega*	Power	SIDA	
	Electricity	SIDA	C37
Khamis*	Power	SIDA	C37
	Electricity	SIDA	C37
Kiambu	Power	Old	
	Electricity	Old	
Mangu*	Power	SIDA	C37
	Electricity	SIDA	C37
Maseno	Power	SIDA	C37
	Electricity	SIDA	C37
Menengai*	Power	SIDA	C37
	Elecrticity	SIDA	C37
Uashin Gishu	Power	SIDA	C37
	Electricity	SIDA	C37
Musingu*	Power	SIDA	C37
	Electricity	SIDA	C37
Alliance*	Power	Old	
	Elecrticity	Old	

Table 1: continued

SCHOOL	TYPE OF WORKSHOP	CATEGORY
The following are Harambee I.E. schools with established I.E. workshops		
M'tetu*	Metal	Harambee built (low cost)
Mulala*	Wood	Harambee built (low cost)
Kathonzweni	Wood	Harambee built (low cost)

Note: * Denotes the schools visited where the observation schedules were administered.

Total number of workshops: 44 Government maintained workshops

2 Harambee maintained workshops but assisted by trained I.E. teachers

Some abbreviations have been used occasionally as follows:

OBS - Observation Schedules

IE - Industrial Education

NA - Not Applicable

N - Number of Workshops visited

2 THE CONDITION OF WORKSHOP BUILDINGS (TABLE 2A)

From Table 2A it is clear that up to 95% of the workshop buildings range from "fair" to "very good" state of repair condition. This indicates that the workshop buildings are still quite new and in satisfactory condition. Only 5% of the workshop buildings are in poor state of condition. The main defciencies which were noted include:

Worn out and cracked workshop floors
Leaking roofs and peeled ceiling
Defective electrical systems
Lack of burglar proofing in some workshops (8% stiil requiring burglar proofing)
Overdue painting
Broken window panes
Low standard of workshop cleanliness

Some buildings are considerably old, but some of the new workshops recently built are not exceptional with reference to these aspects. While the old type of buildings have cracked floors and leaking roofs due to old age, the new C37 workshop defects are due to poor workmanship. A large number of the C37 buildings were observed the have most of the seven listed features. Whereas the buildings were certified to have been built to acceptable standards of the Ministry of Works, Housing and Physical Planning, such

Table 2: RATINGS OF WORKSHOP CONDITIONS

A CONDITION OF WORKSHOP BUILDING		Very Poor	Poor	Fair	Good	Very Good	Yes	No	N/A	Total
1 State of repair of building itself	N	0	2	4	11	22				39
	%	0	5.1	11.2	28.2	56.4				100
2 Emergency stop system in existence	N						37	2		39
	%						94.9	5.1	-	100
3 Emergency stop system working	N						36	1	2	39
	%						94.9	2.6	5.2	100
4 Workshop cleanliness	N	2	6	14	16	3				39
	%	5.1	15.3	34.9	45.0	7.7				100
5 Workshop educationally stimulating	N	0	6	13	18	2				39
	%	0	15.3	33.3	46.1	5.1				100
6 Level of security in the shop	N	0	2	1	7	24			5	39
	%	0	5.1	2.6	17.9	61.5			12.6	100
B WORKSHOP ORGANIZATION AND PLANNING										
7 Noticeboards in existence	N						37	2	-	39
	%						94.9	5.2		100
8 Proper usage of noticeboards	N	7	10	14	3	4			1	39
	%	17.9	25.6	34.9	7.7	11.2			2.5	100
9 Fire fighting equipment in existence	N						34	5		39
	%						87.4	12.6	-	100
10 Fire fighting equipment in operation	N						33	6		39
	%						84.6	15.4	-	100
11 Duty rota for students in existence	N						26	13		39
	%						66.76	33.3	-	100
12 Duty rota in use	N						22	4	13	39
	%						56.4	11.3	33.3	100
13 Safety rules in display	N						9	30		39
	%						23.1	76.9	-	100
14 Protective clothing for students available	N						36	3		39
	%						92.3	7.7		100
15 Sweeping brushes in existence	N						38	1		39
	%						97.4	2.5		100
16 Cleanliness of sinks	N	5	13	3	10	6			1	39
	%	12.7	33.3	7.7	25.6	15.4			2.6	100
17 Existence of project display cabinet	N						11	28		39
	%						28.2	71.8	-	100

Table 2: continued

18 Degree of organization of displayed project	N	2	3	4	1	1			28	39
	%	5.1	7.6	11.36	2.6	2.6			71.8	100
19 Protective clothing for teacher in existence	N						32	7		39
	%						82.1	17.9	-	100
20 Workshop office level of cleanliness and organization	N	1	8	17	11	2				39
	%	2.66	22.5	43.69	28.2	5.1				100
21 First aid kit in existence	N						37	2		39
	%						94.9	5.1	-	100
22 First aid kit properly stocked	N						33	4	2	39
	%						84.6	11.3	5.1	100
C WORKSHOP TOOLS AND EQUIPMENT CARE, REPAIR AND MAINTENANCE										
23 Service record cards in existence	N						28	11		39
	%						71.8	28.2	-	100
24 Service record cards in use	N						9	19	11	39
	%						23.1	48.7	28.2	100
25 Tools loan sheets in existence	N						38	1		39
	%						97.4	2.6	-	100
26 Tools loan sheets in use	N						36	1	1	39
	%						94.9	2.6	2.6	100
27 Tool inventories in existence	N						38	1		39
	%						97.4	2.6	-	100
28 General cleanliness of machines	N	3	14	11	8	2			1	39
	%	7.7	34.9	28.2	22.5	5.1			2.6	100
29 General state of repair of machines	N	0	9	11	11	7				39
	%	0	23.1	28.2	28.2	17.9				100
30 State of repair of commonly used equipment	N	0	9	15	12	3				39
	%	0	23.1	37.9	30.8	7.7				100
31 Quantity of tools racked	N	3	6	4	11	14			1	39
	%	7.7	15.4	11.4	11.3	34.4			2.6	100
32 Quality of tool racking	N	0	2	13	19	4				39
	%	0	5.1	33.3	48.7	11.3				100
D TEACHING AND LEARNING RESOURCES										
33 Workshop library in existence	N						32	7		39
	%						82.1	17.9	-	100

Table 2: continued

34 Teaching aids in existence	N	6	9	9	12	3		39
	%	15.4	23.1	23.1	30.8	7.7		100
35 Quantity of materials in stock	N	3	6	4	11	14	1	39
	%	7.7	15.4	11.3	28.2	34.9	2.6	100
36 Safe and proper storage of materials	N	1	11	7	15	4	1	39
	%	2.6	28.2	17.9	37.9	11.3	2.6	100
37 Quality of other consumables	N	4	11	9	5	10		39
	%	11.3	28.2	23.1	12.6	25.6		100

defects are clearly indication of poor workmanship by the contractors, and perhaps lack of close supervision during construction.

As far as what the school administration can do, it was clear that regular maintenence of these buildings is a burden; and thus of last priority. This results in accumulated maintenence requirements, especially those of broken window panes, painting of walls, leaking roofs and ceiling, etc.

3 WORKSHOP ORGANIZATION AND PLANNING (TABLE 2B)

In the table, the items classified under "workshop organization and planning" are divided into two aspects as under:

(a) The items 7,9,14,15,17,19,21 and 22 concern the facilities which would enable the teachers to organize, plan and manage the workshops effectively.

(b) Items 8,10,11,12,13,16,18 and 20 concern aspects revealing the teachers' efforts in maintaining acceptable standards of workshop as a learning environment.

With regard to aspect (a), above, 80% or more of the workshops are satisfactory.

But there is one facility which shows a provision of only 23%: project display cabinets. It was noted during field observations that the project display cabinets were a common feature in the metalworkshops but not in wood, power and electrical workshops.

It is clear that the Kenya-SIDA project has played a significant role in the provision of these facilities and also of expertise in workshop layout. This aspect of facility provision has been fulfilled satisfactorily.

The observation items under aspect (b) - the degree of teachers' effort towards maintaining the acceptable workshop standards - show considerable variation as to rating. Table 3 summarizes these ratings. Unsatisfactory refers to very poor/poor and to NO. Satisfactory refers to fair/good/very good and to YES in the rating scales used in Table 2.

Table 3: SUMMARY OF RATINGS IN TABLE 2B

Items (cf Table 2)		Satisfactory	Unsatisfactory	N/A	Total
8 'proper usage of notice boards'	No.	21	17	1	39
	%	53.8	43.6	2.6	100
10 'fire fighting equipment operational'	No.	33	6	-	39
	%	84.6	15.4	-	100
11 'duty rota exists'	No.	26	13	-	39
	%	66.7	33.3	-	100
12 'duty rota in use'	No.	22	4	13	39
	%	56.4	11.3	33.3	100
13 'safety rules displayed'	No.	9	30	-	39
	%	23.1	75.9	-	100
16 'clean sinks'	No.	19	18	2	39
	%	49.7	46.1	5.1	100
18 'organization of displayed projects'	No.	6	5	28	39
	%	15.4	12.7	71.8	100
20 'cleanliness and organization'	No.	30	9	-	39
	%	75.9	23.1	-	100

The Kenya-SIDA Project handed over the facilities to the schools in June 1981 after providing all the workshops with the recommended facilities. The minor jobs left undone at the time of winding up were to be done by the school. Any financial requirement to those unaccomplished jobs was to be met by the Project.

Under this reference the observation schedule was carried out exactly three years since the Kenya-SIDA Project handed over the workshops to the schools.

Table 3 shows some deficiencies. For example, most workshops did not have a display of safety rules. Only 56% of the workshops had a duty rota system in use. The teachers during the interview schedules expressed their dissatisfaction of lack of time to maintain acceptable standards due to heavy teaching loads. This might be a factor, but many of these items refer either to time saving measures or to measures such as posting of safety rules, which require no daily attention.

4 WORKSHOP TOOLS AND EQUIPMENT CARE, REPAIR AND MAINTENANCE (TABLE 4)

In Table 4, observation schedules items 23-32 are those classified under "workshop tools and equipment care, repair and maintenance". Items 23-28 concern those aspects which provide the workshop teachers with a means of recording tools losses, and records related to services and repairs rendered to the machines. The workshops visited showed that up to 97% of them were provided with such facilities.

Fully 28% of the workshops have not been issued with machine service record cards by the maintenance unit. While these service record cards are important for assessing the problems of the services machines after a number of years, it was noted that only in 23% of the workshops had Industrial Education Teachers and the maintenance unit technicians recorded the repairs in the machine service record cards.

As regards tool loan sheets, 97% of the workshops visited showed proper keeping of such sheets. The tools inventories were noted to be used in all workshops. However, while tool check-ups should be carried out either at the beginning or at the end of each term, 64% of the workshops had inventories checked lastly in the first term of 1984 and 36% of the workshops during the 3rd term of 1983.

As to the state of cleanliness of machines, 56% of workshop machines were noted to be satisfactorily cleaned. The observation schedule items 29-32 are concerned mainly with those aspects related to the teachers' efforts to care and maintain the workshop tools and equipment.

For the easy interpretation of the observation items, they have been rated as shown in Table 4.

Table 4: WORKSHOP TOOLS CARE, REPAIR AND MAINTENANCE

Items		Satisfactory	Unsatisfactory	N/A	Total
29 'state of machines'	No.	29	9	1	39
	%	73.3	23.1	2.6	100
30 'state of equipment'	No.	30	9	-	39
	%	75.9	23.1	-	100
31 'quantity of tools racked	No.	29	9	1	39
	%	73.3	23.1	2.6	100
32 'quality of tools racked'	No.	37	2	1	39
	%	94.9	5.1	2.6	100

The observation schedule items numbers 29 and 20 shows that over 70% of the workshops had machines and tools in a generally satisfactory state of repair. But nearly all of the workshops had their individual problems regarding tools repair.

The power tools which featured most common in repair problems in nearly all the workshops included: lathe machines, shaping machines, band saws, planers, circular saws, forge units, wood turning lathes, Clinton engines, hydraulic cranes, DC and AC power supply units, voltmeters, olimeters, and oscilloscopes.

As regards repair problems related to bench work handtools, the tools which featured most common in repair problems in nearly all workshops included: jackplanes, hacksaws, handfiles, hammer and mallets, chisels, centre punches, engineers rulers and vices.

The following numbers of machine and tool repair problems were reported:

37 - Cases on replacement of worn out parts such as blades, springs, belts, Clinton engine parts, electrical spare parts and unserviceable engines or tools.

17 - Cases related to minor repairs such as blown fuses, loose screws, un-reconditioned chisel heads, blunt centre punches and scribers, and drills.

13 - Cases on faulty machinery switches especially for lathe machines and wood machines.

10 - Cases of either blown or faulty machine motors.

8 - Cases of unsupplied accessories for shaping machines, lathes, tools sent for repair to the maintenance unit.

The observations regarding tools care, repair and maintenance suggest these likely reasons for the problems:

(a) Irregular Routine and Preventive Tools and Machine Maintenance

It is clear that several cases listed above are of minor nature, where teachers would perform such preventive maintenance. However, though they do make some efforts, most of them during interviews said that irregular maintenance is mainly caused by heavy teaching load and by lack of experience in maintaining some of the equipment. Maintenance Unit staff, on the other hand, thought that some of the preventive maintenance should be done by the workshop teachers. The task of the Unit was to carry out major repairs and a few machine check-ups at given times of the year. There appears to be no clear cut policy regarding tools, machine repair and maintenance other than the usual rushing for repairs when machines break down. The teachers indicated that it would be helpful if frequent in-service courses were organized on repair and maintenance of machines.

(b) Spare Parts for Repairs are not Readily Available

Most of the delays in tools and machines repair is caused by lack of locally available spare parts. Some of the equipment supplied by the Kenya-SIDA Project are not stocked by the local agents. Therefore the supply of the spare parts for such machines take considerable time to arrive from overseas

manufacturers. The teachers expressed the wish that the maintenance unit should stock the most commonly needed parts.

(c) Lack of Qualified Personnel at the Maintenance Unit

The repair and maintenance problems range from mechanical to electrical type of problems. The Maintenance Unit lacks the specail-ist personnel with sufficient knowledge and experience to manage the repair and maintenance problems. Case reported showed that several problems related to repair are due to lack of experienced and qualified technicians. Further, those technicians curretly working for the Unit as far too few to cope with the demand of the 69 Industrial Education workshops, along with workshops/ equipment for technical and business education schools.

(d) Finance for Maintenance

Currently the Industrial Education workshops get Ksh. 80/= per student per year for maintaining the Industrial Education Workshops. This money caters for teaching materials, minor repairs and replace-ments. When I.E. teachers were asked about the degree of difficulty in getting the money for workshop requirements, 33% said it was very difficult, 67% said it was not diffcult. However 41% of those who said it was not difficult to get money, indicated that it was difficult to get all the money indicated in the proposed workshop estimates.

Apparently, the Industrial Education Vote is not appropriately used for its purpose by most of the schools. Yet, it is clear that the rate at which the workshop tools are wearing out leaves no room for school administrators to wait for tomorrow in order to buy spare parts or replace a tool.

The accumulation of equipment found out of order and of those requiring replacement is an indicator that there is some laxity and lack of concern about such expensive equipment. As the years come by, the acceptable learning environment will deteriorate and the standards obviously will go down.

5 TEACHING AND LEARNING RESOURCES TABLE (5)

In Table 5, the observations schedule items 33-37 are those classified under "teaching and learning resources".

Table 5: TEACHING AND LEARNING RESOURCES

Items		Satisfactory	Unsatisfactory	N/A	Total
33 'has working library'	No.	32	7	-	39
	%	82.1	17.9	-	100
34 'teaching aids'	No.	24	15	-	39
	%	61.3	37.9	-	100
35 'materials in stock'	No.	29	9	1	39
	%	73.3	23.1	2.6	100
36 'storage of materials'	No.	26	12	1	39
	%	66.7	30.8	2.6	100
37 'consumables'	No.	24	15	-	39
	%	61.4	37.9	-	100

The table shows that only 82% of the workshops have at least some textbooks placed on the workshop library cabinet. But in most of the workshops

this facility is far too inadequate. Most of the teachers said that they lacked adequate course textbooks for daily student use, let alone for library use. In some schools the available textbooks were shared between students. A few schools had one textbook for each student in forms three and four, but not for those in the lower forms. It was said that the I.E. textbooks are not readily available in the bookshops, and that the money was inadequate to purchase a book for every student.

The Kenya-SIDA project has made an effort to supply some of the teaching aids to the workshops. Also, teachers in a number of schools have made an effort to make some models and charts to facilitate their teaching. However, 38% of the workshops were noted to have inadequate teaching aids. Though some teachers expressed that they could not get I.E. money to buy suitable materials for making teaching aids, in all honesty they also lacked initiative and commitment to this professional responsibility.

Over 60% of the workshops have satisfactory supply of learning materials (items 35-77). But it was discovered that much of the materials found in metal and wood workshops was for the major projects.

As said earlier, teachers emphasized that adequate supplies of teaching materials is becoming increasingly difficult due to lack of funds. This is not due to lack of the funds but because many schools use the I.E. money for other purposes and only cover the co-called essential services in I.E.

THE CONTRIBUTION OF COST STUDIES

BY

CHRISTOPHER E. CUMMING

CONTENTS

LIST OF ABBREVIATIONS

EMU	Equipment and Maintenance Unit
GOK	Government of Kenya
HIT	Harambee Institute of Technology
IE	Industrial Education
KSTC	Kenya Science Teachers College
KTTC	Henya Technical Teachers College
SES	School Equipment and Supplies
SIDA	Swedish International Development Authority
TA	Technical Assistance
TSC	Teachers' Service Commission
USAID	United States Aid Agency
VP	Village Polytechnic
Ksh.	Kenya Shilling

(£1 Sterling = 19.2 Ksh. approximately at August 1984.)

1) INTRODUCTION

For the purposes of this study, costs are restricted to those by the Government of Kenya (GOK), by the Swedish International Development Authority (SIDA) and by students in the form of fees. The fieldwork, on which the report is based, was done in approximately three weeks in August/ September 1984. As far as possible primary sources of data were used, e.g. payment vouchers for equipment supplied to a particular school. However, the reliability of data on expenditures in education is always a concern and hence attention is drawn repeatedly to the nature of the estimates that had to be made where actual figures were not available.

2) RECURRENT COSTS IN SCHOOLS OFFERING INDUSTRIAL EDUCATION

2.1 The thirty-five schools offering I.E. are a particular sub-set of GOK maintained secondary schools. While information on teachers' salaries was available for all 35 schools, records of non-teacher recurrent expenditure concentrated on 23 schools. Table 1, therefore, shows the major components of recurrent expenditure and their relative proportions in those 23 schools. It is observed that:

1) In the two 'high cost' boarding schools, Lenana and Nairobi, teachers' salaries and allowances amount to approximately one-third of gross recurrent expenditure. In 'low cost' day schools, Aquinas, Eastleigh, Kisumi, Tudor and Upper Hill, teachers' salaries exceed two-thirds of overall recurrent expenditure.

2) Emoluments of non-teaching staff, subordinate staff and bursaries shown in column 2, paid to students range widely from 12.2% to 29.7% of overall gross expenditure. It is noticeable how boarding schools have generally higher proportions of expenditure allocated to non-teaching staff.

3) Expenditure on tuition - school equipment and supplies (SES) - is lowest in relative terms in the 'high cost' boarding schools. On average, it is 6.6% of gross expenditure. Within this head of expenditure is to be found the grants allocated to I.E.

4) Boarding equipment and stores amount to about one-fifth of gross recurrent expenditure in those schools with 100% boarding enrolment. (Boarding costs are, of course, a higher proportion).

5) The final column shows the ratio of net expenditure to gross, and, thus, the lower the percentage shown the higher is the income from fees (and rents). Day schools, with only statutory fees as income, obviously have a lower proportion of their gross spending (less than one-fifth) met from income than boarding schools (typically about one-third).

2.2 In order to check the stability (over time) of the proportions of gross expenditure allocated to the various heads, records of some twelve schools from the 23 analysed in Table 1 were investigated. Provided the sub-sample of 12 schools is representative of the 23, then the proportion of expenditure found for 1983 can be regarded as typical for those schools with the proportions determined by the characteristics of the school rather than by the year (1983) chosen for analysis.

Table 1: ANALYSIS OF RECURRENT EXPENDITURE IN 1983

School	Main Heads of Expenditure as a Proportion of Total Gross Expenditure					
	Teachers' Salaries (1)	Other Emoluments (2)	SES (3)	Boarding (4)	Non-Teacher Costs (5)	Net (of Fees) (6)
AQUINAS	75.6%	13.3%	7.7%	-	24.4%	83.7%
CHAVAKALI	66.9	12.8	10.3	5.2	33.1	75.3
DAGORETTI	54.7	26.8	7.2	5.2	45.3	78.7
EASTLEIGH	68.0	16.4	8.7	-	32.0	81.3
KAGUMO	40.9	21.9	6.3	21.5	59.1	62.3
KENYATTA	36.9	20.2	6.2	18.9	63.1	67.0
KIJABE	40.2	22.5	6.8	21.6	59.8	62.7
KISUMU	68.1	12.2	10.1	-	31.9	81.3
KITUI	48.1	17.5	7.3	18.0	51.9	66.3
LENANA	30.7	26.3	3.7	23.4	69.3	63.6
NAIROBI	36.6	29.7	3.4	18.9	63.4	67.6
NYANDARUA	46.4	18.1	5.8	21.6	53.6	62.4
THIKA	37.5	24.9	5.8	19.8	62.5	64.9
TUDOR	71.3	14.3	8.4	-	28.7	84.4
UPPER HILL	71.6	15.0	6.8	-	28.4	86.7
WAJIR	34.9	25.1	5.1	21.4	65.1	67.5
ALLIANCE	41.7	28.0	4.6	15.0	58.3	73.0
CHANIA	52.5	20.0	6.0	12.1	47.5	74.9
KHAMIS	53.7	18.9	6.2	-	46.3	75.2
KIAMBU	49.4	17.0	6.7	21.6	50.6	62.9
MANGU	46.6	21.5	5.2	17.2	53.4	70.2
MASENO	45.0	20.9	5.4	17.4	55.0	69.2
MUSINGU	56.1	18.4	7.6	11.2	43.9	70.6

SES: School Equipment and Supplies

Notes: 1) The schools are arranged in two sets corresponding to those doing Wood/Metal (Aquinas to Wajir) and Power/Electrical (Alliance to Musingu).

2) Columns 2,3 and 4 do not add to 5, the total of all non-Teacher Costs because of residual items of expenditure including 'fuel and maintenance', 'repairs', 'services' and 'non-recurrent expenditure'.

2.3 Non-Recurrent Expenditures. An important primary source of this study of costs is the record for an individual school of the Final Estimates of Recurrent Expenditure, a Ministry of Education document. One item appears there that requires comment, namely, 'Non-Recurrent Grants'. In a pure sense the item is not recurrent at all but rather capital. Whereas certain of the other grants-in-aid are determined by official formulae, the non-recurrent grant is a special and non-repeatable expense. Potentially, it could distort the relative proportions of expenditure from year to year. Records of non-recurrent expenditures for 22 schools reveal a wide range of special provisions made from 0 to Ksh. 317,000. On average, schools received Ksh. 57,100 in 1983.

No explicit mention is made of special provision of I.E. Only in three cases, those of Kenyatta High, Wajir and Khamis do the amounts given amount to more than Ksh. 200 per student.

2.4 School Equipment and Supplies

2.4.1 Final Estimates show, under the sub-head Tuition Equipment and Boarding, the total sum allocated plus, in parenthesis, any special grants included in the total. Some 14 school records, out of the sample of 23 schools, showed sums specifically granted for I.E. These ranged from Ksh. 4000 to Ksh. 25,600. The formal position is that all schools teaching I.E. should receive an additional K£2 per pupil per year in SES grant. The most plausible reason for there being no mention of grants for I.E. in nine schools is inconsistent recording by the Ministry of Education, Directorate of Secondary Education.

2.4.2 Of course, what really matters is not what is allocated (to I.E. or to any other head of expenditure) but rather what is spent. Two indirect pieces of evidence are available on this point. A relevant question was included in a questionnaire, administered to all I.E. schools as part of the larger evaluation exercise. It asked, in effect, whether the extra revenue from the SES grant, plus the fee paid by some students, was sufficient to cover I.E. materials and repairs in 1983. With one exception, the 16 schools that had returned their questionnaire by August 31, 1984, held that the revenue was insufficient. Seven of these schools indicated the extra money - normally for materials for tests - that they had had to spend on I.E. The amounts reported varied from Ksh. 1,632 (Nakuru Day) to Ksh. 52,000. One school admitted that they "had to buy less materials than required by students".

2.4.3 The questionnaire data originated from headteachers and bursars. In a parallel study, conducted by Jon Lauglo, teachers of I.E. reported how much they were allocated for I.E. materials in 1983. They also reported on the difficulties of actually obtaining authority to spend the sums allocated. Teacher reports on allocations for I.E. and, in some cases for estimated expenditure, can be married with enrolment data for 23 schools. Reported allocations per student in 12 schools fall in the range Ksh. 76 to Ksh. 84. In other words, allowing for the vagaries of enrolment counts, allocations come up to the official Ksh. 80 in more than half the schools where teacher reports are available. The remaining allocations range from Ksh. 44 to Ksh. 104 per head. Actual expenditure, as estimated by teachers, was subject to many subjective comments such as "we always overspend", "spend much less", "don't know how much", "not very difficult to get from school administration". One teacher reported spending "hardly any". "We never know how much we should have, almost impossible to get". Teachers in eight schools claimed no difficulties in getting their allocations and presumably they spend them.

In another five schools, spending was significantly less than that "allocated". The extreme case was a report of an allocation of Ksh. 70 per head - a reasonable figure - and an actual expenditure of Ksh. 8 per head.

2.4.4 The only conclusion to be drawn from this data is that, whereas there is a fair degree of standardisation of allocations to I.E. - perhaps more than half the schools teaching I.E. allocate the official Ksh. 80 per head or thereabouts - the position on actual spending is much more mixed with some schools spending more than their allocation and other spending varying amounts less than the official Ksh. 80 per I.E. student.

Table 2: UNIT RECURRENT EXPENDITURES FOR A SUB-SET OF 22 SCHOOLS OFFERING INDUSTRIAL EDUCATION IN 1983. Ksh.

School	Enrolment Day	Boarding	Total	Teachers' Sals and Allowances	Other Emol.	SES	* Boarding Expenses	All non teacher items	Total Gross Exp.
AQUINAS	700	-	700	2082	366	212	-	672	2755
CHAVAKALI	640	120	760	1614	308	248	800	798	2412
DAGORETTI	480	120	600	1688	826	222	800	1400	3086
EASTLEIGH	870	-	870	1646	400	212	-	774	2418
KAGUMO	-	860	860	1524	814	232	800	2200	3726
KENYATTA	-	660	660	1560	856	262	800	2674	4234
KIJABE	-	670	670	1488	832	252	800	2214	3702
KISUMU	990	-	990	1656	296	246	-	776	2432
KITUI	160	500	660	1614	588	246	800	1742	3356
LENANA	-	788	788	1964	1686	216	1500	4460	6404
NAIROBI	100	700	800	2536	2058	236	1500	4400	6936
NYANDARUA	-	670	670	1714	670	216	800	1982	3696
THIKA	-	670	670	1516	1008	236	800	2528	4044
TUDOR	480	-	480	2062	414	244	-	830	2892
UPPER HILL	670	-	670	2466	518	236	-	978	3442
WAJIR	-	380	380	1468	1056	214	900	2738	4208
ALLIANCE	-	646	646	2228	1496	244	800	3118	5346
CHANIA	330	483	813	2062	788	236	800	1866	3928
KHAMIS	320	255	575	1852	652	214	-	1598	3448
KIAMBU	-	610	610	1832	632	248	800	1878	3710
MASENO	-	550	550	2110	978	252	820	2580	4690
MUSINGU	320	220	540	1626	532	220	800	1274	2900

SES: School Equipment and Supplies

*Boarding equipment and stores is the grant per student boarder.

2.5 Unit Costs

2.5.1 Table 2 shows, for 22 schools offering Industrial Education, recurrent expenditure per student, contracted here to "unit costs". Caution must be used in reading this and similar tables. First, the sums shown are gross expenditure. In other words, they are a measure of the total resources used per student to produce whatever the output of the process of schooling is. These are direct recurrent costs borne by government and the fees borne by the individual or his family. (Expenditures by government alone can be easily obtained by using the data on net expenditures in the final column of Table 1). A second point of caution surrounds the actual spending pattern on items other than teachers' salaries. It is widely reported, for instance, that in boarding schools decisions are sometimes made to divert grant intended for tuition and other purposes

to the purchase of food. The figures shown in Table 2 represent the intended directions of grants and not their ultimate destinations.

2.5.2 It can be observed from Table 2 that:

1) The range of unit costs is almost 300% - Ksh. 2412 to Ksh. 6936 per student*.

2) The range of unit salary costs is considerably narrower than overall unit costs - Ksh. 1468 to Ksh. 2536 per student. There are indications here of control over staffing by the Teachers' Service Commission and the increasingly graduate and qualified nature of the teaching force.

3) There are relatively stable amounts spent on tuition (SES) - Ksh. 212 to Ksh. 262 per student indicating the formula nature of the grant operated by the Ministry of Education.

4) The largest variation amongst unit costs lies in the area of "other emoluments". In Chavakali, Ksh. 308 per student is spent; whereas in Nairobi school almost Ksh. 2058 per student is granted. Generally, those schools with only day students have less than Ksh. 500 per student allocated for paying non-teaching and subordinate staff. We have to deduce that for boarding schools a substantial proportion of the "other emoluments" grant (perhaps 50% or more) is a component of boarding costs.

2.5.3 Unit Cost Movements. Table 3 compares total unit costs and unit costs of 'tuition' (SES) expenses for 1982 and 1983 in the same 11 schools. The remarkable stability of amounts granted for school equipment and supplies is noticeable. This head of spending is easily constrained by the GOK simply by holding per capita allocations constant. (In the face of inflation of all goods, the real value of these grants must be declining sharply year by year). Even overall unit costs show no general upwards trend: indeed, five of the eleven schools show a decline in unit expenditures.

Table 3: COMPARISON OF UNIT RECURRENT EXPENDITURES ON ALL ITEMS AND SCHOOL EQUIPMENT AND SUPPLIES FOR 11 SCHOOLS IN 1982 AND 1983

School	Overall Gross Unit Recurrent Cost		Unit Recurrent Cost of SES	
	1982 Ksh	1983 Ksh	1982 Ksh	1983 Ksh
AQUINAS	2614	2755	212	212
CHAVAKALI	2588	2412	248	248
EASTLEIGH	2268	2418	212	212
KAGUMO	3968	3726	234	232
KITUI	3750	3356	242	246
NAIROBI	6498	6936	228	236
THIKA	3740	4044	236	236
TUDOR	2698	2892	266	244
WAJIR	3670	4208	214	214
KIAMBU	4106	3710	248	248
MUSINGU	2818	2900	220	220

*The gross unit costs are not "adjusted" for the varying mix of boarding students, the different curricular patterns and the presence or absence of one or more Higher School Certificate streams. Specifically, there are "start-up" costs associated with new streams - sums of money given to purchase books and equipment. These sums, where present, are recorded under the account head Non-Recurrent Expenditures. See also paragraph 2.3.

3) CAPITAL EXPENDITURES ON INDUSTRIAL EDUCATION

3.1 Overview. For the schools underreview there are potentially two sources of the funding for I.E. capital viz. the SIDA project and other sources. Data on the former derives from the records of the Kenya-SIDA Project Office and on the latter from the I.E. Evaluation questionnaire. In principle, from information on total capital spending on the various project components of buildings, infrastructure and equipment, estimates of the amounts spread per year can be made. (These annualised capital unit costs can then be added to recurrent cost estimates to give a total picture of unit costs).

3.2 Availability of Data

(i) We can deal rather quickly with capital spending from other sources. Only one school - Musingu - out of the 16 schools that responded to the request for additional information reported any capital spending specifically on I.E. in the three years 1981, 82, 83. For all practical purposes it can be assumed the SIDA funds were the only funds available for capitalising I.E. during the period.

(ii) Individual files available in the Kenya-SIDA Project Office going back to 1976 contain data on payments for renovating and building workshops. It is also possible to pull out major infrastructure elements such as staff houses and electricity. Equipment costs are available only by estimation because of a variety of tender systems having been employed over time and because of bulk purchasing.

3.3

3.3.1 An example of the derivation of costs per place per year

Wajir Secondary School. One wood and one metal workshop were built at Wajir each providing 20 student-places. Payment vouchers for the entire building contract including some infrastructural costs, such as new electric cables and supervision of the building programme, amounted to Ksh. 750,576 at 1981 prices. (No staff houses were built). Estimates of equipment supplied to the two workshops amounted to Ksh. 390,000 at 1981 prices plus transport costs of Ksh. 7473.

3.3.2 Two factors apply in annualising capital costs. One must estimate how long the capital (buildings plus equipment) will last and how much interest would be received if the capital were invested in relevant money markets instead of being used to finance buildings and equipment. Accepted practice puts the lifetime of buidings (of the kind considered) to have a life of 20 years and instructional equipment a life of 10 years. If no effort is made to estimate the theoretical loss of interest then the resulting annualised values (total capital expenditure divided by the number of years of life) underestimate the real cost. However, cost calculations using imputed interest rates are obviously sensitive to the rate chosen. Moreover, it could be argued that investing the funds in long term bonds was not a choice for SIDA, being an agency devoted to disbursing funds for development in other countries. It was decided not to attempt to calculate annualised costs using hypothetical interest rates and, instead, to 'spread' total capital expenditures equally over the relevant life times of both buildings and equipment.**

** This crude working assumption receives support from a World Bank document dealing with cost structures of diversified schools. See Hinchcliffe, K. Cost Structures of Secondary Schooling in Tanzania and Columbia, Nov. 1983.

Table 4: EXAMPLE OF DERIVATION OF COST PER PLACE PER YEAR
(in Ksh. at 1981 prices)

	BUILDING	EQUIPMENT
TOTAL CAPITAL COSTS	750576	397473
Cost for one place	18770	9940*
Cost per place per year	940	1000*

*All figures rounded up.

3.4 It is also possible to estimate separate equipment costs (though not building costs) for wood and metal. In Table 5, where possible, separate estimates have been given for the various kinds of workshop.

3.5 Patterns of Capital Spending

3.5.1 Some caution must be used in interpreting the equipping costs per place in Tables 5 and 6. Fairly accurate figures were available, in the form of priced equipment lists, in the Kenya-SIDA Office files, for equipping new wood and metal workshops. Hence, part 1 of Table 5 contains fairly reliable figures at 1981 prices viz. Ksh. 680 per student-place per year for wood workshop equipment and Ksh. 1290 per student-place per year for metal workshop equipment. (The additional amounts incurred at Wajir are strictly allocable to known transport expenses). For only one other school, namely Alliance, can a reliable estimate of spending on equipment be given. The average expenditure on equipping power and electrical workshops is Ksh. 1030 per student-place per year. In all other cases, the equipping costs are heavily estimated.

3.5.2 New power and electrical workshops were provided at 10 schools and the details of the costs of that provision are shown for 6 of these schools in Table 5. Leaving aside Alliance, a special case, the range of costs of providing a student-place per year is from Ksh. 420, at Musingu, to Ksh. 965 at Kiambu. (At Alliance and old structure was refurbished).

3.5.3 A cursory glance at Table 6 will show how stable was the cost of providing a staff house. The most expensive housing - at Kitui - is only 15% more expensive than the least expensive at Thika.** By the nature of the renovation programme tackling buildings of various ages and construction, the costs of "topping up" were bound to be very variable. Thus, Ksh. 18 per student-place per year at Upper Hill has to be set beside Ksh. 252 for Eastleigh.

**Housing Costs. Teachers who occupy school houses do not, of course, receive a housing allowance. In principle, they pay rent. Income from rent is retained by the school. No data on rent charges was collected. The amount of income from rent compared to income from student fees was quite minor. Since the school maintains the houses on site, it is most unlikely that the rent charged meets maintenance costs far less does it enable the Government to recoup its capital expenditure.

Table 5: CAPITAL EXPENDITURES ON BUILDINGS AND EQUIPMENT AT SOME SCHOOLS OFFERING INDUSTRIAL EDUCATION (Ksh. at 1981 prices)

1) Schools with New Wood and Metal Workshops

	TOTAL COSTS			COSTS PER PLACE PER YEAR		
	Building	Equipment		Building	Equipment	
		Wood	Metal		Wood	Metal
TUDOR	602,148	136,000	258,000	750	680	1290
WAJIR	750,576	137,737	259,736	940	690	1300

2) Schools with New Power and Electrical Workshops

	TOTAL COSTS				COSTS PER PLACE PER YEAR			
	Building		Equipment		Building		Equipment	
	Workshops	Houses	Power	Electrical	Workshops	Houses[2]	Power	Electrical
ALLIANCE[1]	24,185	190,000	409,142		30	4750	1030	
CHANIA	487,584	-	118,000	234,000	610	-	590	1170
KHAMIS	715,124	-	118,000	234,000	900	-	590	1170
KIAMBU	771,624	-	122,000	234,000	965	-	610	1170
MASENO	509,765	-	117,000	233,000	637	-	585	1165
MUSINGU	320,682	-	118,000	234,000	400	-	590	1170
	16,000 (Other)				20			

1: Alliance was a pilot school for the introduction of Power and Electrical Technologies. The actual equipment costs are known.

2: The cost of Houses, like Workshops, are annualised over 20 years. The cost per place figure is for one house.

Table 6: CAPITAL EXPENDITURES ON BUILDINGS AND EQUIPMENT AT SOME SCHOOLS OFFERING INDUSTRIAL EDUCATION

Schools where workshops were renovated and re-equipped.
RENOVATION EXPENDITURES MADE BY SIDA.

	TOTAL COSTS Building/Renovating	Houses	COST PER PLACE* PER YEAR	HOUSE UNIT COST
AQUINAS	80,812	-	101	-
DAGORETTI	70,639	205,105	88	105,550
EASTLEIGH	201,247	-	252	-
KAGUMO	92,040	193,000	115	96,500
KENYATTA	72,420	196,100	90	98,050
KIJABE	36,320	213,420	45	106,710
KISUMU	166,240	-	208	-
KITUI	122,420	216,280	153	108,140
LENANA	47,500	-	60	-
NYANDURUA	41,040	-	51	-
THIKA	-	91,300	-	91,300
UPPER HILL	14,000	-	18	-

Note: Details of the various items supplied to "top up" the wood and metal workshops in the above schools are not available. An estimate was made of the average expenditure on re-equipping a workshop.

* It is assumed that the renovation involved 40 student-places at each school.

4) SUBJECT COSTS

4.1 The principles on which the generation of subject costs are based can be stated briefly as follows:

1 The school has several identifiable functions such as teaching, boarding, administration.

2 The timetable of a school and the related staffing hold the key to the recurrent resources allocated to the teaching costs of each subject. (This latter is not the same as "subject costs".)

3 Capital costs for various subjects are derived in relation to the space allocated or used for that subject.

4 Subject costs = teaching costs of each subject + consumable/ recurrent expenditures + yearly cost of the capital + share of the overheads including administration.

4.2 Subject costs having been produced, the intention is usually to compare one subject with another. For instance, what are the relative subject costs of Industrial Education and, say, Science or Kiswahili in the same school? One can, also, compare the costs of any one subject, say, Industrial Education, over several schools.

4.3.1 It would obviously be inappropriate to compare total subject costs. Appropriate unit costs have to be used. Essentially, there are three candidates for the choice of appropriate unit costs.

Definition of Unit Cost Terms

(i) Cost per student. Total subject costs are divided by the number of students receiving the subject.

(ii) Cost per student-period. Total subject costs are divided by the number of student-periods. (One student-period being one student receiving one period of the subject per week, over a school year).

(iii) Cost per class. Total subject costs are divided by the number of classes. A class here is a group taught as a unit. A key point here is that in Industrial Education, each stream is divided into two groups, whereas in other subjects, the entire stream is taken as a single unit.

4.3.2 Whichever unit cost is produced it is an average and not a marginal cost. The marginal cost would be the addition to total subject costs involved in expanding subject numbers (or student-periods or classes) by one unit. The cost of producing subject costs in accord with the principles above is very high.

4.4 Relative Teaching Costs Through a Curricular Model

4.4.1 We can get an approximation to the relative cost of Industrial Education and other subjects in terms of unit teaching costs through examining the curriculum. The official recommended curricular pattern for I.E. is Form I - 3 streams; Form II - 3 streams; Form III - 1 stream; Form IV - 1 stream. The official position with respect to teaching the theory component of the subject is that it should be done to whole classes. However, in data collected in the summer of 1984 by Dr. Lauglo, more than half the sample of 25 schools reported teaching I.E. to Forms I and II in groups of 20.

Being typically intended for a 3 stream school, with one stream continuing to Forms III and IV, two teaching cost models can be set out following the alternative curricular practices of (a) assuming theory is taught to groups of 40; and (b) half classes of 20 students are taught theory. The resulting patterns are given in Figures 1A and 1B.

Figure 1A: CURRICULUM PATTERN IN I.E.: FORMAL MODEL (A) THEORY CLASS 40 IN I AND II

Form	Streams	PRACTICAL ½-class	Periods per week	TOTAL Periods	THEORY Periods per week	TOTAL Teacher periods
I	3	2	4	24	6	30
II	3	2	4	24	6	30
III	1	2	4	8	4	12
IV	1	2	4	8	4	12
TOTALS	8			64	20	84

Figure 1B: CURRICULUM PATTERN IN I.E.: FORMAL MODEL (B) THEORY CLASS 20

Form	Streams	PRACTICAL ½-class	Periods per week	TOTAL Periods	THEORY Periods per week	TOTAL Teacher periods
I	3	2	4	24	12	36
II	3	2	4	24	12	36
III	1	2	4	8	4	12
IV	1	2	4	8	4	12
TOTALS	8				32	96

If the mean cost of a teacher period* in Industrial Education is M_1 then the teaching costs of Industrial Education are either (a) 84 M_1 or (b) 96 M_1 Ksh. Assuming a full stream of 40 students, the total number of students receiving industrial education would be 320. Each student receives 6 periods per week making a total of 1920 student-periods per week. Therefore, the teaching costs of Industrial Education are:

either $\frac{84}{320} M_1$ or $\frac{96}{320} M_1$ per student,

or $\frac{84}{1920} M_1$ or $\frac{96}{1920} M_1$ per student-period.

*A teacher-period or, more precisely, a teacher-contact period, is a teacher in front of a class of any size for one period.

4.4.2 Let us compare the teaching costs of Industrial Education with those of some other subject also allotted six periods per week. This subject typically is taught in classes of 40, and in full classes rather than half-classes.

Figure 2: CURRICULUM PATTERN OF A TYPICAL SUBJECT

Subject "Other"

Form	Streams	Periods Per Week	Total Teacher Periods
I	3	6	18
II	3	6	18
III	1	6	6
IV	1	6	6
TOTALS	8	-	TOTAL 48

Assume the mean cost of a teacher-period in this subject is M_2, then the teaching costs of the subject are 48 M_2 Ksh.

Therefore, the teaching costs are:

$$\frac{48\ M_2}{320} \quad \text{per student}$$

and

$$\frac{50\ M_2}{1920} \quad \text{per student-period}$$

4.4.3 Now, a simplification can be made to ease the comparison of unit costs between Industrial Education and the other un-named subject. It involves assuming that $M_1 = M_2$, that the mean cost of a teacher-period in the two subjects is the same. Teaching costs depend on (i) teachers' salaries plus allowances and (ii) teacher-periods of contact. The first factor in turn depends on salary scale and experience/incremental point on the scale. Teachers of I.E. have, until recent years, been on the S1 scale. Now with the flow of graduate teachers from K.T.T.C., the proportion of graduates will increase. Unless chance factors cause I.E. to be staffed entirely with graduate teachers at the foot of their scale while the rest of the staff are senior teachers at the top of the S1 and graduate scales, the assumption of equal teaching costs seems reasonable. Additionally, if teachers of I.E. teach, on average, the same number of periods in a week and year as other categories, we can assume that the mean teaching costs of a teacher-period are the same.

Figure 3: COMPARISON OF UNIT TEACHING COSTS IN INDUSTRIAL EDUCATION AND AN OTHER SUBJECT

I.E. Teaching Costs		Other Subject Teaching Costs	
per student	per student-period	per student	per student-period
$\frac{84 \text{ or } 96}{320} M_1$	$\frac{84 \text{ or } 96}{1920} M_1$	$\frac{48}{320} M_1$	$\frac{48}{1920} M_1$

$$\frac{\text{Ratio of I.E. teaching costs}}{\text{Other Subject teaching costs}} \doteq 2$$

4.4.4 In short, the teaching costs of Industrial Education are probably, on average, over the system of 35 schools offering I.E., approximately twice those of other subjects. (The Ministry of Education does not have data on the actual costs of any subject in the curriculum. Hence, it is inappropriate to try to produce a more refined figure for Industrial Education).

4.5 Leaving aside the issue of boarding costs in those schools where such costs apply, it is clear that major single item of recurrent expenditure in a school is the item of teachers' salaries. (See Table 1 for instance). It is similarly the major allocable component of subject costs. Consumables in the form of Tuition Expenses and Stores do not exceed 10% of total gross expenditure and amount for all subjects to one-sixth or less of the level of teachers' salaries. Industrial Education is formally allowed to earmark Ksh. 80 per student per year for consumable teaching supplies. (Recently the inspectorate have issued guidance on how much headteachers should allocate from their total tuition expenses to each subject). An indication of the comparative expenditures on Industrial Education and other subjects can begained by recalling, from Table 4 that the unit expenditures on Tuition Expenses fall in a narrow range netween Ksh. 212 and Ksh. 262, including the Ksh. 80 per I.E. student*. It is clear that Industrial Education could, in terms of school equipment and supplies, be considerably better off than the other ten or so subjects in the curriculum. However, impressionistic evidence suggests that not all the money earmaeked for I.E. is always spent on I.E. since more pressing claimants for funds - for example, school feeding -- are often present.

4.6 We have to conclude that I.E. is more expensive in terms of school equipment and supplies than other subjects: but, we are unable to quantify the difference. It seems plausible that in terms of teaching costs and equipment and supplies, I.E. is approximately twice as expensive as other subjects.

5) COMPARATIVE CAPITAL COSTS

5.1 To compare the capital costs of various subjects in those schools offering I.E. would require site visits and/or full records of building and other operations at the school. Records of capital facilities at Kenyan secondary schools are incomplete. The last partial survey of government secondary schools took place in the mid-1970's, since when both development and deterioration have taken place. Site visits were not possible in the time available. What is possible is to compare the relative development costs (building and equipping) for various practical subjects in the curriculum. The starting point for estimates of relative development costs is taken as the 1984 estimates of development costs for a variety of subjects under a variety of conditions.

5.2 The relevant capital figure is the costs per place per year. Unfortunately, the quality of data on capital spending and on the life-times of the facilities is often so poor that annualised values are of little help to

*The official position is that from August 1st 1980 (Cicular S/19/1. Vol.III/201) students taking I.E. should contribute Ksh. 40 per year. Together with a Ministry of Education grant of Ksh. 40 per year (under the normal SES grant these should be available under an earmarked I.E. fund). Since the normal audit process is currently (August 1984) three years or more in arrears, the real effect of this change is not assessable.

the decision-maker. There is, anyway, a strong case for giving weight to the total capital spending in a decision, for government capital or development accounts normally allocate block spending figures for various projects or Ministries. However, there is marginal profit from an academic point of view in first scrutinising the effect of varying life-times on the costs of buildings and equipment and then speculating what conditions would have to operate for, say, an unpromising, initial investment to be worthwhile in comparison with other initially more promising investments. The tables which follow are meant to provide the base for just such speculations concerning the relative merits of the various practical subjects. For the sake of comparison, costs of a classroom for 'talk and chalk' are also given.

Table 7B: ANNUALISED VALUES FOR EQUIPMENT UNDER THREE ASSUMPTIONS

Subject	Cost per place for Equipment Ksh.	Cost per place per year for Equipment		
		5 years	10 years	15 years
I.E. METAL	45,000	9000	4500	3000
I.E. WOOD	22,500	4500	2250	1500
I.E. POWER	20,000	4000	2000	1333
I.E. ELECTRICITY	42,500	8500	4250	2833
BUSINESS EDUCATION:				
TYPING/OFFICE PRACTICE	18,575	3715	1857	1238
ACCOUNTING/ COMMERCE	6,000	1200	600	400
AGRICULTURE A	1,250	250	125	83
B	-	-	-	-
HOME MANAGEMENT/ FOOD & NUTRITION	14,000	2800	1400	933
SCIENCE	5,000	1000	500	333

Source: Appendix 1

5.4 Table 7B shows, for instance, that if the life-time of equipment in TYPING/OFFICE PRACTICE were, on average, 5 years, the cost of equipment per place per year of TYPING/OFFICE PRACTICE would exceed that of all subjects listed if their average life-time were 15 years. Another way of reading Table 7B is to say that equipment for I.E. WOOD would have to last for 15 years for its annualised cost to fall below that of TYPING/OFFICE PRACTICE assuming an average 10 years life for that subject.

5.5 A clear fact emerges fro Tables 7A and 7B. Industrial Education is more expensive than other practical subjects in terms of both components of development viz. building and equipping. Compared to Science, Metal Technology is twice as expensive in terms of building costs for one student-place and nine times as expensive in terms of initial equipping per student-place. The huge difference in equipping costs is partly due to the crucial class-size factor and partly to syllabus requirements.

Table 7A: ANNUALISED VALUES FOR BUILDINGS UNDER THREE ASSUMPTIONS

Subject	Cost per place Ksh.	Cost per place per year Ksh.		
		15 years	20 years	25 years
I.E. METAL	27,500	1833	1375	1100
I.E. WOOD	27,500	1833	1375	1100
I.E. POWER	27,500	1833	1375	1100
I.E. ELECTRICITY	27,500	1833	1375	1100
BUSINESS EDUCATION:				
TYPING/OFFICE PRACTICE	10,000	667	500	400
ACCOUNTING/ COMMERCE	6,700	447	335	268
AGRICULTURE A	4,000	267	200	160
B	10,000	667	500	400
HOME MANAGEMENT/ FOOD & NUTRITION	13,750	917	687	550
SCIENCE	13,750	917	687	550
CLASSROOM	5,000	333	250	200

Source: Appendix 1

Note: The two estimates for agriculture are first of all that for a building of the simplest structure using only well-mounted units (A) and the (B) estimate which represents a more permanent structure with fitments.

5.6 A comparison, meaningful in terms of both curriculum and data reliability, can be offered between I.E. and Science. Building costs per place are roughly twice as high in I.E., a fact attributable to the half-size classes operating in I.E. Even under the least favourable conditions for other practical subjects (a life-time of 15 years), the costs per place per year in I.E. under the most favourable conditions of a life-time of 25 years still do not fall to the cost levels of those subjects.

6) COMPARATIVE COSTS OF INSTITUTIONS

6.1 In all countries the higher the level of the education institution and the more technological the institution, the more expensive is the cost of the output per head. For instance, in Kenya, available figures (Appendix 2) show that 85 primary students can be educated annually for one university student, 46 primary students for one student at K.S.T.C. or K.T.T.C., 9 primary students for one at an H.I.T., 5 primary students for each one at a government-aided secondary school.

6.2 Relative Costs of Institutions Offering Technical/ Vocational Programmes

We will now set side by side, as far as they can be assessed with tolerable accuracy, the costs of schools offering I.E., technical schools, H.I.T.'s and Village Polytechnics. The availability of data is very variable as is its quality. The Appendices 3-6 which support Table 8 should be consulted to

ascertain the detailed steps in the calculations. Several important observations can be made about the figures in Table 8. The comparison here is between entire institutions: the costs refer to those in, for instance, schools offering I.E. and are not the costs of Industrial Education itself. It is argued that this is a valid comparison to make since the other institutions also have a range of functions; and parts of the curriculum, at least in Technical Schools and H.I.T.'s, are non-vocational.

We can observe the following:

1 Recurrent unit costs, at Ksh. 4840-Ksh. 5180 in Technical Schools exceed those in schools offering I.E. except for two High Cost Boarding Schools which offer I.E. Two components of the differential between I.E. schools and Technical Schools are hidden by the aggregated data in Table 8. First, the Government grant is approximately Ksh. 360 per head in Technical Schools as against Ksh. 200-260 in I.E. Schools. Similarly, part of the differential is caused by higher spending on Other Emoluments in Technical Schools which range from Ksh. 860 - Ksh. 1140, as against Ksh. 600 - Ksh. 980 in low cost boarding schools offering I.E. (Appendix 3 for Unit Recurrent Costs in Technical Schools).

2 If the special cases of the High Cost Schools are omitted , the range of recurrent costs in I.E. schools narrows to Ksh. 2412 - Ksh. 4690, giving an overall (Recurrent + Capital) unit cost of Ksh. 3417-6955. Thus, even the most expensive I.E. school seems Ksh. 2400 per year less expensive that Technical Schools.

3 The capital cost figure for Harambee Schools in Table 8 omits the building costs - a massive sum, certainly in excess of Ksh. 2000 per year. Therefore, in crude terms an annual cost in an H.I.T. could approach Ksh. 12,600.

Table 8: RELATIVE RECURRENT AND CAPITAL COSTS OF A VARIETY OF INSTITUTIONS OFFERING TECHNICAL AND VOCATIONAL PROGRAMMES. (Ksh. at 1983/84 prices)

Institution	Per Student Recurrent Costs 1983/84 (1)	Estimated Capital Cost per Student per Year		Overall Unit Costs (1) + (2) + (3)
		Building (2)	Equipment (3)	
Schools with I.E.	2412-6936+	420-965*	585-1300*	3417-9201
Technical Schools	4840-5180	4000	360	9200-9540
Harambee Institutes	10,000	n.a.	740	(10740)
Village Polytechnics	3600	<---260--->		3860

All Costs are Gross; that is, no income is deducted.

* The estimates of Capital invested in I.E. schools pertains solely to the capital additions made in the SIDA I.E./T.E. Project. The figures come from Tables 5 and 6.

+ Taken from Table 2

6.3 We can now simplify Table 8 taking into consideration the points 2 and 3 in 6.2.

Table 9: RELATIVE PER CAPITA COSTS IN 1983/84

Institution	Mean Unit Cost Ksh.	Ratio compared to the cheapest (the V.P.)
Village Polytechnic	3830	1
School with I.E.*	5186	1.3
Technical School	9370	2.4
Harambee Institute of Technology	12600	3.3

Naturally, it cannot be assumed that the outputs from all four institutions are substitutable. No great accuracy can be attached to the figures. The ratios are simply indicative of relative orders of magnitude of costs.

7) INDICATORS OF DONOR COSTS OF INDUSTRIAL EDUCATION

7.1 The final section of this report stands back from the detail and sums up the various component elements funded by SIDA. The solid thrust of the project was, of course, building and equipping workshops.

In Table 10, these two items dominate the expenditure from the I.E. budget. Identifying all expenditures by SIDA was not easy. Indeed it was only after the first draft of the Report was submitted that significant items such as the costs of volunteers and of third country training became available from archive material in Stockholm. Part A of the table corresponds largely with records available in Nairobi at the Kenya-SIDA Project Office. Part B has a set of items which were central to the implementation success of the I.E. project but which were formulated as part of other projects or programmes. e.g. the Kabete maintenance unit can be seen as a central part of the Technical Education project, yet it provided services to I.E. as well.

7.2 From the regular reports of the Project it is clear that the contribution of volunteers to the setting up of the workshops was indispensable to the speedy functioning of the workshops. The above analysis indicates that almost one shilling in every five was spent on volunteers. It will be well to pause here to consider the human development costs embedded in projects such as this I.E. programme. No curriculum development happens without teacher development. The success of this I.E project in lanuching all the certficate courses must be partly due to the teachers of I.E. themselves and to back-up they received in the early parts of the programme from the Project team and the volunteers. The total project cost is split almost 50:50 between the tangible outputs - the building and equipment - and the support, mainly in terms of humans, to enable those outputs to flow on time and in the ways necessary for efficient functioning of the project.

7.3 Infrastructure costs, due to building staff houses and installing power to workshops and houses, represent other components which have been successfully limited to less than 5% of overall costs. Nevertheless, the contribution to the Project's success of decently-housed staff cannot be under-

* The "Mean Unit Cost here is the average of the extremes of the range of overall unit costs reported above in 6.2 observation 2. That is $\frac{\text{Ksh. } 3417 + 6955}{2} = 5186$ provides a notional average.

stated. The supply of power has to be seen as an essential curriculum input for the four syllabi of I.E.

7.4 A crude lesson to be drawn from Table 9 by decision-makers, is that if in the future the Government should decide to build or renovate workshops for I.E. the costs of building the actual educational facility could be approximately 22% of the total costs, while equipping the workshops for the present syllabi will be around 18% of the total costs. These estimates assume that the present human inputs are already working to full capacity and that the items under (B) in Table 10 would have to be planned for.

Table 10: SIDA'S EXPENDITURES ON AID TO INDUSTRIAL EDUCATION, in Kshs.

Type of expenditure	KShs.	%	%
A Over I.E. Project Budget			
New/renovated workshops	11,507,000	46.1	22.1
Staff houses at schools	2,200,000	8.8	4.2
Bringing electricity to I.E. workshops	500,000	2.0	1.0
Furniture	856,686	3.4	1.7
Equipment	9,513,191	38.1	18.3
'Professional services' (transport, telephones, etc)	364,844	1.5	0.7
SUB-TOTAL	24,941,721	100.0	48.0
B Over other budgets			
Technical assistance*	(1,776,000)		3.4
Kabete maintenance unit**	(804,000)		1.6
Volunteers***	10,279,000		19.7
Training in Canada for 12 Kenyans***	(2,200,000)		4.2
Staffing I.E. teacher education department at K.S.T.C. 1970-1978***	(12,000,000)		23.1
TOTAL	(52,000,721)		100.0

Notes: Bracketed figures are heavily estimated.

Source: See Appendix 7.

8) CONCLUSION

8.1 Cost studies by themselves can do only a little to guide policy-making. A full portrayal of the outputs, in this case of Industrial Education, including a recognition of indirect benefits arising from the demonstration effect of successful diversified curriculum must be set alongside data on costs. We can list the findings of the cost studies as follows:

1 There is a wide range of unit recurrent costs in Kenyan secondary schools, linked to whether a school has boarding facilities and whether it is "high cost" (in the sense of more lavish facilities).

2 The Industrial Education component of a school's curriculum appears to be about twice as expensive, in terms of unit recurrent costs, as other subjects.

3 Development costs, being building and equipping, are more expensive for I.E. than for other practical subjects in the curriculum. (However, no recent high-specification practical facilities have benn added to Kenyan schools).

4 Considering four types of institution producing outputs within the definition of technical/vocational institutions offering I.E. are more costly (in combined recurrent and development terms) than Village Polytechnics but significantly cheaper than both technical school and Harambee Institutes of Technology.

5 The main thrust of the project - building and equipping workshops - accounted for less than half the total expenditure incurred by DIDA. While technical assistance to the project was kept to a very modest proprtion (3.4%), volunteers cost almost one fifth of the total project sum spent by SIDA.

APPENDIX 1

Comparative Development and Other Costs of Subjects

I INDUSTRIAL EDUCATION

The head of the E.M.U. supplied the following estimates for constructing and equipping I.E facilities at mid-1984 prices:

METAL WORK	(a) Workshop machines	sh. 750,000.00
	(b) Hand tools	sh. 150,000.00
	(c) Workshop building (Ministry of Works design)	sh. 250,000.00
	TOTAL	sh. 1,150,000.00
WOODWORK	(a) Workshop machines	sh. 300,000.00
	(b) Hand tools	sh. 150,000.00
	(c) Workshop building	sh. 250,000.00
	TOTAL	sh. 700,000.00
POWER	(a) Workshop machines	sh. 200,000.00
	(b) Hand tools	sh. 200,000.00
	(c) Workshop building	sh. 250,000.00
	TOTAL	sh. 650,000.00
ELECTRICITY	(a) Electrical measuring instruments	sh. 350,000.00
	(b) Electronic learning system	sh. 350,000.00
	(c) Hand tools	sh. 150,000.00
	(d) Workshop building	sh. 250,000.00
	TOTAL	sh. 1,100,000.00

The estimates for machines and tools are used in Table 7. The cost of building workshops is taken as the more recent Hughes and Polkinghorne figure for science laboratories. See below.

II BUSINESS EDUCATION

The 1984 draft of a Pre-investment study of business education and training in Kenya gives the following data on equipping and running various business education facilities. The study began in 1982 and uses 1981 prices.

A Typing, Office practice: To equipping and supplying initial learning materials for 40 students = Ksh. 558,400

To supplying consumable materials for a class of 40 students = 70,000 Ksh. per year.

B Accounting, commerce and office organisation: To equipping and supplying initial learning materials for 40 students = Ksh. 180,000.

To supplying consumable materials for class of 40 students= Ksh. 30,000 per year.

C A post-school secretarial programme: To equipping for class of 30 students = Ksh. 870,000.

D A post-school accounting programme: To equipping for class of 30 students = Ksh. 300,000.

The estimates for capital equipping for A and B above are included in Table 7, adjusted for price increases for 10% per year for 3 years to bring the estimates to 1984 prices.

Building costs for the business education programme are estimates supplied by the Ministry of Education (Development Section).

III AGRICULTURE

The Inspector for Agriculture supplied estimates marked 'A' in Table 7. The current philosophy for agriculture in schools is that it should be done without machines: hence the figure of 50,000 Ksh. for the minimum simple hand tools. The building cost 'A' estimate is for building the simplest structure with only wall-mounted benches.

For both Business Studies and Agriculture there has been no recent investment in facilities. In Agriculture the last Government project to provide new facilities was 1977/78. There is in the estimates a measure of "shooting in the dark".

IV HOME MANAGEMENT

Again, there are no recent new projects and the additional complications of the variety of existing facilities. The buildings cost is that for a science laboratory (see below SCIENCE). The equipment cost of 560,000 Ksh. was taken from a priced list of articles devised by the senior inspector of schools for home economics.

V SCIENCE

The Ministry of Education is currently preparing a request for donor aid for building new science laboratories at some 50 schools. A local firm of architect/planners, Hughes and Polkinghorne, have done site inspections. The figure of 550,000 Ksh. represents the 1984 cost of building and fitting out (but not equipping) a single laboratory in an area near Nairobi. Appropriate geographical adjsustment factors would need to be made for schools distant from the capital. The estimate for equipping represents the cost of providing the non-consumable items for teaching present syllabi.

APPENDIX 2

Per Capita Cost of Educating a Student in 1978/9 with Per Capita Cost at Primary School Level as the Base

Institution	Cost Ksh. Per Annum	Ratio Compared to Per Capita Cost at Primary
PRIMARY	540	1
SECONDARY (Aided)	2640	4.9
PRIMARY TEACHER TRAINING COLLEGE	9780	18.1
HARAMBEE INSTITUTE OF TECHNOLOGY	4600	8.5
KENYA TECHNICAL TEACHERS COLLEGE AND KENYA SCIENCE TEACHERS COLLEGE	24760	45.9
KENYATTA UNIVERSITY COLLEGE	36920	68.4
UNIVERSITY OF NAIROBI	45840	84.9

Source: General Problems of Financing Education and Training. Ministry of Economic Planning. March 1982.

APPENDIX 3

Unit Recurrent Expenditures for Four Secondary Technical Schools in 1983 and 1984

	Schools			
	Kabete	Machakos	Rift Valley	Singalagala
	1983	1983	1984	1984
Expenditure Items	Ksh.	Ksh.	Ksh.	Ksh.
TEACHERS' SALARIES AND ALLOWANCES	2152	2306	2578	2124
OTHER EMOLUMENTS	854	986	892	1140
TUITION EXPENSES	362	364	366	364
BOARDING EXPENSES	800	800	800	800
ALL NON-TEACHER ITEMS	2706	2674	2574	3048
TOTAL GROSS EXPENDITURE	4856	4980	5152	5172
NET EXPENDITURE	3212	3556	3756	3736

Sources: 1 Teachers' Salaries are estimated from the mean on-cost of a teacher of Ksh. 39600 per annum together with the establishment figure for each school.

2 Allowances are added at 6% gross salaries.

3. For all other items the source is the Final Estimates of Expenditure Part B: Financial Summary.

4 Enrolments are the official Ministry of Education figures.

Note: Grants and salary scales have not altered since 1980.

APPENDIX 4

Estimated Development Costs in Technical Schools in 1984

1 Expenditure on building, furniture, professional services at Kitale Technical School as at July 31st 1984 = Ksh. 46,128,000[+]

2 Expenditure on equipment at Kitale Technical School as at July 31st 1984 = Ksh. 2,096,000[+]

The cost per place in Kitale Technical School has to relate to a planned enrolment of 576.

Therefore, Cost of building, etc. = Ksh. 80,100 per student-place
and Cost of equipping = Ksh. 3,640 per student-place
(More equipment is in the pipeline).

Commitments[+] at July 31st 1984 show a figure of Ksh. 2,385,000. Assuming some 2 million Ksh. are for equipment, a more realistic estimate of the equipping cost is double that shown, say, Ksh. 7300.

Assuming a life-time of 20 years for the buildings and 10 years for the equipment, it follows that:

Building cost per student-place per year = Ksh. 4005

Equipping cost per student-place per year = Ksh. 365

These costs are used as imputed capital figures for the technical schools generally since no other data exists for fresh development of technical schools.

[+]The source of these figures is the Kitale Technical School SIDA Project Account. Trial Balance as at July 31st 1984.

APPENDIX 5

Costs and Finance of Harambee Institutes of Technology

Source of Funds

1 Production Units, for example, Kiambu Ksh. 1.5m net profit.

2 Land, from community, (generally a free gift).

3 Equipment (A) Donors, for example, USAID Ksh. 5m.
(B) GOK.

4 Grants: Ksh. 2800 per student per year.

5 Fees: Average Ksh. 3000 each.

6 Teachers from T.S.C.: 156 teachers.

7 Levy Fund from D.I.T.: Ksh. 2.9m given to 9 Institutes in 1983.

8 Harambee efforts.

Estimate of Cost per Student

1 Teachers from T.S.C. 156 x mean teacher cost = Ksh. 156 x 40000 = Ksh. 6,240,000.

2 Grants = Enrolment x Grant per student = 2200 x Ksh. 2800 = Ksh. 8,160,000

3 Fees = Enrolment x mean fee per student = 2200 x Ksh. 3000 = Ksh. 6,600,000

4 Levy Fund = Ksh. 2,900,000

Estimated TOTAL RECURRENT EXPENDITURE = Ksh. 21, 900,000

$$\text{Recurrent Cost per Student} = \frac{\text{TOTAL RECURRENT EXPENDITURE}}{\text{ENROLMENT}}$$

$$= \frac{\text{Ksh. } 21{,}900{,}000}{2200} = \text{Ksh. } 9955$$

Equipment supplied estimated at Ksh. 2 million each College

TOTAL INVESTED IN EQUIPMENT = Ksh. 28 million
ASSUME EQUIPMENT LIFE OF 15 YEARS = Ksh. 1.86 million per year
or ASSUMING 2500 STUDENT-PLACES = Ksh. 740 per student per year

OVERALL recurring and annualised capital cost per student
= Ksh. 10740

Source: Interviews with Messrs. Arap Soi SEO (H.I.T.'s)
Mwangi EO (H.I.T.'s)
Njorge EO (H.I.T.'s)

August 29th 1984 to obtain figures for Funding.

Note: No estimate is included for value of buildings.

APPENDIX 6

Costs and Finance of Village Poytechnics

Main Sources of Funds for Village Polytechnics:

1 Community

2 Grants from G.O.K.

3 Donor Aid - loans/grants
volunteers/specialists

4 Fees

Cost per trainee 1980/81:			Ksh. (millions)
1	Government expenditures including administration		32.619
2	Expenditures from fees : 2200 students @ Ksh. 400 each*		8.800
3	Danida evaluation mission's judgement that Government's contribution meets about half the running costs		32.619
4	Donor aid	1 Danida's funding of tools	3.500*
		2 Service of volunteers. Imputed value of 50 volunteers*	(1.000)

(Estimated) TOTAL RECURRENT EXPENDITURE (Ksh. 78.538 m.)

Therefore RECUUERNT COST PER TRAINEE = (Ksh. 3750)

CAPITAL

Estimated net capital invested is Ksh. 400,000* per V.P.

Assuming roughly 250 V.P.'s,

TOTAL CAPITAL INVESTED = Ksh. 100 million.

Assuming a life-time of 15 years,

Annualised capital = Ksh. 6.6 million

CAPITAL INVESTED PER TRAINEE = Ksh. 260

Therefore Overall Recurring and Annualised capital per student = Ksh. 3830

*Main data source for these estimates is Village Polytechnic Programme in Kenya: An evaluation carried out by Danida, June 1981.

APPENDIX 7

SIDA Industrial Education Cost Summary

		Ksh.
A	Over I.E. Budget	
	Building Costs - New workshops, renovations	11,507,000[1]
	- Infrastructure, staff houses	2,200,000[2]
	electricity	500,000[3]
	Furniture	856,686[4]
	Equipment	9,513,191[4]
	Professional services	364,844[4]
	SUB TOTAL	24,941,721
B	Over Other Budgets	
	Technical assistance	1,776,000[5]
	Kabete maintenance unit	804,000[6]
	Volunteers	10,279,000[7]
	Training in Canada for 12 Kenyans	2,200,000[7]
	Staffing I.E. teacher education department at K.S.T.C. 1970-1978	12,000,000[7]
	TOTAL	52,000,721

Sources: 1 Progress Report 1980 para 2.44.

2 22 houses provided at a mean cost of Ksh. 100,000 in 1981 prices.

3 The residual between statement in Trial Balance of I.E. project as at May 31st 1984 (14,207,009.20) and the sum of estimates 1 and 2.

4 Trial Balance of I.E project as at May 31st 1984.

5 The 'technical assistance' component is based on the 1982 Project Status Report for Industrial Education and Technical Education combined. The accrued staffing costs were SKr. 8,035,000 or Kshs. 13.66 Million. 13% of this sum is allocated to I.E. on the assumption that the technical assistance component for I.E. was a similar proportion of staffing cost as the I.E. Project as a whole was of the combined I.E. and technical education project.

6 13% (see note above) of estimated expenditures for the Maintenance Unit as a whole. Estimate in 1981 prices. Source of base figures: The Director of the Unit.

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S-105 25 STOCKHOLM

ISBN 91 586 7056 - 4