CONTENTS

Editorial

EDITORIAL

This twelfth issue of the annual, Journal of Technical and Vocational Education, is in your hands in a new look to match with the objectives of this periodical and also with the new status of being subscribed journal. From the thirteenth issue of 1996 this will become a referred journal in the sense the contributions will be referred to an identified expert in the subject before publication. Even that reference is only after the editor's consideration for relevance, quality, originality and practical application.

A perusal for this and a few earlier issues will point out the enthusiasm exhibited by teachers from Nigeria, that too from only one polytechnic. While appreciating their efforts in this direction the editors appeal to the much larger readership to come forward to publish their ideas, experiences, research work and practising schemes for the benefit of the rest of the readers. Of the four TTTI's only two TTTI's are represented in this issue; the other TTTI's and a large number of subscribing polytechnics are expected to extend their professional experiences throughout the developing world at least from the next issue.

Nigerian experiences in technology education form the major part of this issue. Okeke lists the impediments and makes a series of recommendations to remove them. Njaka comes out with the MOSAI scheme and its implementation. Ogbuka lists their problems and relate them to a developing economy. Mrs. Ikeagu proposes a cooperative teaching approach in Home Economics; Mrs. Afugbuom's study on the management of in service sandwich programmes is another contribution to improve technical and vocational education. Benjamin's mathematical interest is continued from the previous issue; Odunuke presents an appraisal of 6-3-3-4 system with reference to technical vocational education in Nigeria; Ebonine suggests permanent solutions to student unrest. These different facets of Nigerian technical\vocational education may be common to many developing countries which this forum welcomes for pooling the information.

The Indian technical teacher educators discuss at least three problems in this issue. Srinivasan's PRESS is conceptual encouragement for researcher groups; Menon and Dutt illustrate concept mapping in continuing technical education programmes; Mittal and Anand make a series of general and specific recommendations for a database in improving the curricula of technical and vocational education.

Thanks to experts like Dr. A. Dyankov this journal has now reached a stage of recognition in developing countries. The loss of Dr. Wolansky deprived this journal of a source for generation of contributors.

Proposals are welcome for preparing panels of experts to function as referees to consider the contributions received.

The last date for receipt of contributions to the next issue No.13 of 1996 is 31 May 1996.

— *EDITOR.*

IMPEDIMENTS OF EFFECTIVE ACQUISITION OF TECHNOLOGY EDUCATION IN NIGERIA

S.I. OKEKE

ABSTRACT

Technology (Technical) Education was introduced into the Nigerian educational system through the 1980 National Policy on Education (NPE). Among other things, this is aimed at giving training and imparting the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.

Despite its lofty objectives, Technology (technical and vocational) Education in Nigeria is bedevilled by myriads of problems. Many bottlenecks therefore act interwovenly to impede effective teaching and learning of technology education in Nigeria. These impediments traverse through administrative, economic and societal spheres. Prominent amongst these impediments are starvation of institutions of funds by governments, inadequate provision of infrastructures, poor leadership, and political instability, misplaced priority, non-motivation of indigenous technology and publication, corruption, reliance on imported technology with dearth of accessory technical know-how etc.

Appropriate recommendations are made to enhance the effective teaching and learning of Technology Education in Nigeria for the full realization of its objectives.

INTRODUCTION

Technology Education, which is synonymous with technical and vocational education, is the type of education geared towards the production of individuals who can use their hands for the enhancement of their standard of living and for the development of the entire society. It produces a total individual who can be self-reliant and self-sustained without searching for white collar jobs that are rarely there. Technology education therefore produces "job creators" rather than "job seekers".

Technology education and therefore technical and vocational education is the type of training intended to prepare a person to earn a living in an occupation in which success is dependent largely upon technical information and understanding of the laws of science and principles of technology as applied to modern design, production, distribution and service (Osuala, 1981). Hence technology education

produces a person who inspite of economic depression and massive unemployment can still make both ends meet. According to Osuala (1985) the acquisition of Technology Education helps an individual to make good adjustments and to facilitate smooth functioning of the economy through the effective acquisition of practical skills.

No matter now it is expressed, technology education still pin-points to the training of an individual in skills where his inherent capabilities and ingenuities are harnessed for self-reliance and economic enhancement.

However, in Nigeria, technological skills are acquired at trade centres, technical colleges, conventional colleges, commercial colleges, schools of fashion and designing, institutes of hotel and catering, colleges of education (technical), Polytechnics, Universities and Universities of Technology, etc. The graduates of these educational institutions make a living by practicalizing the acquired skills.

Technology Education demands practical exercises achieved using various instructional materials in the form of equipment and gadgets. But it is unfortunate to observe here that effective teaching and learning of technology education in Nigeria is marred by complicated and interwoven sets of problems. It is the aim of this discourse to highlight some of the problems militating against effective teaching and learning of technology education in Nigeria. These problems may be administrative and economic in nature and as a result of the decaying societal norms in Nigeria. Some strategies to be employed for possible amelioration of the situation are equally proferred in this paper.

IMPEDIMENTS TO EFFECTIVE TECHNOLOGY EDUCATION IN NIGERIA

A number of bottlenecks impede the effective and successful acquisition of technological skills in Nigeria. In this paper, attention will be focussed on the major impediments to effective teaching and learning of technology education in Nigeria.

POOR FUNDING OF SCHOOLS

Technology Education is widely recognised as a pivot for technological development but regrettably it attracts low priority in Nigeria. This type of education requires a large quantity of instructional materials, both hard and soft wares, most of which are expensive to procure. Thus technology education is an expensive venture in view of the immense human and material resources needed for its effective implementation. But since the take over of schools from private individuals, voluntary agencies and missionaries in 1970 by the government, schools are being starved of funds to provide necessary inputs for effective acquisition of technological and vocational skills. There is often low budgetary allocation to the educational sector and such allocations are at times diverted to other projects by the governments. Colleges are starved of the equipment for Introductory Technology introduced in the 6-3-3-4 educational system. The School of Applied Science and Engineering Technology of the Federal Polytechnic (formerly Anambra State Polytechnic), Oko, for example, has found it totally impossible to accredit a single programme (Table 1) because the successive Anambra State Governments persistently starved the Polytechnic of fund. The situation does not create the enabling

2

environment to impart the right technological skills to the students.

INADEAQUATE INFRASTRUCTURE

Corollary to the above, is the problem of insufficient availability of infrastructural facilities in the form of classrooms/lecture halls and seats, laboratories, studios and workshops, office accommodation for teachers etc. There is bound to be poor acquisition of skills where microscopes cannot go round the students, or where students are required to provide their own typewriters during such lessons. It is pathetic to see students perching on windows and hanging outside the lecture rooms while lectures are going on. Where the essential facilities are not provided owing to poor funding and administrative indiscipline, proper acquisition of technological skills will be impeded.

POOR QUALITY OF LEADERSHIP AND POLITICAL INSTABILITY

It is a known fact that most of the problems with Nigeria as a nation hinge on the leadership and political atmosphere.

The type of leadership a country has affects the pursuance and implementation of programmes for the generality of the citizens. Also, where governments are frequently changed, the programmes of the previous government are bound to be abruptly terminated by the succeeding government. Nigeria is endowed with important resources, both human and material resources for it to have developed in all spheres of life but according to Okigbo (1986) the promise held by Nigeria could only be realized if the outstanding endowments of resources were matched by an equally outstanding endowment of leadership. Since independence, Nigeria has witnessed the leadership of not less than ten heads of state with incessant coups d'etat. As a result of the

prevelance of political instability and uncertainty, each successive leadership directs its attention and available resources to security to the utter disregard of other essential services of the state including education. Consequently the materials for technological education are not easily provided.

MISPLACED PRIORITY

Our governments and educational administrators seem not to have an appropriate sense of direction as regards the importance of technology education to the economic and technological development of the country. They disregard adequate funding of technology education which is a sine qua non for our national development, and which prepares one for self-employment (Okeke, 1993). Money is often pumped into the equipment of management and communication programmes while de-emphasizing technology programmes which are highly needed by Nigerians today. In the Federal Polytechnic, Oko, for instance, almost all the programmes in the schools of Business Studies and Information Technology are fully accredited to HND status while all programmes in the School of Applied Sciences and Engineering Technology (which is the core of the Polytechnic) are yet to be accredited even at OND level (Table 1) as at the time of this survey. It is regrettable to observe from Table 1 that the only course in the School of Business Studies, that is Hotel and Catering Management, which is basically for skill acquisition and for self-employment, is not accredited at all. The simple reason is that not much fund is usually made available by government for the equipment of the necessary workshops for acquisition of technological skills and the little funds that trickle in are used in ensuring the full accreditation of Management and Financial Programmes. This is a mark of misplaced priority in our educational pursuit.

Table 1 : Programmes offered in the various schools of the Federal Polytechnic, Oko and their accreditation status.

SCHOOL AND PROGRAMMES		OND	HND
A. School of Business Studies:			
1.	Accountancy	Accredited	Accredited
2.	Banking/Finance	,,	,,
3.	Business Administration	,,	,,
4.	Marketing	,,	,,
5.	Secretarial studies	,,	,,
6.	Hotel & Catering Management	,,	,,
B. School of Information Technology			
1.	Library Science	Accredited	Accredited
2.	Mass Communication	,,	,,
3.	Printing Technology	Newly Introduced	
C. School of Applied Sciences and Engineering Technology			
1.	Civil Engineering Technology	Not Accredited	Not Accredited
2.	Electrical/Electronic Engineering Technology	,,	,,
3.	Mechanical Production Engineering Technology	Not Accredited	Not Accredited
4.	Agric. Processing & Farm Mechanization Engineering	,,	,,
5.	Food Science and Food Eng. Tech.	,,	,,
6.	Science Technology	,,	,,
7.	Soil Conservation, Irrigation and Land Drainage Engineering Technology	,,	,,
8.	Computer and Statistics	,,	,,
D. School of Environmental Design and Technology			
1.	Architecture	Accredited	Not Accredited
2.	Building Technology	,,	,,
3.	Estate Management	,,	,,
4.	Quantity surveying	,,	,,
5.	Town & Regional Planning	,,	,,
6.	Land Surveying	Not accredited	,,
7.	Fine and Applied Arts	,,	,,

NON-MOTIVATION OF INDIGENOUS TECHNOLOGY AND PUBLICATION

Nigeria is a country where a talent is never recognized and motivated. Nigerians with ingenious potentialities are not aided by governments, industries and agencies. Nigeria is endowed with various human resources for the development of appropriate indigenous technology that can be effectively employed for the enhancement of technological education in the country. For quicker technological development and indigenous fabrication of equipment relevant to technology education, governments and industries should identify specific technological problems and mandate indigenous scientists, engineers and technologists to provide solutions to such problems by making funds available. Many Nigerians are known to have invented one thing or the other (Table 2) but these inventors are not motivated for improvement and diversification of their inventions. It is axiomatic to state here that with the present diminishing revenue of Nigeria, continued dependance on imported materials for technological education will totally negate the lofty aims of this form of education.

Table 2 : Catalogue of some Nigerian inventors and their inventions (Adapted from: Opubo Daminabo, 1990, National Concord, August 10, P.7)

S.No.	INVENTOR	INVENTION	DATE OF INVENTION
1.	G.K. Daniel Kallio	Malloquine, an anti-malaria drug	1968
2.	Israel Egbufor	Nigeria's Solar energy driven car	Early Eighties
3.	Akpan Ekpo	a. First Nigerian palm wine pasturizer	
		b. EPOMILL, a complex machine that processes various finished products from palm produce	1978
4.	Prof. M.I. Ige and E.U. Odigboh	Independently fabricated melon (egusi) shelling machines	Late Seventies
5.	Tahana Botkwa	a. Acha Processing machine	1977
		b. Portable combined Harvester	1978
6.	Paul Mbamali	Thirty Kilometer per hour farm motor-car called 'Pauline'. It does not use batteries but uses motor-cycle tires	Early Eighties
7.	Prof. A.N. Njoku-Obi	Anti-Cholera Vaccine	Early Seventies
8.	Prof. Samuel Odoyemi	a. Discovered how to effectively tap non-alcoholic juice from both oil and raphia palms	1983
		b. Discovered how to make good quality paper from raphia palm	1985

Publication is presently very expensive in Nigeria such that most intellectuals and academics cannot easily embark on publication of texts relevant to effective teaching and learning of technological education. People wishing to publish are not only financially handicapped but also deterred by the harsh conditions imposed by publishers as well as the prevalence of piracy. Technology education not only requires hard and soft wares but also essential books and other prints.

CORRUPTION/INDISCIPLINE

Corruption and general indiscipline are the two problems which have slowed down the pace of development in Nigeria. Corruption indeed rears its ugly head in virtually all facets of the nation's life and therefore education is not an exception.

Corruption and other crimes manifest themselves in the forms of embezzlement of public funds and illegal transfer of project funds into personal use. The embezzlement of public funds by educational administrators is totally counter-productive and negates the lofty objectives of improved and qualitative technology education. This act hampers adequate provision of instructional materials in institutions for technological education.

RELIANCE ON IMPORTED TECHNOLOGY

With the neglect of the development of indigenous technology and with the disregard of indigenous invention, Nigeria relies on the importation of equipment for technology education. These foreign equipment and gadgets are usually imported at exorbitant prices thereby draining the little revenue allocated to education. As a result of the high costs of these materials many institutions are unable to procure them for effective skill acquisition.

LACK OF TECHNICAL KNOW-HOW

Where such equipments are procured, there is often the dearth of trained personnel to install and maintain them. The lack of technical know-how is one major factor responsible for the abandonment of machines procured for Introductory Technology to the mercy of weather vagaries in many secondary schools in Nigeria. Most of these imported materials are fabricated under environmental specifications of the maker countries such that our tropical weather conditions affect their function and performance. It is common in our educational institutions to observe abandoned machinery, microscopes, typewriters etc. because there is no trained personnel to put them in good order.

Consequently before the full realization of the objectives of technology education, there should be the local production of instructional materials and with necessary trained personnel to service the devices.

RECOMMENDATIONS

In view of the importance of technology education in the present Nigeria and in view of the enormity of problems facing this type of education in Nigeria, the following are preferred as immediate and long term solutions to the enormous problems facing this type of education in the country. When these are implemented, there is bound to be the enhancement of the teaching and learning of technology education in Nigeria.

1. The Federal Government of Nigeria should utilize the gains of the Structural Adjustment Programme (SAP) and our oil revenue (now that it is at least correctly priced) to adequately

equip all levels of our education for effective acquisition of technological skill by Nigerians.

2. Government and Industries should adequately fund researches into the production and fabrication of specific instructional materials and gadgets as means of reducing dependence on importation.

3. Efforts should be made to gather known local inventors, scientists, technologists, craftsmen and professionals and charge them with particular educational needs such as the development of specific teaching aids through the indepth study of imported gadgets with the motive of modifying same to the forms adaptable to our weather conditions. We may, therefore, encourage innovations in technology in Nigeria.

4. Governments, industries, agencies, banks and wealthy individuals should encourage writers for the publication of local books and publishers themselves should be made to change the obnoxious conditions often imposed on writers. These will obviously motivate academics into publishing necessary texts in various areas of our education.

5. Nigerian should be enlightened to embrace patriotism and eschew all forms of corruption, indiscipline and other vices and de-emphasize material wealth as the ultimate for one's existence so that funds ear-marked for educational projects are not misappropriated by those at the helm of affairs.

6. Industries, banks and multi-national companies should by legislation be mandated to contribute a specified percentage of their annual profits for the development of education particularly technology education in Nigeria. This money could be lodged into what may be called the National Technology Education Development Endowment Fund (TEDEF) with

an instituted reputable Technology Education Development Endowment Fund Committee for disbursement to deserving educational institutions. This committee should be made of educationists of proven integrity and with undented career.

CONCLUSION

Now that the country is passing through economic quagmire it is not an exaggeration to note that technology education is necessary to salvage the prevailing massive unemployment in the country. In Nigeria today, people who have relevant practical (technological) skills are actually those who are gainfully employed with attractive remuneration. Thus, adequate infrastructural facilities and equipment need to be provided for effective implementation of the objectives of technological and vocational education. Nigeria has the economic powers to transform her schools into enviable citadels of education and technology. With this in mind, it is obvious that our saviour from economic doldrums and massive unemployment is what we can do with our hands. Therefore the prime objective of the leadership and those at the helm of affairs in schools should be to fund adequately institutions and programmes that are our educational priority, the effective teaching and learning of technology education in Nigeria will continue to be impeded by myriads of problems.

With the political instability prevailing in the country which more or less distracts the attention of the leadership towards the provision of a sustainable educational standard for the citizens, other sources of assistance must be sought if Nigeria must develop technologically. Consequently, in the present political dispensation, the funding of education in Nigeria, particularly the acquisition of technical skills, must be given a multi-organizational

approach (Okeke, 1994). This seeks the active participation of banks, industries, multi-national companies, wealthy individuals, philanthropic organizations, trade unions, alumni associations, parents/teachers' associations etc in the funding of education in Nigeria. The survival of education and in fact technology education in Nigeria therefore rests squarely on the involvement of these bodies in the provision of necessary funds and inputs. All hands must be on deck in the efforts to solve the myriads of problems facing skill acquisition in Nigeria.

REFERENCES

FEDERAL GOVERNMENT OF NIGERIA (1981) **National Policy on Education** Lagos, Government Press.

OKEKE, S.I. (1993) Vocational Education in Nigeria: A programme for Lucrative Employment in a Depressed Economy. **Journal of Technical & Vocational Education** Madras, 10.

OKEKE, S.I. (1994) The funding of Technical and Vocational Education in a depressed Economy: A Clarion Call for Multi-organizational Participation. **Journal of Technical & Vocational Education** Madras, 11

OKIGBO, P.N. (1986) Sorcerers, Astrologers and Nigerian Economic Recovery. Annual Distinguished Lecture, National Institute for Policy and Strategic Studies, Kuru, near Jos, Nigeria.

OPUBO, D. (1990) Of Inventors and Frustration (2) **National Concord Newspaper,** Friday, August 10,

OSULA, E.C. (1981). **A Manual of Vocational Technical Education** Calabar, Centaur Press Ltd.

OSUALA, E.C. (1985) **Vocational Guidance for Nigerian Schools,** India, ANU Books.

THE MOSAI SCHEME AND NIGERIA'S NEW NATIONAL POLICY ON EDUCATION

C.E. NJAKA

ABSTRACT

One of the cardinal objectives of the new National Policy on Education of the Federal Government of Nigeria was its emphasis on education for self-reliance. It was in keeping with this objective that caused the establishment of MOSAI scheme by the former Anambra State government. The scheme was aimed at complimenting the efforts of the federal government into achieving this objective.
This article presents the concept, the objectives and the modalities for the implementation of the MOSAI scheme, among other aspects of the scheme. It also emphasized the impact the scheme had on the pupils, students and the citizens of state, and noted the remarkable achievements it made within the short period it existed as a major reason to uphold it.

INTRODUCTION

Nigeria was for many years a British Colony. And throughout the period of colonial rule, there was no evidence of the existence of any defined national policy on education. But for several years after her independence the system of education Nigeria inherited from Britain continued to dominate its educational practice, even when such education no longer served the needs of the country. It is, perhaps, the public disenchantment to the education practice that initiated the holding of a national curriculum conference in 1969, which subsequently adopted a National Policy on Education in 1977 by the Federal Government of Nigeria. The new national policy stipulated a six-year primary course, three-year junior secondary, three-year senior secondary and four-year degree course.

The overall idea of the policy was to make the school system more relevant to the socio-economic and cultural realities of the Nigerian situation, thereby producing versatile and self-reliant children with appropriate employment skills. The policy emphasized technical as well as vocational subjects at both the junior and senior secondary school levels. The policy became operational in 1982, but not in all the states of the federation.

In the former Anambra State of Nigeria (now Anambra and Enugu States), the policy became operational in 1982, but it was not until about 1987, that the State Ministry of Education formally rationalized its secondary schools, and

phased out some of its Teacher Training Colleges (TTC's) in line with the full implementation of the policy. In its rationalization exercise, some secondary schools were pegged down to junior and senior secondary schools, or to merely junior secondary schools. Of the nineteen (19) phased out Teacher Training Colleges, some were converted to senior and junior secondary schools, while some were converted to vocational schools to be called "Community Skills Centres" for the training of people in various skills. Five of the phased-out Teacher Training Colleges were selected to run special Science Schools, and the remaining ones to be used as Remedial Schools designed to improve on the difficulties of students seeking admission into higher institutions.

Furthermore, the two Teacher Training Colleges left to operate were restructured to educate and train the necessary cadres of technical and vocational teachers needed for the effective implementation of the new education policy. In addition to the products of these two teacher's colleges, more technical teachers were recruited, and workshops/seminars conducted for the existing science and technical/vocational teachers to update their knowledge of the latest developments in their respective fields.

THE MOSAI SCHEME

The above was the state of affairs in the former Anambra State (now Anambra and Enugu States), and probably in the other states of the federation, in which the new national policy on education became operational in 1982. According to available records, the state had produced about five batches of junior and senior secondary school graduates under the new policy, but there was no evidence to indicate that the graduates of these schools actually acquired the technical/vocational skills expected of them. Even after the rationalization of the schools, there was no evidence of any improvement on the part of the graduates. It was this sorry state of affairs, that induced the then Anambra State government into introducing the MOSAI scheme, aimed at complementing the efforts of the Federal government. The scheme was launched on June 22, 1989 by the then Military governor of the state.

THE CONCEPT OF MOSAI

The acronym MOSAI stands for Mobilization of Schools for Agriculture and Industry. MOSAI according to the 1989 government blue print on the scheme was a movement in education which emphasized vocation, science and technology in the school curriculum with strong production bias. It was designed to emphasize "career" oriented education rather than white-collar-job, aimed at making education more functional and relevant to the needs and problems of the state in particular and Nigeria in general.

The scheme called for a complete change of attitude towards practical education, unalloyed commitment to production of goods and services as part of the school curricula. It was to promote an appropriate combination of the use of heads, hands, and hearts thereby constituting a challenge to a teacher's innovative capability. What was really peculiar about MOSAI was that it complemented one of the cardinal objectives of the National Policy on Education which emphasized education for self-reliance. It was meant to inculcate the rudiments of agriculture, local crafts and applied technology in processing household materials.

THE OBJECTIVES OF MOSAI

The scheme was set up with the following objectives;

i) The acquisition of technical skills by pupils and students using local resources to achieve relevant and functional education.

ii) The active participation of would-be graduates at all levels of education in the state agrarian and industrial revolution with joy and sense of fulfilment.

iii) The facilitation and sustenance of economic recovery and growth through increased agricultural and industrial output, employment generation and practical application of the schools curricula.

iv) The involvement of pupils, students, and teachers at all levels of education in the state in discovering and tapping hitherto reglected agricultural and industrial potentialities existing in their schools.

v) The achievement of healthy school environment through efficient use of waste matter for agricultural purposes; and

vi) The achievement of a success level that will make the state "Japan" of Africa by the year 2000 AD.

THE MODALITIES FOR THE IMPLEMENTATION OF THE SCHEME

For the scheme to achieve the above objectives, Thursday, everyweek was set aside as Practical Education Day (PED). This was to enable the pupils, students, teachers and non-tutorial staff in all the schools in the state to participate in the MOSAI scheme. On this day all educational institutions will be engaged in the production of goods and services only. The major emphasis will be on agricultural activities. At the end of every Thursday every school would record its achievements in concrete terms.

Each teacher in the primary school must keep a record of the weekly Practical Education activities of his/her class. In the secondary schools, each senior staff of the schools must keep a similar record for a group of students assigned to him for Practical Education. All agricultural science and technical teachers must keep accurate records of performance in their various specialized fields. These records shall be inspected from time to time by Central Practical Education Committee, or its representative.

IMPLEMENTATION COMMITTEES OF MOSAI SCHEME

There were three Practical Education Committees set up to ensure the successful implementation of the scheme, Central Practical Education Committee (CPEC) at the state level, Zonal Practical Education Committed (ZPEC) at the local government level, and school Practical Education Committee (SPEC) at the School level. The Central Practical Education Committee was charged with the overall implementation of the scheme, and was mandated to coopt members as the need arose. The Zonal Practical Education Committee was to coordinate and monitor the implementation of the scheme at the local government level.

It was the responsibility of this committee to:

i) monitor the scheme and pool together the successes and problems of the implementation; process them and give feedback to the Practical Education Committee for information and further improvement.

ii) promote positive attitude and strong commitment to the scheme.

iii) organize zonal competition on the scheme; and

iv) hold bi-monthly meetings to process the inputs from various centres and make reports to Central Practical Education Committee.

The School Practical Education Committee at each school had the following functions:

i) Location of good arable land and obtaining of such land.

ii) Suggesting the crops to be grown and animals to be reared.

iii) Advising on the industrial activities of the school.

iv) Keeping records of successes and problems and transmitting the same in writing to Zonal Practical Education Committee and Central Practical Education Committee.

v) Holding monthly meetings to review, reflect on, replan or strengthen the strategies of operations.

vi) Managing the income and expenditure on MOSAI; and

vii) Giving annual report of the results of the MOSAI scheme of the schools.

MOTIVATION FOR ACTIVE PARTICIPATION IN MOSAI SCHEME

As a form of incentives to schools and pupils/students that participated actively in the MOSAI scheme, the state government stipulated the following prizes and awards to be won at the end of each school year. The prizes and awards included:

i) a special allocation of fund set aside for the establishment of a processing/preservation facility for the most productive school farms. This facility will be owned and commercially run by the school as the core of its cottage industry.

ii) provision of a van for the best school farms that are twenty hectares or more in the first year of the introduction of the scheme.

iii) provision of a van for the best school farms both in hectarage and production

iv) cash grants for further expansion of school farms that are twenty hectares or more in the first year of the introduction of the scheme.

v) scholarships given at primary and secondary levels as well as the vocational training centres for selected farmers of the year.

vi) automatic employment given to the best farmers at the tertiary school level.

In addition to the above prizes and awards, the proceeds realized from practical education belong to the respective schools which shall be in complete control, and free to manage the revenue accruable from it, without external interference. The end of the school year will be celebrated happily with a feast during which the school community enjoys its annual harvests and successes.

Finally, an unspecified severe penalty awaited deliquent headmaster/principal who refused to adopt the innovation in the curriculum as introduced in the scheme.

THE IMPACT OF THE SCHEME

Soon after the scheme was launched in June 1989, the state-owned radio station came out with a very powerful jingle highlighting the importance of the scheme to the agricultural and technological development of the state. The radio jingle described the MOSAI scheme as "a campaign to mobilize schools for agriculture and industry, to yield food in abundance and to teach our children to use their hands. All schools and communities must support the programme". This radio jingle, in addition to other state-owned information networks worked relentlessly to publicize the scheme throughout the nooks and cranies of the state and beyond. The radio jingle particularly was able to accomplish the task of publicising the scheme because it was relayed at the beginning and end of every major news bulletin of the radio station.

And again because the radio station was received in over three-quarters of the states of the federation.

Within the short period the scheme existed, the impact was felt throughout the state and beyond. This was brought to light by reports of some of the Principals, Headmasters and Community leaders from the various parts of the state. In one such 1990 report, Mr. Madubuko, principal of one of the secondary schools in the state, described MOSAI as "the highest thing that has happened to the people of the state in terms of creativity, manual operation and self reliance". Another secondary school principal Mr. Okeke in his own report, observed that "MOSAI the newly introduced programme by the state government is gaining ground among the school children. We have advanced beyond the mobilization stage, we are happy to announce our adulthood in the programme aimed at making Anambra State - the "Japan" of Africa".

Furthermore, Mr. Eke, Principal of one of the state secondary schools, in his report, remarked that "the programme should be upheld because of its impact on the craft, arts and farming habits of students". And in own report, Mrs Ozobualu, Principal of St. John of God Secondary School, Awka, described MOSAI as "laudable and beautiful, we believe in it, staff and students. There is no gainsaying that MOSAI is the type of functional education any country would want".

The above reactions from the reports of these principals who are in the position to monitor the scheme, were enough indications that the scheme was doing what it was established to do, and therefore should be upheld.

THE ACHIEVEMENTS OF THE SCHEME

The scheme recorded some notable achievements during the short, period it existed. The greatest of which, according to Ndubuisi (1990) was "the awareness it created of the immense potentialities and talents in our children and youths which had been hitherto neglected by schools. There were also tremendous enthusiasm, interest and motivation which were generated among our children and youths in the appropriate combination of use of their heads, hands and hearts".

The achievements of the scheme in practical terms, led to the cultivation of 2,105 hectares of cassava, 5,200 stands of palms, 13,710 stands of pineapple suckers, and 4,200 stands of plantain and banana by various schools in the then Anambra state under agriculture. In technology, products such as cutlery, matchet, metal gong, electric bell, toy fans, miniature refrigerator, pulley, bookshelf, table, chair and wooden bed, among others were produced. In industrial production, various types of goods, like, handicraft, cosmetics, weaving, ornaments, toys, cards and bags, etc were recorded in small quantities. Also plaiting and barbing of hair, shoemending and marketing of products were some of the achievements in the service industry.

As a result of the above recorded achievements, MOSAI Exhibition was held at Enugu, the state capital on the 17th of February, 1990 to show some of the items produced. Among the items exhibited were milling machine, solar heater, sealing machine, baby carriage, various agricultural implements and food crops among others, which were produced by the pupils and students. At the end of the exhibition, 137 pupils and students were awarded a total of N 87,400.00 by the then state government. The awards were incentives to motivate the pupils and students into doing more and perhaps perfecting on their inventions.

There is no doubt that the achievements recorded by the scheme during the short period it existed was a remarkable one. And if the New Education Policy, since its inception had achieved as much as the scheme, Nigeria would

have joined the league of other technological nations by now.

CONCLUSION

The MOSAI scheme was established to emphasize "Career-Oriented" education rather than white-collar-job which had been the bane of Nigeria's educational system throughout the period of colonial rule. The aim of the career orientation was to make education more functional and relevant to the needs and problems of Nigeria. In doing this, it complemented one of the cardinal objectives of the New National Policy on Education which emphasized education for self-reliance.

The impact the scheme made on the pupils/students as well as the citizens of the state, and the achievements it recorded during the short period it existed was enough to integrate it into the country's educational system. This would have geared the new education policy into realizing its set objectives of making Nigeria a self-reliant nation.

Nigeria is richly endowed with enough natural as well as human resources to turn the country into a technological giant. And in the opinion of this writer, if the scheme was operated long enough to make its full impact on our technological education, it would have realized its dream of making the state and infact Nigeria the "Japan" of Africa by the year 2000 AD.

REFERENCES

Aneke, Chukwu (1990), **"Embrace MOSAI programme"** Daily Star, April 25

Anambra Stare, (1989) **"Blueprint on Mobilization of Schools for Agriculture and Industry (MOSAI)"** , July 1989.

Anyikwa, O.B. (1990), **One year of MOSAI"** Daily Star, June 21.

Ekwegbalu, Unoaku, (1990), **"MOSAI-Legacy for Nigerians"** Daily Star, February 17.

Madubuko, S. (1990) **"Educationist Commends MOSAI", Daily Star,** March 3.

Ndubuisi, A.F.(1990), **"MOSAI-Blazing a New Trail in self-Reliance" Daily star, April 4.**

Ndubuisi, A.F. (1990) **"Heads of schools Told to Give Priority Attention to MOSAI", Nigerian Mirror,** June 21.

Ndubuisi, A.F. (1990) Improvisation of Materials, Tools, and Equipment for MOSAI workshop" Paper presented at the workshop for MOSAI Skill Leaders, held in five Educational zones of the then Anambra State from 29th May to 5th June.

Ozobialu, M(1990) **"MOSAI Exhibition Today", Daily Star,** February 17.

Okoyez, A. (1990) **"MOSAI: Boost to Functional Education", Daily Star,** February 12.

Udenigwe, F.(1990) **"Schools Heads Urged to Motivate Students", Daily Star,** May 22.

Umoh, P. (1990) **"MOSAI: 6-3-3-4 on a New Place", Daily Champion,** August 25.

Ugwuanyi, M.(1990) **"Make MOSAI a National Issue", Daily Star,** March 16.

PARTICIPATORY RESEARCH IN SOCIAL SCIENCES (PRESS)

R. SRINIVASAN

ABSTRACT

Participatory research in Social Sciences is a very useful proposal to make research as a way of life rather than a sophisticated process. In this paper the purposes, the benefit and a list of useful themes across the subject disciplines are presented.

Any systematic attempt to analyse a phenomenon comes within the frame work of research. Disseminating research findings activates people to ponder over them and pool their ideas thereby ensuring collective wisdom among the practitioners.

A fertile aspect of research in social sciences could be participatory in nature involving people eliciting their views for refining social behaviour. Participatory research if undertaken will ensure the individuals confronted with a problem to know its pulse for effective adjustments. The impact of on going social and infrastructure projects could be assessed realistically in cost -effective terms for large scale application if found feasible.

A tentative list of useful themes and the disciplines covered is presented below:

Discipline	Theme	Effects (Leads to promote)
Commerce and Economics	Market surveys of Products Customer satisfaction/ consumer redressal	Increased Product Coverage
Education	Classroom Problem and teachers	Learner growth/development
Psychology and Education	Case study, Clinical case study	Minimising deviant behaviour
Rural Development	Village upliftment schemes & Micro level planning	Promotes standard of living
Industrial Management/ Labour Economics	Workers participation in management	Morale boosting
Sociology	Mass religious conversions	Tolerance
Politics	Public opinion polls	Well informed electorate
Ecology/Environment	Civic Exnora	Hygiene and Cleanliness
Management	Participatory management techniques	Collective decision making
Business Finance	CRISIL Rating	Public Support

The purposes of participatory research among other things are as follows.

— Arousing curiosity in those concerned
— Gives a realistic position to public/ mass about vital issues concerning majority of population
— Enhances output/productivity
— Averts mob behaviour and protects public property
— Promotes social cleanliness - ecology, hygiene and environmental preservation
— Elicits cooperation in complying with Governmental rules and procedures

In mobilising public support for social transformation through participatory research the role of non-governmental organizations (NGO) goes a long way in educating public and freeing them from the clutches of evil elements. Establishing an egalistic pattern of society, one of the avowed objectives of our planners could be approached through participatory means.

The sample coverage could range from the minimal level of one person / family to a vast size of respondents depending upon the extent of influence on the society.

One of the aims in the setting up of Regional Rural Banks was to ensure local feel coupled with promoting banking habits. Another example is the collective bargaining which promotes labour welfare and harmony among industrial employees.

Participatory research is obligatory as well as contributes to personal fulfillment of certain commitments.

PRESS, if pressed, would promote individual and group happiness harmonising desired behavioural change and social solidarity.

CONCEPT MAPPING AS AN INSTRUCTIONAL STRATEGY FOR CONTINUING EDUCATION PROGRAMMES

P.N. MENON & SUNIL DUTT

ABSTRACT

Concept mapping is a natural human process of understanding and hence is useful in continuing/adult education as an instructional strategy. Strategies for introducing this technique androgogically and educational applications together with a diagrammatic illustration are presented.

INTRODUCTION

According to Toynbee (1947) a civilization survives only so long as it makes adequate response to the challenges of time. In the slowly changing cultures, much of the learning that one needs to adapt to his cultural and physical environment can be facilitated in the years of childhood and youth. Thereafter learning does not come to a grinding halt. It takes place incidentally during normal life-time. Beyond this, the nature of learning required depends largely on the changes that take place in the outer world. When major changes take place in the outer world, that is in the cultural and physical environment, man must learn to adjust to them. From the cradle and carry-cot days to the grave, if anything that co-exists with life it is learning. Our civilization has virtually marched from the care dwelling age to the present day of rocket technology only through continuous learning. Learning and using the educational process through-out his life, man can assure maximum personal development,

learn how to control the products and processes of science & technology maximally for his own benefit, and perfect his ability to live democratically in all areas of human relationship. (Homer Kemper, 1955)

Adult education is increasingly being seen in its totality as continuing education. Everright and Haygood (1969) proposed that adult education is the process whereby persons who no longer attend school on a regular and full time basis undertake sequential and organized activities, with a conscious intention of bringing about changes in information, knowledge, understanding or skills, appreciation and attitudes or for the purpose of identifying and solving personal or community problems.

According to Allan Rogers (1986) continuing education stresses the unity of the concept of education in both child & adult and indicates that it continues throughout life - though the phrase has also come to have at least two other narrow meanings: all education for adults returning to the educational system, and

professional vocational oriented training programmes at an advanced level for adults who have already received good deal of education.

WHO IS AN ADULT?

The problem of defining adult is so great that at times those bodies with the greatest experience of making such definitions give up. UNESCO in 1976 determined that adults are those people whom their own society deems to be adult. However according to Rogers (1986) there are three major characteristics that makes an adult distinct from non-adults: full development, sense of perspective, and autonomy. This view of adult is represented in the figure given below:

Sense of
perspective
Full growth
Autonomy
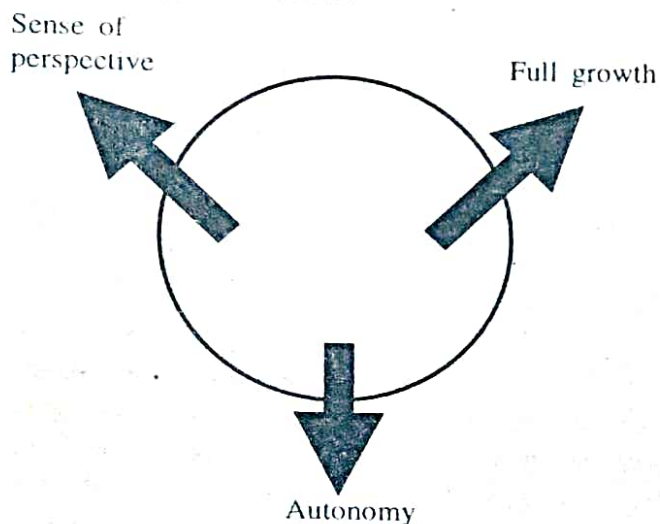
The idea of full development includes personal growth the expansion and utilization of all the individual's talents and the process of moving towards greater maturity. The sense of perspectives refers to sounder judgements about themes themselves and about others. Autonomy indicates responsible decision making, voluntariness rather than involuntariness.

ADULTHOOD & EDUCATION

The above three characteristics - full development, perspective and autonomy are traits that mark the adult from the non adult in almost all sections. They carry profound implications for us as teachers. They help to establish both the aims and the curriculum of the education we provide for adults. Therefore, the training programmes of continuing education for adults should:

— Seek to promote personal growth i.e. full exploitation of the talents of the individual

— Encourage the development of sense of perspective

— Foster confidence, the power of choice and action to increase responsibility.

HOW DO ADULTS LEARN?

In the foregoing section we have defined who an adult is and what his characteristics are and relationship between adult and continuing education. Now let us explain how adults learn. We know that pedagogy means the art and science of teaching children. But the irony of fate is that even today, adults are being taught by the principles of pedagogy. Therefore, pedagogy of adult education is condradiction in terms. Yet, have not most adults - including people in professional training - being taught as if they were children whereas, adults should be taught andragogically? Andragogical theory, according to Knowles (1973), is based on four assumptions

— An adult grows and matures his self concept, moves from one of self dependency to one of measuring self directness.

— As an adult matures, he accumulates an expanding reservoire of experience that causes him to become a rich source of learning. Adults tend to have a problem centred orientation to learning.

— As an individual matures, his readiness to learn is decreasingly the product of his biological development and academic pressure and is increasingly the product of

the developmental tasks required for the performance of his evolving social roles.

RELEVANCE OF CONCEPT MAPPING AS AN INSTRUCTIONAL STRATEGY

Meaningful learning is the goal of instruction at all levels. Human brain commits to its memory all information as meaningful patterns. They are never stored in haphazard manner.

In class-rooms when adults are taught, they are increasingly being taught pedagogically and the subject matter is just transferred from printed text to the minds of adults.

In almost all educational institutions no effort is made in the class to make learning meaningful. Enormous quantity of information is poured out directly from the printed texts to the young minds. The success of the student is determined by the extent of his ability to commit the material to his memory by rote learning. The adult student has to spend considerable amount of time and energy for commiting the material to memory. As a result, when the examination is over, most of them forget almost everything they have learned. In the context, educational technology has come out successfully with an innovative teaching-learning strategy to help the adult learners learn meaningfully whatever is being taught to them without taking refuge to rote learning. This new innovation is termed as CONCEPT MAPPING, an ideal method of instruction according to the principles of Androgogy.

When things are properly learned, material learned forms meaningful patterns in the minds of students. Here in this map, meaningful relationships between concepts are formed in the form of propositions. Quite early in childhood, children learn concepts by discovery learning. Later, most concept meanings are learned through a composite of propositions in which the concept to be acquired is embedded. In this sense, concept map is a schematic device for representing a set of concept meanings embedded in a framework of propositions. These maps make clear to both students and teachers the small number of key ideas they must focus on for any specific learning task. After a learning task has been finished these maps can provide a summary of what has been learned.

STRATEGIES FOR INTRODUCING CONCEPT MAPPING IN TEACHING ADULTS ANDRAGOGICALLY

Assumptions for making Concept Maps:

— The student who comes to the adult level classes must have already possessed the ability to distinguish between objects, events and concepts.

— They can distinguish between concept words and linking words, i.e. linking words are used together with concept words to construct sentences that have meanings.

— They can distinguish between proper nouns and concept words, i.e. Proper nouns are names of specific people, places, events or objects.

Activities to prepare students for Concept Mapping:

i) Keeping these assumptions in mind, the teacher can construct a few short sentences on the board to illustrate how concept words plus linking words are used to convey meanings.

Examples are 'the dog is running'; 'there are clouds and thunder' etc.

ii) Ask students to construct a few sentences of their own and identify the concept words and tell whether each is object or event and they may also be asked to identify the linking words.

Concept mapping activities

—· Select a particularly meaningful paragraph or two from the text book or other printed material and ask the students to read carefully the passage given and to identify the concepts necessary for understanding the meaning of the text. List the concepts on the board as they are identified. Discussion should be initiated with the students to identify the concept which is the most inclusive idea in the text and the most important one.

— Put the most inclusive concept at the head of a new list of rank ordered concepts. List the next most general, most inclusive concepts. working through the first list until all concepts are rank ordered. Differences in the ranking of concepts may occur. It is possible because there are different ways to see the meaning of the text. One way of ranking alone can be considered at a time.

— Now the construction of the map can be started keeping the rank order list as a guide to build a concept hierarchy. Have students help in choosing good linking words to form the proposition shown by the lines of the map.

— The best way for making a concept as suggested by Gowin is to have students write concept words and linking words on paper rectangles and then arrange these rectangles as the students get new insight on the map organisation.

Now look for cross, links between concepts in one section of the map and concepts in other part of the concept 'tree'. Have students help to choose linking words for the cross links.

— Most first effort maps have poor symmetry or some concept clusters poorly located related to other more closely related concepts or clusters of concepts. In such case, the map can be tried once again. Sometimes two or three constructions of maps are needed to show a good representation of proposition meaning.

An illustration of these concept maps is given in the Annexure-I.
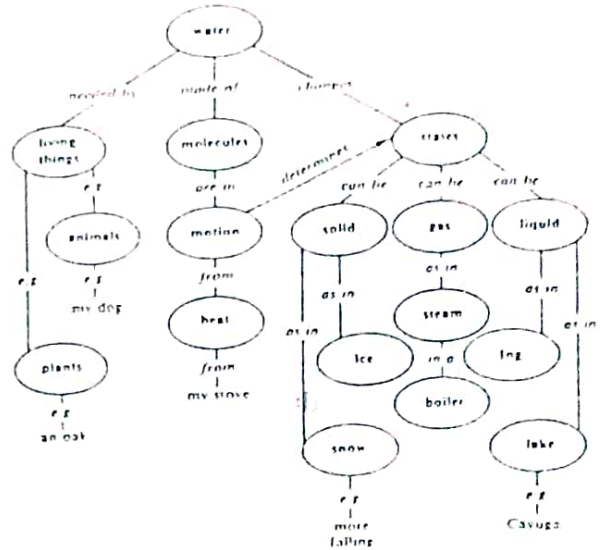
Fig. 1: A concept map for water showing some related concepts and propositions. Some specific examples of events and objects have been included (in Roman type outside ovals).
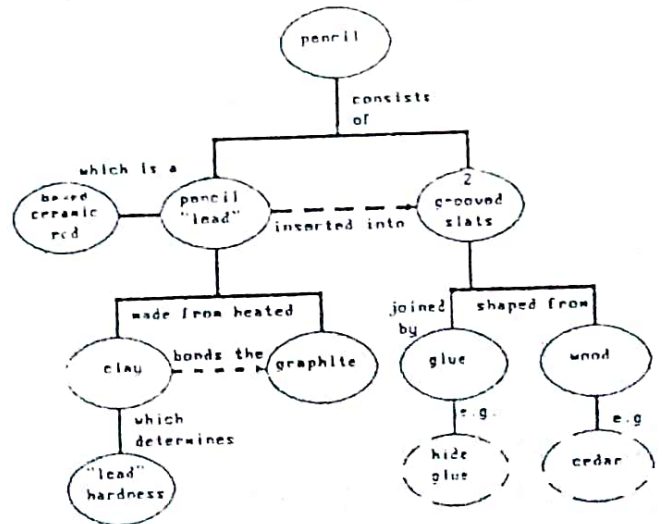

Fig. 2: Concept map on the design of the pencil, constructed to show most of the graphic conventions employed in concept mapping.

EDUCATIONAL APPLICATIONS:
For Fostering Creativity:

Students and teachers who construct concept maps often remark that they recognize

new relationships and therefore, new meanings. In this sense, concept mapping can be a creative activity and may help in fostering creativity. In addition, these are found to be effective tools for showing misconceptions in our understanding to see significant meaning between concepts.

For negotiating meanings:

Here, negotiation connotes learning the meaning of a piece of knowledge by dialogue, exchange, sharing and sometimes compromise sharing meaning is a cognitive aspect of learning which cannot be equated with the process of blood transfusion. Here meaning alone is shared and not learning which is an individual responsibility.

For developing social skills:

It is suggested that concept mapping as an instructional strategy should be carried out through team work. As a by-product of this instructional strategy, social skills are also developed in students.

For exploration of what the learner already knows:

In concept mapping, there is always sharing of meaning of related concepts. While preparing concept maps, students bring something of their own for negotiating. They are not a blank tablet to be written on or empty vessel to be filled with. Whatever the students have learnt before, needs to be used to acquire new learning. Making concept mapping as a cooperative endeavour where teacher and student need to recognize the value of prior knowledge and explore them suitably for preparing a concept map.

For mapping learning route:

Suppose we want to make a journey by road from Chandigarh to Delhi, one can assume that one normally would start with taking national map of India first and find where these two places are located in the map. Later, one will take the individual maps of the northern region connecting Chandigarh to Delhi. Similarly, when teacher has to teach a small topic, students should know the relationship of that lesson to the topic and that topic to the subject and the subject to the course. Thus, separate concept maps at the course, subject, topic and lesson levels can be prepared to give the students an idea where he has been and to where he will be going and how he will get there when a topic is taught to him.

For extracting meaning from text book:

Learning to read effectively presents a dilemma to our students-many a time, words and phrases are hard to read when they have little or no meaning, still reading is a powerful means to learn meanings. Concept mapping can help to break through the meaning impasse.

For planning a paper or exposition:

While writing a paper we often come across with a difficulty of paralysis of expression. Concept mapping can eliminate this difficulty. To begin with list a few concepts or propositions one wants to include in a paper. Usually, in a few minutes a brief concept map can be constructed with all the ideas. Later additions, modifications, and transformation can be done to make a detailed concept map, but this initial jotting down of concepts and ideas would certainly give a guideline for writing a paper or an article. What has been said about papers also applies to preparation of poster, notices, exhibits etc. .

For Curriculum Development:

Posner and Rudnitsky (1986) have used the idea of concept mapping and have divided planning into three question areas: a) what is to be learned? b) why is it to be learned, and c) how will the learning be facilitated? The use of

concept maps can help teachers develop curriculum that is hierarchically arranged, integrated, and conceptually driven. Fig shows a concept map of the curriculum development process.

RESEARCH STUDIES CONDUCTED IN THE AREA OF CONCEPT MAPPING:

Concept mapping was invented at Cornell University by Novak and the members of his research group (Stewart, Van Kirk and Rowell, 1979). Later on, a large number of studies have been conducted by various researches in the field of science both at the primary and high school levels. e.g. Bogden (1977) and Diekhoff and Diekhoff (1982) compared student generated concept maps to ideal teacher-constructed maps. In some research, student maps have been scored for the correctness of the relationships portrayed (Bogden, 1977; Novak and Gowin, 1984). This approach suggests that there is an inherent structure of the discipline which teachers can convey to their students. Recent research studies in science education have emphasized the need to understand how learners construct knowledge through experiences with physical phenomena (Smith and Nedle, 1989). Beyerbach and Smith (1990) illustrated how concept mapping can be useful in describing students evolving construction of knowledge in a particular subject area and in promoting reflection. Okebukola and Jegedge (1988) found that students in a pre-degree biology course who were working together cooperatively on the concept mapping tasks were found to attain meaningful learning better than students working individually. Cullen, J (1990) found that concept maps have great potential for helping students to learn chemistry.

Jegede, Alaiyemola and Okebukola (1990) found concept mapping significantly more effective than the traditional/expository teaching strategy in enhancing learning in biology. In addition, it apparently reduces students' anxiety towards the learning of biology. Menon and Dutt (1993) support the stand that concept mapping is an effective teaching strategy for IX class biology students.

Wandersec (1990) had used concept mapping to teach undergraduate biology courses and to teach science education methods courses to pre- and in-service primary, secondary and university science teachers: "I continue to be impressed by the potential of such graphic meta cognitive tools to help science teachers and science educators improve science instruction. I invite all researchers with an interest in the "graphic representation of scientific knowledge" to join us in exploring this domain, since much more research is needed.

CONCLUSION

Concept mapping has been applied in a variety of ways in science and technology education. It has wide implications to instructional planning, development, implementation and evaluation, research interviews etc. By using it a teacher can bring about meaningful learning where rote learning predominates. Concept map as an instructional strategy shows great promise for a "Quantum Leap" in improving the quality of education at all levels.

However, much work is yet to be done to use it as an instructional strategy by the teachers who engage the classes of adult learners. It looks a difficult task for a novice like automobile driving, frightening to begin with but thrilling when learned properly. It is certainly a twentyfirst century boon for all prospective and aspiring adult learners and their teachers.

REFERENCES

Ausubel, DP. Novak, JD and Hanesian, H (1978) Educational Psychology: A cognitive view, New York: Holt Rinehart and Winston. 2nd ed.

Beyerbach, B.A. and Smith, J.M. (1990) Using a Computerized Concept Mapping Program to assess preservice teacher's thinking about effective teaching. Journal of Research in Science Teaching. Vol. 27 No. 10 pp. 961-971.

Bogden, CA (1977) The use of concept mapping as a possible strategy of instructional design and evaluation in college genetics. Unpublished Master's thesis, Cornell University, Ithaca, New york.

Cullen J (1990) Using concept Maps in Chemistry : An alternative view. Journal of Research in Science Teaching. Vol. 27 No. 10 pp. 1067-1068.

Diekhoff, G.M. and Diekhoff, KB (1982) Cognitive maps as a tool in communicating structural knowledge. Educational Technology. 22(4) pp. 28.30.

Gowin, DB (1981) Educating Ithaca, NY: Corne University Fress.

Lovell, R.B. (1987). Adult Learning. London: Croom Helm. Ltd.

Menon PN, & Dutt.S (1993) Effectiveness of Concept Mapping as an Instructional Strategy for teaching biology. In Conference on Instructional Planning by Indian Academy of Instructional planning at Loni, Maharashtra

Menon, PN & Dutt, Sunil (1994). Concept Mapping-An Instructional Strategy. Paper presented at National Seminar on curriculum Development, Chandigarh: T.T.T.I.

Novak JD (1977). A Theory of Education Ithaca, New york : Cornell University Press

Novak, JD (1990) Concept Mapping : A useful tool for science education. Journal of Research in Science Teaching. Vol. 27 No. 10 pp. 937-950.

Novak, JD and Gowin DB (1984) Learning How to Learn New York: Cambridge University Press.

Okebukola PA and Jegede, OJ (1988) Cognitive preference an learning mode as determinants of meaningful learning through concept mapping. Science Education. 72(4) pp. 489-500.

Posner G and Rudnitsky, A (1986) Course Design : A guide to Curriculum Development for teachers, white plains NY, Longman Inc.

Roth WM and Roychoudhary A (1983) The concept Maps as a Tool for the collaborative Construction of Knowledge: A micro analysis of High School Physics students, Journal of Research in science Teaching. Vol. 30 No. 5 pp. 503-534.

Smith DC and Neale, DC (1989) The construction of subject matter knowledge in primary science teaching. Teaching and Teacher Education. 5(1), pp. 1-20.

Wandersee, JH (1990) Concept Mapping and the Cartography of Cognition. Journal of Research in Science Teaching. Vol. 27 No. 10, pp. 923-936.

Toynbee, A.J. (1947). A study of History. New York: Oxford University press.

PROBLEMS AND RELEVANCE OF TECHNICAL EDUCATION IN A DEVELOPING ECONOMY: THE NIGERIAN CASE

C.I. OGBUKA

ABSTRACT

A formal system of education was introduced in Nigeria in 1857 with the coming of the missionaries. Organised planning of a system of technical education came into being about 1946. Technical education since then has played very important roles towards the development of this country in terms of economic, social, political and technological development.

Despite the laudable achievements of technical education to Nigeria since its inception, it is beset with many teething problems.

In this paper, I have highlighted some of the problems like shortage of fund for effective running of this education, inadequate staff supply to teach the courses in some of our institutions, high cost of equipment for effective teaching and irregular supply of water and electricity.

In the light of these problems some useful recommendations have been made which if applied will make technical education attain an enviable height.

THE MEANING OF TECHNICAL EDUCATION

There are as many definitions of Technical Education as there are experts on the field. At the post primary level, Technical Education is that education that helps to prepare students for occupational employment upon completion of relevant courses. It contains groups of planned experiences that are integrated to give the individual experiences in self-expression and self-direction through the teaching of marketable skills such as drafting, electronics, graphic arts, typing, welding, auto-mechanics, machine repair etc. Technical Education offers means of self support at an early age. They also attract a number of youths who do not have much interest in academic phases of education by lending dignity to non-academic pursuits.

The New Universal Library defines Technical Education as "education for industry and covering a wide range of institution subjects and standards of attainment."

The National Policy on Education (1981) defined Technical Education as "that aspect of education which leads to the acquisition of practical and applied skills as well as basic

scientific knowledge". It is infact that education that is designed to prepare individuals for entrance into, and progress within technical occupations. It requires an understanding of the fundamental laws and basic principles of Mathematics, Science and Technology supported by appropriate general courses.

There are about forty different areas which the National Board for Technical Education of Nigeria recognised as technical subjects and supports for students, industrial attachment during training. These subjects range from Engineering to Accountancy and Marketing.

Because of the country's need for more and better trained worker and because the skilled trades have been elevated to a new position of desirability by the Federal Military Government of Nigeria, Technical Education has assumed important roles and most essential place in our educational system. It is no wonder then that much is demanded from students studying in the technical fields.

There are several levels, several achievements, standards and types of institutions involved in technical education of Nigeria. They are:

i. Pre-vocational

ii. Vocational

iii. The trade centres now called technical colleges which usually train operative, craftsmen and recently technicians.

iv. Colleges of Education (Technical)

v. The Polytechnics and Colleges of Technology which train technicians and professionals.

vi. The Universities which usually train professionals (and some also train technicians).

The professionals trained by the universities are however different from those produced by the polytechnics. The training in the polytechnics is with a definite bias towards industrial application.

BRIEF HISTORY OF TECHNICAL EDUCATION IN NIGERIA

1900-1940

For a long time, technical education was not accorded an important role in the educational system of the country. It was an aspect of education regarded as the concern of individual government department rather than an integral part of the educational system. Consequently, even though the western type of education was introduced about 1840, there was no technical training institution until about hundred years later.

In the period 1900 - 1910, the Nigerian Railway Institute and the Survey School Lagos were established. After a break of twenty years, three more similar institutions were established between 1930 and 1940. These were the post and Telegraph Training Centre, the Veterinary School Vom and the school of Forestry at Samaru Agricultural Station. All these were at the level of trade centres and organised as departmental in-service training centres.

The only formal training type of technological institution of the 1930's was the Yaba Higher College of Lagos. It was established in 1932 to provide training at a level higher than that of trade centres. It was the first of the Polytechnic type institution.

With the expansion of commerce and industries of the 1950's came the establishment of three colleges each known as Nigerian College of Arts, Science and Technology at three different towns in the country. Three

technical institutes were also established during this period.

A number of trade centres were also established with three located in the Western Region of the Country.

Towards, the end of that decade, the Nigerian College of Arts, Science and Technology were phased out and the sites handed over to the Regional Governments. The regional governments later established universities which took over the functions of the Nigerian Colleges.

1960 - 1970

The trade centres trained only craftsmen but technicians were also needed. The need to produce technicians to meet the needs of industry and commerce led to the establishment of Technical Colleges / Colleges of Technology by the Regional and Federal Governments between 1960 and 1970. There were five such colleges.

1970 - Present

The Country has come a long way since the 1960's. We now have many types of institutions producing the various categories of personnel. There are now at least 18 polytechnics, many colleges of technology including some multi-campus ones. There are also a large number of technical colleges and colleges of education (technical).

TECHNICAL TEACHERS PROGRAMME

The training of technical teachers is a very important aspect of the technical education programme of any country. For a long time the few Nigerians who were trained to teach in the technical education programme received their training outside the country mostly in Britain.

Nigeria has however started to turn its attention to this important area. The National Technical Teacher's College in Yaba - Lagos was for quite some time the only institution producing technical teachers with the Technical Teachers Certificate. But now - Polytechnics, colleges of Education (Technical) also train technical teachers for either or both of the NCE (Technical) and the Technical Teachers Certificate.

It is expected that these polytechnics will in the near future start the B.Ed. (Technical) Programmes.

AIMS AND OBJECTIVES OF TECHNICAL EDUCATION

The aims and objectives of Technical Education as enunciated in the National Commission for Colleges of Education (Vocational and Technical) 1990 are among others:

i. To produce competent teachers of the discipline for primary and junior secondary school classes in Nigeria.

ii. To produce trained manpower in applied sciences technology and commerce at sub-professional levels.

iii. To produce the technical knowledge and vocational skills necessary for agricultural, industrial and economic development of the nation.

iv. To produce skilled, self-reliant and enterprising craftsmen and technicians.

This is comparable to the aims and objectives of technical education as enunciated in the National Policy of Education (1980). Among others are

i. To provide people who can apply scientific knowledge to the improvement and

solution of environmental problems for the use and convenience of man.

ii. To provide trained manpower in applied science, technology and commerce particularly at sub-professional grades to have an intelligent understanding of the increasing complexity of technology.

iii. To enable our youngmen and women to have an intelligent understanding of the increasing complexity of technology.

iv. To provide the technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.

v. To give an introduction to professional studies in engineering and other technologies and

vi. To give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.

The goals potray technical education among others, as the acquisition of appropriate skills, abilities and competences, both mental and physical, which equip the individual to live in and contribute to the development of his society.

A casual glance at these aims will reveal that these are laudable national ideals.

RELEVANCE OF TECHNICAL EDUCATION TO NATIONAL DEVELOPMENT:

The importance of Technical Education as a requirement for technological development cannot be overemphasised.

National development involves the provision of adequate and good health services, adequate and efficient electricity and water supply, good transportation and communication system, adequate food and housing and all those other things that will lead to better and higher standards of living for the people.

Without good technological training in the field of medicine, nursing and other allied professions, it will be impossible to provide good health services. Good and efficient electricity and water supply cannot be provided if a country does not have electrical and civil engineering personnel.

A country cannot improve her transportation and communication systems nor provide enough food and housing for her people if she does not have personnel with technical expertise. In fact a country finds it difficult to implement some parts of her development plans because of non-availability of the necessary technical staff.

These facts noted above and the generally accepted fact that the National development or technological development of any country depends mostly on the effectiveness of her vocational and technical education. This also supports the noble ideals of the goals of Technical Education as presented in the National Policy on Education stated earlier.

Osuala (1983) supports this idea where he said interalia:

"the success of a nation's economy depends on the quality of its workers. The economic and social well-being of any society is dependent upon the quantity and quality of goods and services available to its citizens. Therefore, programmes of Vocational Technical Education should be designed to meet the Educational and training needs of youths."

Apart from its economic value, vocational technical education also creates increased options to students on the available courses in our higher institutions.

PROBLEMS OF TECHNICAL EDUCATION

Despite the laudable national ideals of Technical education, the present situation of Technical Education in this country is very deplorable. It is best with a lot of problems and some to be listed below.

SHORTAGE OF FUNDS

Technical education by its nature requires a lot of fund for effective running. Laboratories and workshop must be well equipped if practical training is to be thorough. Unfortunately, many of the technical institutions and other institutions running technical programmes are not adequately equipped. The present economic recession has made the problem more acute. The inadequate supply of equipment has handicapped the training of technical manpower.

This shortage of fund also affects the funding of student's Industrial Attachment.

INADEQUATE STAFF SUPPLY

The staff situation in some of the institutions in this country is highly deplorable. The institutions compete with industries for the limited number of people who have both the training and experience to successfully handle training of technical manpower. As the industries offer much better remuneration, the institutions do not stand a chance of competing favourably with them in attracting staff.

In addition, the industries offer better job satisfaction for the professional many of whom wish to continue to grow in practical experience. Many do not wish to teach as they do not see teaching as adding to their experience. The minority who do not mind teaching wish to supplement it with continued practical experience. This was possible until the private degree which barred all public servants from engaging in any private practice. This lead led to an exodus of technically trained professionals from technical institutions. Consultancy is now allowed in many technical institutions and it is hoped that this will help to attract some more qualified staff.

HIGH COST OF EQUIPMENT

In addition to the normal high cost of technical education because of the need to provide expensive equipment is the unusually high cost of equipment in this country, where practically all equipment have to be imported. Equipment in this country costs so much when compared to their prices in Britain or United States. For example, an item which is known to cost about ninety to one hundred dollars in America sells for eight thousand naira in Nigeria. Whoever thinks of solving the problem by going abroad to buy his equipment finds that he cannot get foreign exchange or that any repair facility of the local agent cannot be available to him or that the manufacturer sells only to the accredited local agents.

NON-AVAILABILITY OF REPAIR FACILITIES

Another big problem to our technical education is lack of repair facilities for many equipment. Most vendors of these equipment are more interested in selling than in keeping them functioning. Even when they are interested in keeping them functioning, they are more likely to be hampered by non-availability of the technical expertise.

IRREGULAR SUPPLY OF WATER AND ELECTRICITY

Irregular supply of water and electricity does a lot of harm to a number of equipment. Scarcity of water and electricity supplies disrupt practical classes on many occasions. This problem is sometimes solved by installing generators and sinking of bore holes but this adds to our financial problems.

INADEQUATE NUMBER OF QUALIFIED CANDIDATES

Year in, year out, polytechnics and universities find it difficult or even impossible to fill the capacity for science-based courses and taking in the excess students so that they don't roam about the streets. Thus the intake and outturn for non-science based courses continue to grow at the expense of the science-based courses.

RECOMMENDATIONS/CONCLUSIONS

The following recommendations are offered towards solving the problems affecting the effective running of technical education in this country.

Increased In-take Into Technical Programmes

In this respect the student enrolment in the polytechnics and colleges of technology will have to be greatly increased particularly in the science-based courses.

Provision of Preliminary Courses

There will not be enough candidates qualified for the science-based courses while there will be more than enough for other courses. The solution will be to mount preliminary programme in· the science-based courses in those institutions it is not yet existing.

Adequate Funding

The technical institutions should be adequately funded so that the laboratories and workshops can be properly equipped. According to Okeke (1994),

"Our government is now unable to totally and single-handedly finance education particularly technical and vocational education as a result of the global economic recession and depression and oil glut. He therefore calls that the private sector and voluntary agencies, social and philanthropic organizations be involved in the funding of education especially technical and vocational education".

Encouragement of Consultancy Services

Consultancy services must be actively encouraged in our technical institutions and the remunerations of the teaching staff must be made comparable to those in the industries so as to attract the right calibre of staff.

Improved Water and Electricity Supplies

The government must make every effort to ensure regular and adequate water and electricity supplies. In the alternative, any technical institution must find ways of becoming independant of the municipality in the provision of these facilities. For example provision of water bore-holes within the institution's premises.

Effective Technical Education

For the technical education to be effective, the following must be done:

i. Technology changes so rapidly that what is new today may soon become obsolete. Students

must therefore be equipped through adequate practical training with the ability to adapt and innovate so that they can continue to learn, and keep abreast of the growing technology. Students must be well-equipped to be immediately useful to the industries on completion of their programmes. Supervised industrial attachments of 3-4 months should therefore continue to be an integral part of the technical programmes. Under no condition should it be scrapped. Rather, solution should be found to the problems posed by financial difficulties and all parties involved must be prepared to make some sacrifice.

ii. For anyone to be able to hold his head in the society, ability to communicate effectively is an essential tool. These days, there exists in some quarters the tendency to believe that knowledge of the English Language is not important. This is wrong. For as long as English remains the medium of instruction in Nigeria and the official common language must our student be given adequate training in that language. The study of English should therefore be emphasized.

iii. Our students must be well aware of their environment; so General Studies must form an integral part of our training.

CONCLUSION

It can be seen from the above that the problems of technical education are many and the solution to the problems in this country demands the cooperation of all the government and their agents and the professional associations. The technical and the technological institutions, the employers and indeed every Nigerian. The problem also calls for the assistance of international organisations. In fact solving the problems of technical education will give Nigeria great advances in her National development.

REFERENCES

International Learning Systems Corporation Limited: The New Universal Library. Caxton publishing company 1968.

National Commission for Colleges of Education Minimum Standards for NCE Teachers Vocational and Technical (1990), Federal Republic of Nigeria.

National Policy on Education (1981): Federal Republic of Nigeria.

Okeke, S.I. (1994) - "The Funding of Technical and Vocational Education in a Depressed Economy: A Clarion Call for Multi-Organizational participation". Journal of Technical and Vocational Education, 11, Technical Teachers Training Institute, Madras, India.

Osuala, E.C. (1983) - A handbook of vocational - Technical Education for Nigeria Kailash Mithal for Anu Books, MEERUT - 250001 - India pgs 8-9.

DATA BASE FOR EFFECTIVE CURRICULUM PROCESSES

L.N. MITTAL & Y.K. ANAND

ABSTRACT

For Planning, designing, implementing and evaluating the curriculum, it is essential that appropriate information/data base should be collected at different levels for taking appropriate decisions. This paper highlights various stages of curriculum processes, detail out various functions to be performed at state, polytechnic and teacher levels for effective curriculum processes. Paper, in the end makes some specific recommendations concerning curriculum development.

INTRODUCTION

Teaching learning process in any educational institution depends on curriculum document. Curriculum document contains aims and objectives of the programme, detailed contents i.e., knowledge, skills and attitudes to be developed for achieving desired objectives, suggests guidelines to teachers for providing appropriate learning experiences in the light of course objectives, provides guidance in respect of student evaluation. An estimate of recurring and non-recurring financial resources required for setting up infrastructure and running the course and strategies for effective implementation also forms part of curriculum document.

In India, there are over 900 polytechnics which are conducting on an average three to four programmes in about 80 disciplines. After the establishment of Curriculum Development Centres at Technical Teacher's Institutes (TTTIs), considerable awareness has been created in the system regarding various stages/processes of curriculum development, but still lot more has got to be done to make polytechnic courses more relevant to individual and employment needs. It has been experienced that many a time, decisions regarding starting new institutes and programmes are taken without appropriate information base. Also, programmes are started without having adequate infrastructure (Physical, human, informational). This results in considerable mismatch between supply and demand and quality of technical manpower and unbalanced growth of institutions and programmes.

Before detailing data base required for effective curriculum processes at different levels, it is important to discuss various stages of curriculum development.

Curriculum development comprises of the following stages:

a) Planning stage

b) Design and development stage

c) Implementation stage
d) Evaluation stage

CURRICULUM PROCESSES

Planning Stage

For Planing technician education system in an appropriate manner, it is essential to conduct market studies to determine and future technician manpower requirement for gainful employment in the world of work. Collection of such information at state level and its consolidation for starting new institution and programmes will considerably avoid mismatch between supply and demand of technician manpower.

Design and Development Stage

At this stage, decisions regarding curriculum objectives, curriculum structure, course contents, adoption of appropriate teaching-learning strategies in the light of course objectives, development of resources for effective implementation of curriculum are taken. Some of these decisions are taken at the state level based on the policies laid down by the AICTE.

Implementation stage

Once the curriculum design has been made, attention is required to be paid to the steps required for the successful implementation of curriculum. It deals with harnessing of resources and their utilisation. Information regarding availability of resources (Physical, human, informational) is required for taking appropriate decisions leading to effective curriculum implementation.

Evaluation Stage

Evaluation is considered in two stages. The first stage is monitoring during implementation stage. During this stage, corrective measures are taken to improve the teaching-learning process. Once the system has undergone corrective process for sometime and got improved, a summative evaluation is undertaken for making changes in planning and development stages for increasing the effectiveness and bringing improvements in the curriculum process at different stages. In the light of above, next section deals with different types of functions to be performed at state, polytechnic and teacher's levels and types of data base required to be built for effective curriculum processes.

FUNCTIONS AND DATA NEEDED AT DIFFERENT LEVELS FOR EFFECTIVE CURRICULUM PROCESSES

At State Level

1. Preparation of a directory of technical education facilities in the state.

2. Ascertaining technician manpower requirements.

3. Identification of viable disciplines, their intake and location.

4. Preparation of data-base regarding availability of expertise from academic institutions and industry who can help in the design of curriculum.

5. Collection of Important documents related to technical education.

6. Preparation of operational plan/action plan for growth and development of the technical education in the state.

7. Designing Curricula of Programmes keeping in view professional development, development of learning to learn skills, interpersonal skills and personality aspects in the light of state action plan.

8. Planning and development of physical, human and informational resources, (where gaps exist) keeping in view optimum utilization of resources and resource sharing for effective implementation of curricula.

9. Follow-up of developmental activities concerning effective curriculum implementation and providing necessary support to the polytechnics.

10. Promotion of networking of polytechnics with world of work/institutions for resource sharing and greater employability of students.

11. Promotions of innovations and developments in teaching-learning processes, instructional resources development, system improvement etc.

12. Identification of problem areas concerning effective curriculum implementation and ensuring follow-up action/remedial measures for bringing desired improvements in curriculum processes.

At Polytechnic Level

1. Preparation of brochure of the institute highlighting its salient features and strengths.

2. Preparation of a directory of potential employers for different disciplines offered by the polytechnics.

3. Collection of information regarding technology development at work-place in respective disciplines

4. Preparation of data-base of expertise in the respective disciplines.

5. Collection of information/feedback from industrial/field organizations regarding relevance of existing curriculum in the respective disciplines.

6. Planning and development of physical, human and informational resources in a phased manner in the respective discipline.

7. Network with industrial/field organizations and institutions for sharing physical, human and informational resources.

8. Promotion of innovations in teaching-learning processes, instructional material development, student evaluation and system improvement.

9. Collection of feedback concerning implementation of curriculum, identification of problem areas, remedial measures to be initiated at institute level and providing feedback.

At Teacher's Level

1. Establishment of linkages with industrial/field organizations in the respective curriculum areas.

2. Development of rapport with professionals concerning specific curriculum areas.

3. Collection of information related to equipment and instructional resources concerning specific curriculum areas.

4. Development of instructional resources where gaps exist.

5. Collecting feedback from students regarding comprehensiveness of knowledge and skills imparted.

STATE CURRICULUM DEVELOPMENT CELLS

As a follow up of World Bank Assisted Project for strengthening Technician Education, many states have made some efforts to establish state level CD cells and have attached some polytechnic teachers in these cells. It has been experienced that:

i) New diploma courses are identified without much of database regarding long range employability of students

ii) Committees, headed by either a Principal or a Head of department are established to design/review the curricula. In many cases, these committees have no support of any kind. Judicious decisions about the type of expert required in curriculum workshop is missing.

iii) Curricula are revised without much of data base by adding and subtracting a few topics here and there.

iv) Curricula are being/revised in a hurry without much attention paid for the development of learning to learn skills, interpersonal skills and personality aspects.

v) Net working with industrial/field organizations is generally lost sight of.

vi) The curriculum documents so revised by and large do not lay emphasis on technician engineer profile. A study of few such documents reveal the courses to be replica of diluted version of degree courses.

SPECIFIC RECOMMENDATIONS

Keeping the foregoing, in view following suggestions are made:

i) It is important that functions and data needed, listed in section 3 at state, polytechnic and teacher levels, be made and mechanism established to perform such functions.

ii) Focus of technician programmes development of basic understanding of concepts, principles, procedures and practices in the chosen field; knowledge of various materials; their specifications and application; knowledge of relevant Indian Standards; skills in reading drawings; Estimating and Costing skills; measurements, testing and diagnostic skills; basic principles of management; awareness regarding ecology, environment and safety at work places and important provisions of industrial lagistation, use of computer for engineering application should be considered essential requirements.

iii) Starting new diploma courses should be based on long range manpower needs. It will be an advantage to design such courses in collaboration with CD centres at TTTIs.

iv) It is essential that professional practices should form part of technician programmes. This should be attempted by providing minor project work during 4th semester and major project work during 6th semester for enabling students to solve practical problems.

v) There is need to lay considerable stress on basic concepts, principles and procedures drawing skills; estimating and costing; measurement and testing; and diagnostic skills.

vi) While recommending/working out physical resources, optimum utilization of space and equipment and networking for sharing resources should be kept in mind.

vii) Instructional strategies for achieving the laid objectives should be planned and monitored by holding regular meetings by Head of Department with their respective faculty.

viii) It is necessary to train all Heads of Department in curriculum processes.

REFERENCES

TTTI (1995): Information and Data base for Curriculum Processes at state and polytechnic levels; Chandigarh

TTTI (1994): Proceedings of National Seminar on Curriculum Development; Chandigarh

ENHANCING HOME ECONOMICS TEACHING IN NIGERIAN SECONDARY SCHOOLS: A CO-OPERATIVE TEACHING APPROACH

C.N. IKEAGU

ABSTRACT

This paper examined team teaching as one of the most efficient and effective modes of instructional technology in which more than one teacher plan, teach and evaluate the teaching learning process cooperatively, deliberately and methodically. This paper also traced the beginning and expansion of team teaching. Moreover, it discussed the triangular structure and theory of team teaching. A look was also taken at the planning and types of team teaching. An example of team teaching in Home Economics was presented. The Paper equally discussed briefly on the relationship between curriculum development and team teaching. Finally, it was concluded with a discussion on the advantages and disadvantages of team teaching and its implications at the close of the century in Nigerian educational system.

INTRODUCTION

It is clear that African reconstruction, rebirth, development can become a reality only when Africa is prepared to place more emphasis on technical education. We do not know of any country or nation in the world that was developed by an army of clerks and administrators.

The African builders of tomorrow will be drawn from an army of skilled technicians, engineers, scientists and the like, who have technical skills and a good general educational background as well as from millions of Africans with elementary, Secondary or university education who are also able to turn screws, wield axes, tend gardens and fix types - Fafunwa (1967).

Using the above statement as a launching pad for discussion, it implies that in the Nigerian Secondary Schools, teacher - dominated teaching. should give way for democratic teaching whereby both the teacher and students learn together, creating warm relationships, clear understanding and a rest for knowledge. This is more so that the National Policy on Education (1981) highlights technical vocational education (which Home Economics is a member) which emphasises functional and utilitarian education through skill acquisition for self-reliance.

In the contemporary Nigerian secondary schools, various teaching methods and techniques are at the disposal of the vocational education teachers. Bossing (1952) to clarify these techniques and methods defined teaching method and techniques as those strategies adopted by the teacher as the most efficient means of achieving his teaching goals. On the other hand, Okorie (1979) enumerated some of these fundamental teaching methods in Nigeria as lecture, discussion, problem solving, project, home - work, field trip, etc. This implicated that for effective teaching of Home Economics, the skilful and democratic teacher needs to use the many different methods and techniques at his disposal. The writer has to stress at this point that each of these methods has its advantages and disadvantages.

If Nigeria is to advance technologically as stressed by Fafunwa (1967), it has to review and drastically restructure her educational policy as it affects vocational technical education. This measure must evolve other fundamental teaching strategies and overhaul the present traditional structure existing in our schools so as to include team teaching.

Team teaching approach in vocational education seems to be the answer to the utilitarian and functional education which apparently seems to have eluded the Nigerian country.

The Beginning and Expansion of Team Teaching

The idea of team teaching was first practised in the mid 50s in America in the universities and in England in the early 60s at the secondary schools. Its popularity gained prominence as a result of its implementation in these two levels of the educational system as championed by some educational associations like the National Education Association (NEA) and the National Association of Secondary School Principals, (Barnes 1960).

From then, its application in classroom instruction spread to other countries of the world including Nigeria due to the unending benefits. Onwuka (1981) concluded that the Nigerian Secondary Schools should often organize a range of activities involving small and large groups and also individual instruction for improved performance. He stressed that team - teaching would be essential for effective organisation of such activities and would require arrangements whereby groups of teachers or students and their technical assistants would utilise their skills in planning and instructing in a given subject area, involving a small number of students that are equivalent in size to the conventional classes.

Definition of Team Teaching

Team is a number of persons playing together and forming one side in some games and sports. By extension, it means group of people working together (Horby et al, 1962). This simply implies that these groups of people are employing combined effort either severally or collectively for the achievement of the team's goal.

In other words, it means differentiation in function but a commonality of purpose where team advantage overshadows that of personal members of the team.

Team teaching may be defined as a form of organization in which individual teachers decide to pool resources, interest and expertise in order to devise and implement a scheme of work suitable to the needs of their students and the facilities of their schools, (Warwick 1972). In another development, Mills (1977) is of the view that teacher teams are being used

advantageously where large groups have to be trained. Each 'team' contains well-qualified experienced teachers, some able teachers, some less skilled and if need be, some partially trained instructors. The training requirements are analysed and divided into parts that will fully occupy each category of teacher, enabling them to work at their own level and as a team.

Team teaching requires a co-operative group of teachers who can get along well together and who can accept the limitations the method requires in their autonomy. A trainee may not appreciate being taught by a team of people rather than one person to whom he can go with confidence when he needs special help. The method also requires organization but it should be adaptable to changes. Here again, team teaching should not be regarded as yet another revolutionary innovation in educational technology, as any well-run training organizations will have a staff working as a team, with meetings and discussions to decide who does what in the best interests of the trainees and the organization.

Team teaching should be on object lesson and a source of encouragement for teachers who find themselves working in isolation, and considered to build a little empire even to the extent of being suspicious of anyone appearing to encroach on their acedemic or technical territory.

Team teaching can flourish only when all engaged in teaching give top priority to the basic aim of their job which is to help trainees to learn. This aim should transcend personal ambitions to build up a section or a department. The senior member of staff or head of department would lead the team which accepts responsibility as a team and shares equipment and experience in friendly co-operation. In conclusion, Warwick (1973) emphasised that

team teaching involves completely unstructured approach - one in which the subjects as such do not make an appearance at all.

From the above discussion, one concludes that team teaching is a form of organization comprising teachers who decided on the content to teach as well as the methodology and instructional materials to employ without anybody's directives. These team teachers have their unique competencies in relation to the three instructional management competencies needed to excel in teaching. These competencies are-

a) personal and professional competence

b) the methodogical competence and

c) the subject - matter competence. (Akubue 1988)

Besides, the departmental equipment and facilities, free time for meetings and at times, subject identity, etc should be considered in addition to the competencies.

Furthermore, team teaching is believed to hold fast on the premise that the combined resources of all working harmoniously are far greater than the total of each individual member. The discussion also revealed that the school infrastructural facilities like buildings, equipment, personalities concerned, curricular tradition, available materials must be in consonance to the content to be taught by the group.

Most importantly, team teaching must recognize the students need because the teaching content and all other instructional attendants are specifically meant for the consumption of the students. Examples of students needs that can be cited according to Akubue (1988) include physical handicaps, slower intellectual capacities, malnutrition, etc

among others. Where these needs are blocked or subjected to the extremes, he highlighted, the child develops an inadequate balance between his needs and these forces thus resulting in feelings of negative self image. On this last point therefore, the bye-products of team-teaching among others include the alleviation of all these forms of learners developmental needs using their three competencies.

Team Teaching Theory

The theory of team teaching revolves upon three separate but intertwined component facts. These factors are the students' needs, teachers' contribution and school factors. These factors have a strong triangular and cybernetic interrelationship as illustrated as below.

Students Needs   Teachers/Staff Contribution

School Factors

Team Teaching Theory
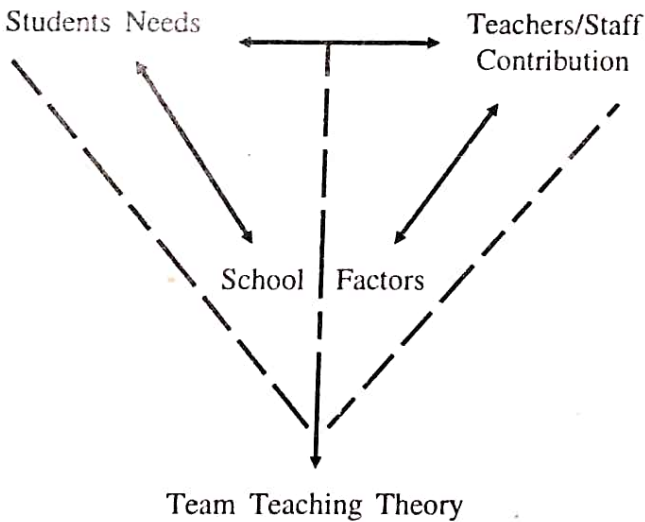
Source: Warwick (1972)

The theory states that teachers working together in a coordinated manner can produce an overall improvement in student, performance and that the utilization of experts working in their special areas will consequently lead to a more effective employment of resources. This simply implies that the combined resources of all working harmoniously are far greater than the total of each individual member.

Organizational Structure of a Teaching Team (Curzon, 1978)

Team Leader

Clerical Assistant — Teachers O P Q R — Technical Assistants
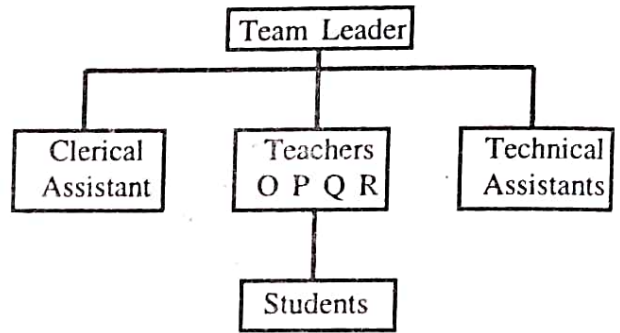
Students

From the organizational structure illustrated above, the team leader is the administrative head of the organization. Therefore, he has many complex tasks to perform for the overall benefits of all the individual learners (students) of the team. These tasks include planning and supervising the groups modus operandi as well as controlling both the teachers, students, technical and clerical assistants. Besides, the team leader will also be the chairman in assessing discussions made by all members.

Essentially, he has to participate as a teacher in the group work. Lastly, as a manager of the team, he has the responsibility of supervising the school facilities such as teaching space for the team, audio-visual aids for instruction and also ensure that the team's work rapports with the school programme of activities.

Preparing For Team Teaching

Team teaching being a technique in instructional technology (Onyejemezi 1981), cannot be introduced overnight without adequate preparation. One of such preparations

involves scheduling regular meetings involving informal discussions for the intending participants.

Secondly, the teachers should consider their own skills and divide the classroom instruction accordingly. Because no teacher is hundred percent perfect in all phases of the teaching role. This means that 'teacher O' may be good at introducing ideas or concepts, 'teacher P' excels in helping the fast learners who need a higher level of treatment, 'teacher Q' is good at diagnosing students' needs.

Thirdly, as a result of mutual observation of one another and planning together regularly, they deepen their knowledge on the complexities and intricacies of the process of teaching and learning. As Onwuka (1981) and Committee on Instructional Technology (1970) rightly pointed out, the aim of this co-operative method of teaching can be achieved by arranging the class in groups. These groups they continued can either be for:

a) Large - group instruction

b) small - group instruction

c) Individualized instruction/Students working on their own. As regards the large group instruction it can serve two purposes. Firstly, it can be used for introducing the major lesson which can embrace a filmstrip that comprises all of the major lesson or merely part of it. Secondly, it can be used at the end of the lesson to evaluate the salient aspects of the lessons and discussions.

For the small-group instruction, it involves students moving into their distinct groups for detailed treatment and discussion of the major lesson introduced when they were in large group. They can as well work on individual projects and deliberate on a number of specialist views on the course topic. In determining the lesson format, individualized and personalized instruction may be sandwiched throughout the course so that individual learner may proceed at his own pace. Students in this group may be directed by group members to read about a topic using available resources.

Types of Team Teaching

There are four types of team teaching, viz.,

(i) Thematic approach, (ii) Concentric Approach, (iii) Concurrently presented thematic approach and (iv) Cumulative sequence approach.

These four types the writer represents as

Cumulative sequence approach

Concurrently presented thematic Approach

Concentric Approach
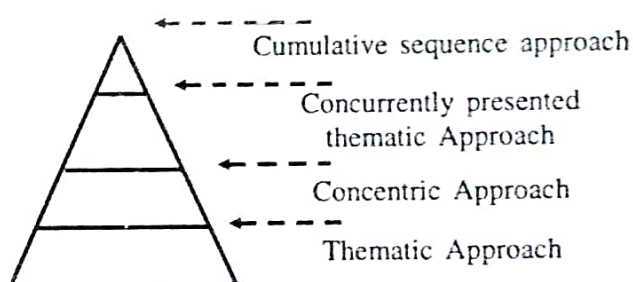
Thematic Approach

Thematic approach : From the illustration given above, this is the common base on which the others are built. In this approach, one central idea runs throughout the course, with relevant linked topics.

Concentric approach : The syllabus of work is arranged in such a way that from a central thematic point, subjects radiate outwards.

Concurrently presented thematic approach : Two or more linked themes are presented so that each member of the team studies one theme in detail.

Cumulative sequence approach : No theme is actually presented to the students at the onset rather an overall pattern is built up as the work proceeds. This is the peak and the programmes

are lined consecutively and their relationship with other programmes in the sequence remains uncertain or vague until the final stage of the scheme.

Team teaching In Vocational Home Economics

Home Economics is an experimental science and hence activity oriented. Illustrating with a topic in Home Economics, like "Steps in Bread Making Using Yeast" to see how it can be presented for a large class of 100 students using four expert teachers to make up the team.

The writer has to stress that in every experimental class in Nigerian secondary school, four crucial sessions are recognized. They are:

1. **Preparatory Laboratory Session** : The teacher tries a series of experiments to acquint himself with the techniques needed in the experiments.

2. **The pre-laboratory Session** : The teacher now introduces and presents the teaching strategies for the intended topic.

3. **The Laboratory Session** : The Students carry out the experiments themselves under the guidance of the teacher.

4. **The Post - Laboratory Session** : The teacher summarizes the students' results on the blackboard and both of them discuss the results of the experiments.

Applying the team teaching approach, firstly the team leader introduces the topic and gives a skeletal treatment of the steps in bread making using yeast. Secondly, the second group member with the assistance of the laboratory technicians presents a film showing the steps in bread making using yeast to the large group of students with little explanation.

Thirdly, the students are split into smaller groups of 25 each with a team member. These respective groups are also provided with all the necessary materials for the experiment. The students having retired in their groups now practise the steps involved in bread making using yeast with the resources available. Fourthly, in the post laboratory session, the entire groups reassemble for discussion and analysis. Meaningful deductions are made based on the result findings.

Fifthly, individualized and personalized study is introduced and each student is given a specific but related project or assignment to do on their own eg. "Steps in Making Queens Cake". This assignment or project work is usually discussed with the members of the team before the students start off.

Curriculum Development and Team Teaching

Education in developing countries has been described as suffering from "Narration Sickness". (Obianwu, 1985). This implies that much of the curriculum content is done through talking. The traditional 'Chalk and talk ' method of instruction has been found to be ineffective and questioned on the following grounds :

a) quality and efficiency of learning

b) the expected creative reforms to fundamental changes taking place in the society.

c) the basis of the needed broad range of objectives to cater effectively for diverse group of learners (individual differences) in the cognitive, affective, and psycho-motor domains.

In view of the ineffectiveness of the traditional or conventional method of teaching, the curriculum content has been revised to embrace a shift to a new system known as the principles of instructional technology which entails shifts as follows:

i) From the teacher's teaching to the learners, learning as key outcomes of instruction

ii) a shift from static to dynamic structure in the instructional programme

iii) shift from seeing the student as a member of the group to recognizing him as an individual

iv) shift from the use of audio-visual (A-V) materials primarily for group discussion but also for individualized instruction.

This new system led to the introduction of systematic instructional planning known as Instructional Technology. Educational or Instructional technology according to the British National Council for Educational Technology (1967) is the development, application and evaluation of systems, techniques and aids in the field of human learning. Concluding, Onyejemezi in Onwuka (1981) stressed that it is also a system by which methods can be used relevantly to support and complement one another. For instance, team teaching, large group teaching, discovery methods, etc are other techniques which used in an integrated pattern of management, produced a rich environment which the learn can develop.

This implies that team teaching as a bolster of students' achievement, is an indispensable tool for future curricular reviewers. This is because, students' needs, staff contribution and school factors which are the three theoretical bases of team teaching should not be side-tracked as noted by Obianwu (1985) in future developmental review of the curriculum for maximum efficiency inspite of its deficiency.

Advantages of Team Teaching

1. The team uses the expert interest of its members to improve students' performance.

2. It opposes the idea that the individual requirements of either the teacher or students are best served by departmentalization or compartmentalization (Warwick 1973).

3. It erases the idea that the subject teacher is the sole contributor to the lesson. Rather, it believes in the principle that the combined resources of all working harmoniously are far greater than the total of each individual member.

4. There is every likelihood that the team members learn from one another.

5. The team members widen the students' horizon of experiences due to their expert knowledge.

6. It helps the team member to be more resourceful and conscientious so as to meet up the academic demands.

7. It emphasises the direct relationship between the size and composition of the group to the nature of work to be done.

8. It is useful to schools wishing to revise their curriculum to be more child-centred.

Disadvantages

1. **Administrative problem:** It involves a lot of administrative bottle-necks - free time for meetings, subject identity, etc

2. **Space:** Inadequate teaching space hinders team teaching.

3. **Control:** The control of the large group of students for the lecture militates against effective team teaching.

4. Resources: Team teaching requires many resources which may be very costly to provide.

Conclusion

This paper attempted to awaken Nigerian curriculum planners and innovators as well as other governmental bodies charged with the formulation of Nigerian educational policies to view critically the educational implications of the attendant changes likely to take place by the year 2000 before which time, the government believes illiteracy will be eradicated in Nigeria.

They should always bear in mind that a child's needs are dynamic just like his society as noted in the paper, it then implies that adequate arrangements be made henceforth lest team teaching produce social misfits or its principles being a mirage, despite the fact that a worth while curriculum cannot be constructed by reference to children's wants or interest alone. (Barrow, 1978)

REFERENCES

Akubue, A.(1988), A Handbook on Classroom Organization and Management.

Barnes, M.W. (1960), **Common Sense and the Curriculum** London, George Allen and Unwin.

Bossing, N.L. (1952), **Teaching in Secondary Schools** U.S.A., The River-side Press.

Curson, L.B. (1978), "Teaching in Further Education" in Cessell, P.20

Fafunwa, Babs, A. (1967), **New Perspectives in African Education** . Macmillan and Company (Nigeria) Ltd.

Fafunwa, Babs, A. (1977), **History of Education in Nigeria**. London, George Allen and Unwin.

Federal Government of Nigeria, (1981), National Policy on Education.

Mills, H.R. (1977), **Teaching and Training: A handbook for instructors**. (Third Edition). London, Macmillian Press Ltd.

Obianwu, E.A. (1985), A Handbook on Audio-Visual Media.

National Council for Educational Technology. Report: **Towards More Effective Learning**. (1967-68) London, Education Press Ltd.

Okorie, Uga (1981) **Curriculum Development for Africa** . Nigeria, African Publishers Ltd.

Onwuka (1981) **Curriculum Development for Africa** Nigeria, African Publishers Ltd.

Ukeje, B.O. (1984), **Foundations of Education** Benin City, Ethiope Publishing Corporation.

Warwick, D. (1972), **Team Teaching** Unibooks.

Warwick, D. (ed) (1973), **Integrated Studies in the Secondary School**. University of London Press

EXPANDING THE SCOPE OF MAGIC SQUARES

ONWUKA, B.E.

ABSTRACT

This paper expanded the scope of magic squares making it possible to produce n by n magic square for any integral n. It supplied formulae which now makes it possible to write magic squares containing both positive and negative whole numbers. It introduced the concept of magic bundles which are matrices that can be converted into magic squares by a few interchanges of entries. For example natural numbers 1 to 16 is a magic bundle. The paper suggested a number of uses to which magic squares can be put, the most important being reviving the dwindling interest in mathematics especially in African and third world countries. The Paper surveyed various properties of magic squares and supplied a test for the enterprising reader.

Background To The Problem

Mathematics teaching in Nigeria since her attainment of political independence in 1960 has been an uphill task. The first problem to tackle was foreign oriented test books and teaching methodology. Text books were mainly imported from Britain into Nigeria. These books were mainly imported from Britain into Nigeria. These books were culturally contrasting to the Nigerian environment. Most of the examples used in them were strange to say the least. Furthermore the level of presentation was a little above that required for an emerging nation. The teaching methodology of the early sixties stressed computation and formulae. These problems were contained to some extent just after independence mainly because enrolment was low and pupil teacher ratio was big. This enabled teachers to pay closer attention to their students. Schools were then administered by missionary societies who took the moral development of both teachers and pupils very seriously. Absentism by teachers was virtually non-existent. The factor that was of very great advantage was that school age ranged from seven to ten years. This meant that pupil were very mature before they started schooling. They could therefore count and reckon and manipulate complicated figures at lower classes of school.

The situation changed dramatically in the early seventies when state governments started to take over school administration.

Missionary societies lost grip of schools and hence of teachers

Teaching profession became "government work". There was explosion in

school enrolment since some states not only took over school administration but also introduced free primary education. As a result school age dropped considerably, teacher pupil ratio dropped and class management became more problematic. Teachers were trained under crash programmes and were not given thorough training in methodology. A lot of teachers joined service not because of joy of teaching work but to find something doing. Teachers of mathematics were in short supply; in deed at the primary level every teacher is a teacher of mathematics in his or her class.

The following problems were identifiable:

i) Frequent and unsystematic use/ recommendation of text books involving lobbying by authors and publishers.

ii) Teachers lack of mastery of subject-matter.

iii) Apathy towards mathematics on the part of both teachers and students. This apathy resulted from lack of rich home environment, non attendance to preparatory/nursery schools, low school age, peer group stories about the difficulty of mathematics and bad method of teaching which did not stress participation and experimentation, and poor training of teachers.

iv) Government take over of schools which set the teachers free and opened avenues for private business ventures and encouraged absentism, It alienated teachers from their cherished students and encouraged moral laxity in teacher - pupil relationship.

An urgent need exists to revive the dwindling interest in mathematics especially at the teacher training level so that the trained teachers can contain the existing situation at the primary school and secondary school levels.

The author has been teaching mathematics and statistics at a technical teacher institution for the past ten years and has been working seriously, to review the subject of recreational mathematics to get more disciples and followers for mathematics. It is on the background of the problems besetting the teaching of mathematics in Nigeria and indeed in all African Countries that the author embarked on research into recreational mathematics to expand the scope of magic squares.

EXPANDING THE SCOPE OF MAGIC SQUARE

Magic Formulae:

Magic formula for generating suitable numbers which can be organised into a magic square has been developed by the author. Indeed for each n x n magic squares, many formulae have been supplied for writing different magic squares having n rows and n columns. For example a magic formula for 4 by 4 magic square is given by $157 - 15S = 2b$

The auxiliary formula is $\dfrac{41 - b}{S - 5} = \dfrac{15}{2}$

This form suggests that S assumes 1, 3, 5, 7, 9, 11, 13. .... This magic formula can also yield 8 by 8 magic squares 12 by 12 magic squares, 16 by 16 magic squares 20 by 20 magic squares. To obtain magic squares which are not 4 by 4 from this formula magic synthesis is used. This consists of arranging a number of 4 by 4 magic squares into adjoining blocks to form another magic square having numbers of columns and rows which are multiples of 4. These are shown in the diagram below:

4 by 4 Magic Square

4 by 4 Magic Square	4 by 4 Magic Square
4 by 4 Magic Square	4 by 4 Magic Square

For each value which S assumes a different magic square is possible. Magic formulae for generating numbers which can be arranged into 3 by 3 magic square exist. For example a magic formula for 3 by 3 magic square is $51 - 4S = b$ for $S = 1, 2, 3, 4, 5, 6,$ .... The magic trace or auxiliary equation is $\dfrac{31 - b}{S - 5} = 4$

For each S one different 3 by 3 magic square is possible. The formula is also used to generate numbers which can be organised into 6 by 6, 9 by 9, 12 by 12, 15 by 15, 18 by 18, 21 by 21 etc. magic squares. In the case of any magic square possible from this formula which is not 3 by 3, magic synthesis is used. This as usual consists of arranging the available 3 by 3 magic squares as blocks into magic squares whose number of rows and columns are multiples of 3. The diagrams below illustrate the procedure used:-

3 by 3 Magic Square

3 by 3 Magic Square	3 by 3 Magic Square
3 by 3 Magic Square	3 by 3 Magic Square

A magic formula for 5 by 5 magic square is $193 - 12S = b$, $S = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10$ ....

The auxilliary equation is $\dfrac{16 - b}{s - 11} = 12$

Using magic synthesis we can use this formula to produce 10 by 10, 15 by 15, 20 by 20, 25 by 25 etc. magic squares. To achieve these we again use magic synthesis.

A magic formula for 7 by 7 magic square is $352 - 24S = b$, $S = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,$...........................

The auxiliary equation is $\dfrac{136 - b}{S - 9} = 24$

By suitable magic synthesis we can use this formula to produce 14 by 14, 21 by 21, 28 by 28, 35 by 35 etc magic squares.

It is possible to produce a family each of 9 by 9, 11 by 11, 13 by 13, 15 by 15, 17 by 17, 19 by 19, 21 by 21, etc using a magic formula for each family. Using the method of magic synthesis it is then possible to produce families of magic squares having rows and columns as multiples of 9, 11, 13, 15, 17, 19, 21 etc. respectively.

As an illustration a magic formula for 9 by 9 magic square can be obtained as $500 - 40S = b$, $s = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,$ .... The trace or the auxiliary equation of this magic formula is $\dfrac{180 - b}{S - 8} = 40$

A magic formula for 11 by 11 magic square is $740 - 60S = b$, $s = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,$ ....

The trace or the auxillary equation is $\dfrac{320 - b}{S - 7} = 60$

Many formulae for others can be supplied at will. Indeed for every odd n, simpler magic formulae exist for generating numbers which can be arranged into n by n magic square. Such simpler formulae are also cheaper both in terms of labour, a esthetics and

awesomeness. For example, let a + (n - 1)d be the nth term of any arithmetic sequence, then the first 9, 16, 25, 49, 81, 121 etc terms can be arranged into 3 by 3, 4 by 4, 5 by 5, 7 by 7, 9 by 9, 11 by 11, etc magic squares. By magic synthesis it is possible to use the produced magic squares to obtain larger magic squares having numbers of rows and columns which are multiples of 3, 4, 7, 9, 7, etc. respectively.

Indeed for each infinite arithmetic sequence, the above mentioned 9, 16, 25, 49, 81, 121 etc consecutive terms can be obtained by starting with any term of the sequence as the firs term for our purposes.

Each magic square based on a magic formula can yield the magic formula provided the auxiliary equation, otherwise called the trace of the magic formula is available.

Magic formulae have made it possible to write magic squares which are i) entirely made up of positive integers.

ii) made up of both positive and negative integers.

In short magic formulae have extended the set of operation from the natural numbers into the set of integers. Shown below are a number of magic squares without their magic formulae and their trace.

(1) 2 by 2 Magic Square

7	7
7	7

(2) 3 by 3 Magic Square

240	100	200
140	180	220
160	260	120

(3) 4 by 4 Magic Square

196	70	79	169
97	151	142	124
133	115	106	160
88	178	187	61

(4) 5 by 5 Matrix Square

145	194	33	82	131
187	61	75	124	138
54	68	117	166	180
96	110	159	173	47
103	152	201	40	89

(5) 6 by 6 Magic Square

118	27	92	135	31	91
53	79	105	55	79	103
66	131	40	67	127	43
133	7	97	136	3	98
43	79	115	41	79	117
61	151	25	60	155	22

(6) 7 by 7 Magic Square

133	169	105	7	43	79	125
165	101	31	39	75	121	129
197	27	35	71	117	153	161
23	59	67	113	149	157	193
55	63	109	145	181	189	19
87	105	141	177	185	15	51
101	137	173	109	11	47	83

(9) 10 by 10 Matrix

718	1006	62	349	636	734	1049	14	329	644
965	226	308	595	677	1004	194	284	599	689
185	267	554	842	924	149	239	554	869	959
431	513	801	883	144	419	509	724	914	104
472	759	1047	103	390	464	779	1094	59	374
898	1120	2	394	786	730	1038	26	334	642
1134	226	338	730	842	994	202	290	598	686
170	282	674	1066	1178	158	246	554	862	950
506	618	1010	1122	114	422	510	818	906	114
562	954	1176	58	450	466	774	1082	70	378

(10) 11 by 11 Matrix

340	405	470	440	505	5	70	135	200	265	330
400	465	435	500	55	65	130	195	260	325	335
460	430	495	50	60	125	190	255	320	385	395
425	490	45	110	120	185	250	315	380	390	455
485	40	105	115	180	245	310	375	440	450	520
35	100	165	175	240	305	370	435	145	510	480
95	160	170	235	300	365	430	495	505	475	30
155	220	230	295	360	425	490	500	470	25	90
215	225	290	355	420	485	455	465	20	85	15
275	285	350	415	480	450	460	15	80	145	210
280	345	410	475	445	510	10	75	140	205	270

(11) 12 by 12 Magic square:

251	83	95	215	236	96	106	206	266	70	84	224
119	191	179	155	126	186	176	156	112	196	182	154
167	143	131	203	166	146	136	196	168	140	126	210
107	227	239	71	116	216	226	86	98	238	252	56
281	57	73	233	294	44	62	240	311	31	51	251
105	201	185	153	98	204	188	152	91	211	191	151
169	137	121	217	170	134	116	222	171	131	111	231
89	249	265	41	80	258	276	26	71	271	291	11
176	148	150	170	196	140	144	184	206	122	128	188
154	166	164	160	152	176	172	164	140	176	170	158
162	158	156	168	160	156	180	164	152		146	182
152	172	174	146	148	188	192	136	134	194	200	116

Let us develop a family of 5 by 5 magic squares using the magic formula $193 - 12S = b, S = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,$ ....

The trace is $\dfrac{61 - b}{S - 11} = 12$.

For $S = 1$, $b = 181$, $S = 2$, $b = 193 - 24 = 169$, $S = 3$, $b = 193 - 36 = 157$,

$S = 4$, $b = 193 - 48 = 145$, $S = 5$, $b = 193 - 60 = 133$, $S = 6$, $b = 193 - 72 = 121$,

$S = 6$, $b = 193 - 72 = 121$, $S = 7$, $b = 193 - 84 = 109$, $S = 8$, $b = 193 - 96 = 97$,

$S = 9$, $b = 193 - 108 = 85$, $S = 10$, $b = 193 - 120 = 73$, $S = 11$, $b = 193 - 132 = 61$,

$S = 12$, $b = 193 - 144 = 49$, $S = 13$, $b = 193 - 156 = 37$, $S = 14$, $b = 193 - 168 = 25$,

$S = 15$, $b = 193 - 180 = 13$, $S = 16$, $b = 193 - 192 = 1$, $S = 17$, $b = 193 - 204 = -11$, etc.

Now for each S there is a different 5 by 5 magic square.

For $S = 1$, We have the following numbers

181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205.

The associated Magic Square is:

197	204	181	185	195
203	185	187	194	196
184	186	193	200	202
190	192	199	201	183
191	198	205	182	189

For $S = 2$, the associated numbers are:

169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 217.

The associated magic square is:

201	215	169	183	197
213	177	181	195	199
175	179	193	207	211
187	191	205	209	173
189	203	217	171	185

For $S = 3$, the associated numbers are:

157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190, 193, 196, 199, 202, 205, 208, 211, 214, 217, 220, 223, 226, 229.

The associated magic square is:

205	226	157	178	199
223	169	175	196	202
166	172	193	214	220
184	190	211	217	163
187	208	229	160	181

For $S = 4$, the associated numbers are:

145, 149, 153, 157, 161, 169, 173, 177, 181, 185, 189, 193, 197, 201, 205, 209, 213, 217, 221, 225, 233, 237, 241.

The associated magic square is:

209	237	145	173	201
233	161	169	197	205
157	165	193	221	229
181	189	217	225	153
185	241	241	149	177

By placing these 4, 5 by 5 magic squares as adjoining blocks, we can produce a 10 by 10 magic square as shown below:

197	204	181	188	195	205	226	157	178	199
203	185	187	194	196	223	169	175	196	202
184	186	193	200	202	166	172	193	214	220
190	192	199	201	183	184	190	211	217	163
191	198	205	182	189	187	208	229	160	181
201	215	169	183	197	209	237	145	173	201
213	177	181	195	199	233	161	169	197	205
175	179	193	207	211	157	165	193	221	229
187	191	205	209	173	181	189	217	225	153
189	203	217	171	185	185	241	241	149	177

From the above we see that for each magic formula, S stands for the Common ratio of the mother arithmetic progression while b stands for the first term. The most useful form of a magic formula is called a magic form. With the removal of a certain factor it becomes what is called a magic trace.

In the form of linear equation it becomes a magic formula for example $2\dfrac{a-b}{S-d}$

$= 48$ is a magic primitive and $2\dfrac{182-32}{11-7} = 48$

is called magic starter, $2\dfrac{128-b}{S-7} = 48$ is called

a magic form $\dfrac{128-b}{S-7} = 24$ is called a magic

trace while $296 - 24S = b$ is called a magic formula. To determine whether an arbitrary linear equation with integral coefficients is a magic formula is possible but involved. Developing traces to various forms of magic formulae is an easier task.

Possible uses of the Magic Square:

1) Repayment of Loans can be made using magic plan. This will be useful to a business man who engages in seasonal business or business with yields fluctuating seasonally.

2) In statistics a magic formula can yield a family of discrete data all having the same mean. These data can be used to illustrate the concept of dispersion.

3) Magic squares provide fun and recreation in mathematics.

4) Magic squares provide insight into properties of integers.

Properties of Magic square:

1) The sum of two magic squares is again a magic square

2) If a set of integers will yield a magic square, two types of arrangement are possible viz; in ascending order or descending order.

3) The square of a magic square is a symmetric matrix.

4) The transpose of magic square is again a magic square.

5) Interchange of rows or columns leaves the magic square a magic square.

6) Rotation of a magic square through 90^0 whether positively or negatively leaves a magic square

7) A magic square is a square matrix having a common sum for entries in all the rows columns and diagonals.

8) Magic square are based on a certain sequences of integers called arithmetic sequences.

9) Magic squares and history of mathematics form the chore of modern Recreational Mathematics.

10) The difference and scaler multiples of a magic square are magic squares.

The cheapest magic squares to produce are 4 by 4 and 3 by 3 magic squares. For 2 by 2 magic square we encounter a case of degeneracy. Indeed four copies of any integer can be arranged into a 2 by 2 magic square.

Among magic squares larger than 4 by 4 magic squares having odd number of columns and rows are easier to produce.

Associated with 4 by 4, 8 by 8, 12 by 12, 16 by 16, 20 by 20, etc magic squares is the concept of magic bundle which is a square matrix which can be converted into a magic square by either of the following number of moves, 4, 16, 36, 64, 100, 144 .... To convert 4 by 4 magic bundle into a 4 by 4 magic square only 4 moves are required. Indeed 12 of the entries in the magic bundle retain their previous positions. To convert an 8 by 8 magic bundle into a magic square, 16 moves are required. Indeed 48 of the 64 entries in the magic bundle retain their previous positions in the matrix. For 12 by 12 magic bundle, 36 moves are required while 64 entries retain their previous positions. Any 4 by 4, 8 by 8, 12 by 12, 16 by 16, 20 by 20 etc magic squares can through inverse operations be converted back into the magic bundles from which they were formed. From a 4 by 4 or 8 by 8 or 12 by 12 or 16 by 16etc magic bundles a family of 1, 4, 9, 16 etc respectively finite arithmetic sequences can be unfolded.

SUMMARY

Let n be an arbitrary integer and let it be required to produce an n by n magic square, then if n is odd natural numbers 1 to n^2 can be arranged into n by n magic square. If on the other hand we need not only an n by n magic square but also 2n by 2n, 3n by 3n, 4n by 4n, 5n by 5n, etc magic squares then we must use a magic formula to generate a family of n by n magic squares which we arrange in contiguous blocks to produce these large magic squares whose number of rows, and columns are multiples of n. On the other hand if n is even it is not possible to arrange natural numbers 1 to n^2 into a magic square. An exception is $n^2 = 4$. Indeed magic squares of even number of rows and columns except 4 are impossible without the use of magic synthesis, Before the discovery of magic formula magic squares with even number of rows and columns such as 6 by 6, 8 by 8, 10 by 10, 12 by 12, 14 by 14 etc were possible by magic synthesis involving duplication, triplicating quadruplicating etc of one single magic block. This makes the resulting magic square common place since such magic squares contain entries repeated upwards of 4 or more times. With the discovery of magic formula magic squares were diversified; it became possible to write 2n by 2n magic square for any integral n, with all entries in magic square different. For every positive integral n, there exist infinite number of n by n magic squares and it is possible to write an infinite sequences of n by n magic square. Thus there is no single gap in the sequence 1 by 1, 2 by 2, 3 by 3, 4 by 4, 5 by 5, 6 by 6, 7 by 7, 8 by 8, 9 by 9, ... n by n magic squares. In fact infinite such sequences exist and help in enriching the curriculum of recreational mathematics as well as throwing deep insight into the structure of the set of

integers. It is hoped that recreational mathematics will rekindle the dwindling interest in the subject mathematics and quicken the pace of global technological development.

EXERCISES

1) Use the following magic formula to produce 3 by 3, 6 by 6, 9 by 9, 12 by 12, 15 by 15 magic squares. $41 - 4S = b$, $S = 1, 2, 3, 4, 5, 6, 7$...................

2) Use the following magic formula to produce 4 by 4, 8 by 8, 12 by 12, 16 by 16 magic squares $531 - 15S = 26$, $S = 1, 3, 5, 7, 9, 11, 13, 15, 17$, ...

3) Use the same magic formula to produce 4 by 4, 8 by 8, 12 by 12 and 16 by 16 magic bundles.

c) Show that the magic formula $579 - 15S = 2b$ $S = 1, 3, 5, 7, 9$, ... is functionally equivalent to the formula $531 - 15S = 2b$, $S = 1, 3, 5, 7, 9$, ...

3) Use the following magic formula to produce 5 by 5, 10 by 10, 15 by 15, 20 by 20, magic squares. $625 - 12S = b$, $S = 1, 2, 3, 4, 5, 6, 7, 8, 9$,...................

4) Use the magic formula $625 - 12S = b$, $s = 1, 2, 3, 4, 5, 6, 7, 8, 9$, ... to produce 25 by 25, 30 by 30, 35 by 35, and 40 by 40 magic squares.

5) Produce a 4 by 4 magic square containing the numbers 7, 11, and 15.

b) Produce a 5 by 5 magic square containing the numbers 15n9, 155 and 151.

6) Arrange natural numbers 1 to 169 into two different 13 by 13 magic squares.

7) Produce any two 9 by 9 magic squares and use them to show that 1) the sum of two magic squares is a magic square.

ii) the difference of two magic squares is a magic square.

iii) the transpose of a magic square is a magic square.

iv) two sets of numbers with the same mean may have different variances.

BIBLIOGRAPHY

1) Abbot M.H. **Side Trips in Mathematics** New York, N. World Publishing Company U.S.A., 1864

2) Meyer J.S. **Fun with Mathematics** New York, world Publishing Company, U.S.A.

3) Fuckerman, (Trans) Selection from **Mathematics for the Amatuer** Princeton, Princeton, Universit

A STUDY OF THE UTILIZATION OF EDUCATIONAL TELEVISION PROGRAMME FOR SCHOOLS IN NKPOR URBAN

O.E. OCHUBA

ABSTRACT

This study aimed at utilizing media facilities like educational broadcasting and television in the furtherance of instructional programme for teachers in Secondary and Primary schools, an attempt which will greatly enhance development of better schools especially under the present social economic quagmire of the country. Most children don't want to go to school any more, may be due to austere school environment or uncared attitude of the teaching staff.

There is therefore a need to find better and more scientifically efficient way for better schooling. There is presently a lack of resources in schools like laboratories, teaching aids etc. not to talk of radio, television and other media facilities.

By the end of this treatise an attempt will be made at making suggestions which if adhered to could make for better school and better learning environment.

INTRODUCTION

Education is the basis for the preparation of the individual to take his place in his society. This primary and encompassing objective of preparing the individual to live effectively in and contribute to the development of his society can only be achieved by exposing the individual to well planned learning opportunities and experiences. Learners are expected to be provided with appropriate learning experiences. A systematic integration of a variety of resources in teaching - learning process or environment produces appropriate learning experiences, which in turn result in effective meaningful learning. Experiencing for the learners means having them see, hear, touch, taste, made do and try (Dale 1962: 24). Experiencing is therefore the process of acquisition of knowledge, skills, attitudes and understanding through active participation on the part of the learners. Experience can be direct with real things/life situations or second hand for example, through pictures, models or through experiences recounted by a writer or speaker.

Educational broadcasting has made a considerable impact on our society. Its lateness as a means of communication not withstanding. The world really seems smaller with radio and television as one sits in his room and views or hears what happens in the world around. Broadcasting cuts across all boarders.

Broadcasting is educational. Since the purpose of broadcast is however dependent on the producer and could be seen from the content, production and presentation of the programme. However, the need for educational purpose in mind is on the increase. All countries of the world that used educational broadcasting scored outstanding success. Since teaching in Kenya would not have been successful without educational radio. The growth of broadcasting audience has been on the increase. Broadcasting together with the development of recording, have led to an extra-ordinary increase in audience for educational programmes of all kinds. Educational programmes could be referred to as broadcasting on radio or television which is an example of physical resource. The programmes can be used for both formal and informal learning.

In Nigeria, started in 1959 when the Western Region Government established the Western Television station in the whole of black Africa. Educational Television Programmes developed as part of the general broadcasting programmes as private ownership of the broadcast media was not allowed.

Many developed countries as well as developing countries have been using the television medium to supplement teachers instruction in the classroom, but there are problems, associated with television utilization.

Some of these problems include:

1) Problem of language

2) Problem of inappropriate time for broadcast

3) Problem of face to face relationship between producer and teachers

4) Technical problems from instructional equipment.

5) Problem of evaluation as the teacher cannot get feedback from students.

Some researchers have done investigations to identify these problems, but much has not been done to investigate how far the educational programmes are being utilised to achieve its objectives.

The Concept of Resources

Education like every other enterprise or organisation has aims and objectives. To achieve the objectives, resources are basic requirements. Management of organisations should try and make some decisions about how to use the resources available to them. Onyejemezi, (1991) defined resources as those things that enhance the achievement of organisational or institutional objectives.

There are three main types of resources:-

i) Financial resources

ii) Physical resources

iii) Human resources

Financial Resources

Financial resources mean money in its various forms, local currency, hard currency, letters of credit accounts receivable and other forms of indebtedness. There are many ways of generating financial resources such as sales of goods, services, loans, sales of stock and bonds subsidies local donations, different types of levies or assessments and international aids.

Physical Resources

These are the material things such as buildings, items of equipment, softwares, raw materials or natural resources which the organisation controls.

Human Resources

People with different specialities, capabilities and roles, who are part of the organisation are the human resources. They may be direct employees, clients or customers served, temporary employees or consultants, part-time persons or any persons with different types of other relationships to the organisation, as these people hold a variety of memberships and levels of commitments to the organisation, while the organisation makes different kinds of demands on them and classifies them in various ways. Resources in education comprise all these three groups - financial, physical and resources. Human resources learners, teachers, non-tutorial staff, leaders in education, educational administrators, members of the community with relevant skills or knowledge. Physical resources are spaces, building and other infrastructural facilities, real life situations or objects from the community, representation of real objects such as pictures, models, audio recordings, video recordings, films and the hardware for producing or using them - tape recorders, video and play-back equipment, different types of projectors, television, computer etc. Educational resources also include any item of information, a piece of evidence, an activity, an idea or a series or combination of these, that a child can be directed or turned to in the development of his ability to learn, think, feel, discriminate, create.

It is anything in the environment that may be of value in forwarding the thinking and understanding of children, whether it is articraft, a person or an experience, an account, an explanation or a piece of information (Holder and Mitson 1974:3).

Instructional Resources And The Teacher

We shall recall that as good teachers, we do more than communicate ideas or knowledge to learners. At the same time we follow up the learner's progress, give assignments or tasks to give practice in the use of the new knowledge; discuss other issues that may arise in the course of guiding the learners, make effort to create interest and motivation in learning. In carrying out these teaching-learning activities or academic injunctions, we cannot depend solely on our voice. The learner's senses of learning must be appealed to like sight (see), hearing (ear), touch (limbs, the body), smell (nose) and taste (mouth). (Onyejemezi, 1991). The learner sees, hears, tastes, smells, touches, actively participates in the teaching - learning process and thereby learns with understanding. Anything which the teacher uses to stimulate the learner and which results in understanding the curriculum content is a learning resource. So television is a learning resource. In essence, instructional resources or materials facilitate the main objective of providing the learner with the right type of experience in a teaching - learning situation which results in meaningful learning.

For teachers to provide appropriate learning experiences for the learners, they should use a variety of learning resources or materials that appeal to the different senses. The spreading out of the content to be learnt before the students through the use of different learning resources or materials is known as the Multi-Media approach. The multi-media approach gives individual learners the opportunity of learning from resources that suit them best. Harden and King (1971) in their work, stated that "Multi-Media" provides vital material for learners of different capacities, interest and learning styles, add vividness to learning thus increasing learning.

Communication and Education

The rapid development of communication in most countries, the expansion of various forms of mass communication and in particular of audio-visual communication, combined with the spread of information, open up new horizons and multiply one linkage between education and communication. There is a conspicuous increase of the educational potential of communication. Endowed with a greater educational value, communication generates an "educational environment". While the educational system loses the monopoly of education, communication becomes a vehicle for and a subject of education (Sandman etc 1973).

The educational value of information and communication and their impact on intellectual development are considered to be of primary importance by many thinkers, research workers and government authorities, in particular in the third world. The educational and socializing role pertaining to communication implies that it should correspond to the utmost society's development needs, and be treated as a social good.

Secondly, the omnipresence of communication in modern society is a sign of the emergency of a new frame work for the personality, with a strong educational flavour. The bombarding of citizens with an ever-growing volume of information, the extension of news flows to new social or geographical categories, has created the impression that access to knowledge is now free, and that social distances could be eliminated and professional strictness revealed. There is talk of the emergence of a "new man" capable to varying degrees of being fashioned day by day in his habits of thinking, his critical attitudes and his technical know-how-by this environment (Dale, 1962).

At the same time, in Nigeria, broadcasting stations have developed interesting, useful and imaginative educational programmes, some of "formal" nature (as complements or other of "informal" pattern (particularly for farmers, adults and people in need of technical knowledge (George, 1991). Some stations dedicate separate broadcasting channels in radio and television to educational programmes, while some reserve shorter or longer periods of their general broadcasting schedules for educational, training and learning purposes.

The sudden extension of the use of communication technologies for educational purposes first led to an analysis of the effective impact and direct influence of evermore stimuli upon individuals and generate discussion of the media's educational impact upon cognitive development or behaviour patterns of stimulus response (Tubbs et al, 1980).

Today conclusion is being drawn that communication forms part of a broader set of transformations caused by gradual changes in the environment, and impact of technologies differs according to the psychological, intellectual, social and cultural circumstances of the individual exposed to them.

From this point of view, the interpretation of the "non-formal" educational action of the media is following the same trend as educational thinking in general.

Utilisation of Television of Education: Exam Success by Students

From the research conducted, it shows that there were no provision of television sets in schools. Only 27% of the schools have

television set, while 73% of them do not have television sets. Almost all of the respondents were not aware of the NTA Channel 8 "Exam Success Programme 70". 86% of the students interviewed were not aware of the programme but 14% were aware of the programme. 78% of the respondents do listen to the programme, 3% listen by chance and 19% listen usually.

There was no provision of accommodation for the listening audience. 90% of the respondents emphasized that they do not have space for the listening audience, while 10% agreed that they have inadequate space militating against effective utilization of educational broadcasting programme.

The research showed that the time of the broadcast to the students in schools was not suitable for effective learning. 100% of the target audience responded that the time of the broadcast was not suitable.

The time of the broadcast affects the utilization of the programme. There is no educational broadcast in the school time-table. There was nothing like "Exam success" programme or broadcasting in their time tables.

The research also indicated that day students were more exposed to the programme than boarders. Most of the homes have television sets while majority of the schools do not have it.

The result also showed that the programme was not always based on the school syllabus; 51% emphasised that the producers rarely based the programme on school syllabus.

Lack of consultancy affects the achievement of this programme "exam success". This is because the producers rarely consult the teachers before broadcasting. And this had adverse effect on effective utilization of the programme.

CONCLUSION

The study aims at investigating the problems associated with utilization of educational television programmes among schools in Nkpor Urban. Based on the result of the findings, the study is emphasises that the programme is purely not meeting the target audience. Only 10% of the total target population agreed to be benefitting from the programme while 90% do not favour it. Furthermore, the time for the programme does not fall in line with the current school programme because while schools open by 8.00 a.m. and end at 2.30 p.m, the television programme comes up around 5.30 p.m. And this is the time for the games and other extra-curricular activities for the students and the period for the preparation of what to teach in the next school day for the teachers. Also, communication gap between the NTA producer and teachers in the secondary schools does adversely affect the utilisation of the programme by the secondary schools.

REFERENCES

Dale, E. (1962) **Audio Methods in Teaching** (Revised Edition) New York, Holt, Rinehar and Winston.

George, Comstock, (1991) **Television and Human Behaviour** Complete summary of Research on Television's Impact. New York, Random.

Harden and King (1971) **Innovations in Education Pros and Cons** Washington, Jones Publishing Co.

Holder, M.L. and Mitson, R. (1974) **Resource Centres** London, Methuen Educational Ltd.

Onyejemezi, D.A. (1988) in Mkpa, ed. **Educational Technology in Nigeria Education**. Onitsha, Summer Educational Publishers.

Onyejemezi, D.A. and Akude, I.K. (1986) **Educational Technology Materials for Effective Teaching** Research Reprot presented at the Anambra State Chapter of the National Association of Educational Technologists' conference.

Sandman, P.M., Rubin, D.M. Schman, D.B. (1973) **Introduction to Mass Media** New Jersey, Prentice Hall.

Tubbs, Stewart, Moss and Sylvia (1980) **Human Communication** New York, Random House

EXPLORING AVENUES FOR INDUSTRIAL USES OF FACTORS AND COMPOSITE NUMBERS

E.O. BENJAMIN

ABSTRACT

This research Work aimed at providing an easy means of identifying all prime and composite numbers and factorizing all composite numbers, in any chosen range. This objective was achieved using the sequence of natural numbers. The composite numbers were ordered as rows and columns of an infinity by infinity matrix. The common differences of the row and column sequences yield the factors of the number at which the two sequences intersect. The prime numbers showed themselves by not being present in the matrix. A descriptive algorithm was presented for obtaining all the prime factors of n!

Background to the problem

Factors and composite numbers hold a high promise of providing a means of modern information coding and decoding. This promise had necessitated a revisit of the prime and composite numbers. Already in a pilot research work conducted in 1992 I found out that 2, 3 and 5 are exceptional prime numbers and all other prime numbers excluding them are contained in eight basic arithmetic sequences. These sequences are

1) $\{30n-23\}$ 2) $\{30n-13\}$ 3) $\{30n-19\}$ 4) $\{30n+1\}$ 5) $\{30n-17\}$ 6) $\{30n-7\}$ 7) $\{30n-11\}$ and 8) $\{30n-1\}$. Besides, this pilot research showed beyond all doubt that all composite numbers can be ordered in arithmetic sequences forming rows and columns of a large matrix while prime numbers cannot be so arranged. In

a second pilot research work conducted in 1994 I developed an algorithm to identify all odd composite numbers and to factorize them completely. The composite numbers analysed had to be odd because I worked in the set of integers module 2. Even so, the work appeared to be comprehensive since even composite numbers are trivial from the point of view of factorization. One could go on dividing by two until one obtains an odd composite or prime number. Perhaps, the merit of this second pilot research can be estimated by examining the research procedure and the procedure employed in identifying and factorizing any odd composite number. The set of integers module 2 is 1, 3, 5, 7, 9, 11,13,........................I noted that this set contains all prime numbers except 2 because all prime numbers except 2 are odd. Secondly, I noted that this set also contains

composite numbers and that every composite number it contains also has as factors elements of the sequence. I therefore proceeded to produce a matrix of locations of all composite terms in this sequence. The numbers 9 and 15 occupy locations 5 and 8 in this sequence. This means that the matrix of locations will contain as entries such numbers as 5 and 8; it would not contain 1, 2, 3, 4, 6, etc because these locations are those of prime numbers. We thus see that such a matrix will be useful not only in identifying composite numbers but also in identifying prime numbers. Since there is a relation between the term of an arithmetic sequence and the location it occupies, we see that when a location occurs in the matrix, we can use it to decode and identify the composite number occupying the location. Furthermore, any location which fails to occur in the matrix can be used to identify the prime number which should occupy such a position. But what of using the matrix to factorize any identified composite number? This question was taken care of in the construction of the matrix. Indeed the matrix of locations has rows as arithmetic sequences and columns as arithmetic sequences. The factors of the composite number identified are simply the common differences of the row and column sequence which intersect at the location of the composite number. The matrix is an infinity by infinity matrix but if we are interested in all composite or prime numbers less than or equal to 5000 we consider only the entries spanning 5000 × 5000.

The matrix is shown below

5	8	11	14	17	20	23	26	....
8	13	18	23	28	33	38	43	....
11	18	25	32	39	46	53	60	....
14	23	32	41	50	59	68	77	....
.	.	.	.	.	.	.	.	....

Using the relevant common differences, the mark can be extended in both directions.

Any location L can be decoded to yield the composite number C using the relation $2L - 1 = C$. For example $2(5) - 1 = 9$. Conversely any odd number n such as 57 can be verified to be a composite or not by searching for $\frac{n+1}{2} = \frac{57+1}{2} = 29$ in the matrix. Notice that 29 occurs in the matrix, hence 57 is a composite number. The factors of the composite number $2L-1$ with location L are the common differences of the row and column sequences in which the location is found. For example the composite number with location 29 is 57. The required row sequence is 5, 8, 11, 14, 17, 20, 23, 26, 29 .... and the required column sequence is 20, 48, 67, 86, ... The factors of 57 are therefore 3 and 19.

Purpose of study

The decoding procedures involved in applying the findings of the above research made me think of looking for a more suitable sequence which does not involve such an exercise.

Research Questions

To guide the conduct of this research, the following hypotheses were formulated.

1. a) Picking up the comprehensive sequence of natural numbers 1, 2, 3, ...n, can the composite terms be completely ordered as column and row sequences in a matrix?

b) Since each term echoes the position it occupies in this sequence will it be possible for only composite numbers to occur while prime

numbers fail to occur as entries in the proposed matrix?

c) Can the matrix be constructed so as to make it possible to factorize completely every composite number and identify every prime number in any chosen range?

Research Procedure

The researcher picked up the comprehensive sequence of positive whole numbers, namely 1, 2, 3, 4, 5, ... and developed an infinity by infinity integral matrix of all composite numbers. All rows and columns are simple arithmetic sequences and contain no prime numbers. The details of operations applied are as follows:

The sequence (n) being comprehensive contains all prime numbers and all composite numbers. Every composite number in the sequence has as factors prime numbers or composite numbers also in the sequence.

Now 4 is the first multiple of 2, 6 is the first multiple of 3, 8 is the first multiple of 4. Thus the first multiples occur in a regular sequence namely 2(n+1). Now for each such first location we have a common difference of n + 1. Therefore in line with Onwuka's (1993) research procedure, I developed the following infinity by infinity integral matrix of locations as follows:

$$= 2(n + 1) + (N - 1)(n + 1)$$
$$= 2n + 2 + nN - n + N - 1$$
$$= n + N + nN + 1$$

For n = 1, we have row 1 as
2N + 2, N = 1, 2, 3, 4, 5, ...

For n + 2 we have row 2 as

3N + 3, N = 1, 2, 3, 4, 5, ...

For n = 3, we have row 3 as

3N + 4, N = 1, 2, 3, 4, 5, ...

The first few entries are shown below:-

4	6	8	10	12	14	16	18	20	....
6	9	12	15	18	21	24	27	30	....
8	12	16	20	24	28	32	36	40	....
10	15	20	25	30	35	40	45	50	....
12	18	24	30	36	42	48	54	60	....
.	.	.	.	.	.	.	.	.	....
.	.	.	.	.	.	.	.	.	....
.	.	.	.	.	.	.	.	.	....

Noting that rows and columns are simple arithmetic sequences, the entries in the rows and columns can be extended to any desired n. This matrix yields the first n prime numbers for any n. These primes are merely noted as missing from the matrix. Using this matrix, a symbolic algorithm will be developed to obtain all the prime factors of n!. The principle on which the proposed algorithm will be based is the following:-

To obtain all the prime factors of n!, stretch each row and each column as far as to K ≤ n. In other words K is the greatest entry less than or equal to n. From this matrix pick up all missing numbers as prime factors of n!. Regard all numbers occurring in the matrix, disregarding repetitions, as composite factors of n!. Factorize each composite factor by calculating the common difference of the row and column sequences in which the composite factor occurs. These by design are the factors of the composite factors. If the subfactors are missing from the matrix collect them as further factors of n! If they occur in the matrix, again calculate the common differences of the row and column sequences in which they occur. These are again factors of n! If they occur in the matrix, again calculate the common

differences of the row and column sequences in which they occur. These are again factors of n! Continue this process until none of the subfactors occurs in the matrix. Then collect all the prime factors of n! In actual calculation, the matrix is most useful in recursive supply of all primes n.

CONCLUSION

All the research hypotheses have been successfully verified. The purpose of study has been fully achieved. This can be followed by symbolic realization of the proposed algorithm for obtaining all the prime factors of n! The research findings have opened new avenues for examining the set of integers.

REFERENCES

1. Green S.L. (1966): **Advanced Level Pure Mathematics**, London, University Tutorial Press, England.P. 373.

2. Gupta S.L. & Rani N. (1970): **Fundamentals of Real Analysis** 2nd Edition Chaziabad U.P., Vikas Publishing House Ltd.

3. Onwuka B.E. (1993): "Presenting the Prime Numbers in Regular Sequences". A basic Research Project awaiting Publication.

4. Onwuka B.E. (1994): "An Inquiry Into the Structure of the Integers A research Project Awaiting Publication.

5. Kochendorffer R. (1972): **An Introduction to Algebra**, Gromingen, Wolter-Noordhoff Publishing Netherlands.

A STUDY ON STUDENTS PERCEPTION OF IN-SERVICE SANDWICH TECHNICAL EDUCATION PROGRAMMES MANAGEMENT IN TERTIARY INSTITUTIONS IN NIGERIA

U.J. AFUGBUOM

ABSTRACT

This study aimed at appraising the in-service sandwich technical education programmes management in tertiary institutions in Nigeria.
The findings revealed that in-service sandwich technical education programmes in Nigeria are poorly managed and identified the key problems as improper timing of the programmes, poor financing, inadequate planning and poor accommodation.
Recommendations were made based on the findings that a complete reappraisal of the management of the in-service sandwich technical education programmes should be carried out with a view to adequately planning, financing and timing the programmes as well as properly accommodating the students, so that the full benefits of the programmes can be fully harnessed.

INTRODUCTION

The Nigerian education system characterised by changes in science and technology resulting from changes in knowledge, discoveries and experiences of individuals calls for changes in the curriculum, teachers and administrators to make education more relevant and responsive to the contemporary world.

In view of this, in-service sandwich education programme in Nigeria was launched in 1976 with the mounting of programme in tertiary institutions aimed at preparing teachers for the universal education scheme (Anukam, 1986) which was a first step in the march towards the achievement of education for all by the year 2000 A.D. The exploding enrolment into the sandwich programmes has caused serious problems for both the students and the management of the programmes (Maduabum, 1992). There is a general concern for the welfare and academic performance of the sandwich students so that the education acquired will be beneficial to the students and the society at large.

OBJECTIVES:

This study specifically is sought to

1. find out if in-service sandwich technical education programmes are poorly or adequately managed.

2. identify problems if any encountered in the management of the sandwich technical education programme.

3. Make recommendations based on the findings of this study.

RESEARCH METHODOLOGY

A purposive random sampling technique was used to select 300 students enrolled in the sandwich technical education programmes from three tertiary institutions in the country.

A structured 21-item questionnaire validated by expert educational administrators was administered on the students, filled and given back to the researcher on the spot.

FINDINGS

The data analyzed using percentages (%) revealed that 287 out of the 300 students agreed that the in-service sandwich technical education programmes are poorly managed.

— 96.7% of the sampled student population agreed that timing is a problem.

— 93.4% of the students expressed that in-service sandwich technical education programmes are poorly financed.

— 86.0% of the sampled students indicated that accommodation is a problem.

— 96.0% of the sampled students agreed that planning is a problem.

— 269 students maintained that there is need for improvement in the management of in-service sandwich technical education programmes in Nigeria.

RECOMMENDATIONS

Recommendations were made based on the findings of this study as follows:

— Contact sessions should be scheduled only during the long vacation;

— There should be an increase in the financial allocation to the sandwich technical education programmes;

— a careful planning as well as definite programmes of action;

— adequate accommodation arrangements made well in advance of the contact sessions; and

— a complete reappraisal of the management of in-service sandwich technical education programme in tertiary institutions in Nigeria, with a view to improving the programme is necessary.

CONCLUSION

In-service sandwich education programmes are initiated to enable our teachers to get their qualifications and positions updated. The emphasis therefore should be both on acquisition of knowledge and all aspects of teacher development. Since teachers are the hub of any education system, great attention must be paid to their training because of the multiplier effect it will have on our education system.

BIBLIOGRAPHY

Anukam, I.L. (1986) "A survey of Training Programmes for primary School Teachers in Imo State". In Ayodele S.O., Fejimidagba O. and Abimola I.O. (eds) **Curriculum Organisation of Nigeria Monograph Series** No. 4.

Maduabum M.A (1992) In-Service Education of science Teachers in Nigeria: Dimensions for consideration. In Afe, J.O., Mgbako-Ezenmia R.C. and Maduka, C. (eds) **In-service Education of Teachers: The Nigerian Experience**. Benin, College of Education Press.

Nwanko C.A. and Unachukwu G.C. (1993) "A Survey of the major problems facing students of Distance Education: Implications for counselling". A Paper presented at the National Conference on Distance Education and the contemporary Nigeria held at Federal Polytechnic, Oko. 3 - 5 November.

OBJECTIVES AND PURPOSE TO BE SERVED BY VOCATIONAL AND TECHNICAL EDUCATION: THE 6-3-3-4 SYSTEM OF EDUCATION IN NIGERIA -AN APPRAISAL

G.E. ODUNUKE

ABSTRACT

For some years now in the third world countries, including Nigeria, emphasis has been on vocational-technical education. This is believed to be the basis for industrial and technological development and advancement. In line with this thought, the 6-3-3-4 system of education was introduced in Nigeria in 1982. The new educational system was aimed at exposing Nigerian youths early to functional education to enhance technological development in the country. The objectives and purposes of the system are laudable but their realization appear to be a mirage. So far, what is observed is different from the expected. The Paper will examine the original intentions and expectations of the programme, point out areas of departure, and make recommendations for further improvement of the system.

INTRODUCTION

The National Policy on Education (1981) defines technical education as "that aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge. Vocational-technical education generally involves the acquisition of skills and competencies that can help an individual to function effectively in industries and commercial occupations. The Federal Government of Nigeria, for this reason, is determined, and committed to the development and execution of Vocational technical education. The overall aims of vocational technical education include the following:

i. to provide trained manpower in applied sciences, technology and commerce particularly at sub-professional grades.

ii. to enable our young men and women to have an intelligent understanding of the increasing complexity of technology.

iii. to provide the technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development, and

iv. to give training and impart necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.

To achieve these objectives and attain the national goals, there is need for vocational technical education programmes in Nigeria for the training of the required manpower. Such is the 6-3-34 system of education introduced in Nigeria in 1982. In order to train these personnel, there is need to prepare vocational-technical teachers who are both knowledgeable and skillful in imparting that knowledge. The secret behind this lies in the proper implementation of the 6-3-3-4 system of education in Nigeria.

The Need For Vocational Technical Education In Nigeria

Education can be seen as the basis for the social, political, economic and technological development of the society. For any aspiring and growing nation, education is a catalyst for its technological and industrial take-off.

All organisations or nations determine their objectives for development on the basis of need. Need is the difference between what a thing is now and what it ought to be. In the instructional context, need is a condition in which there is a discrepancy between the acceptable state of the learner and the observed state.

The nation's need is one of the dimensions to be examined in generating educational aims. In pre-independence Nigeria, the colonial masters needed clerks and catechists and as such emphasized, reading, writing and arithmetic in the junior technical and secondary schools. The post-independence need of the country has become science and technology. Hence the new National Policy on Education has come to emphasize acquisition of technology and scientific knowledge as a basic element in the nation's development. The 6-3-3-4 system of education was considered as a means to achieving this need. Science and Vocational courses which were neglected in the pre-independence curriculum are now emphasized in our junior technical and secondary schools.

For economic and social growth in any nation, functional education in terms of vocational technical education is a necessity. Most developed nations had the same experience. The United States of America, the most developed country in the world, invested wisely in vocational technical education. Abolade (1987) asserts that by 1917, the U.S.A had earmarked a substantial amount of money for vocational-technical education. It was the belief that skills and competencies in such a career were indispensable for acceleration of productive industrialization. Similarly, at the turn of the century, the U.S.S.R. had 70% illiteracy. The U.S.S.R. quickly began a massive build-up of manpower of all categories particularly in the engineering and technological cadres. Every year more than four million technical personnel were trained. Today, the Commonwealth of Independent States (formerly U.S.S.R.) ranks next to U.S.A. in terms of technological development.

Vocational-Technical Education and Natural Development

Vocational-technical education is our instrument for economic development since it can provide the needed manpower at all levels to increase output. It can influence attitude towards work, productivity and profit-making among others. Its beneficiaries use their newly acquired skills at once, whereas years will pass before those in purely academic education will specialize to use theirs. This should be recognised as a contribution towards economic development.

While recognizing the fact that Vocational-technical education can have a speedier effect than general school education, emphasis is now placed also on the improvement of the life of the individual in addition to that of the economy.

Abolade (1987) recognises five main types of need to be satisfied for improvement of life:

1. Personal consumer goods like food, clothing and shelter.

2. General access to such physical or social services as good water supply, preventive and curative medicine and communication.

3. Technological infrastructure and capacities necessary to produce these goods and services.

4. Productive employment for individuals so that they can earn income to enable them benefit from the supply of goods and services, and

5. Mass-participation in decision-making: if vocational education can address these challenges, its contribution to socio-economic and political development is unquestionable.

This it can do if it is recognised as part of the overall national provision for life-long education and also as part of the overall national social and economic plan.

Brief History Of Junior and Senior Secondary Concept

This concept started in Richmond, Indiana in North America in 1895 and in Ohio State also of the United States of America in 1909 (Nwaogwugwu (1982). The North American Government adopted the system for the following reasons:

1. There was the growth in elementary and secondary school population which led to lack of classroom accommodation.

2. The broad educational programme offered at the junior/high school levels provided opportunities for technical and vocational skills and general education.

3. It emphasized manipulative skill development and attractive to the nature and needs of the young adolescents.

4. To provide broad educational programme to cater to the wide and varying academic interests of students - thus reducing, if not preventing, incidence of school dropouts.

In Nigeria, the 6-3-3-4 system of education was introduced in September, 1982 to take care of the child in transition. In this programme, children are expected to spend six years in the primary school, three years each in the junior and senior secondary schools, and four years in the university or its equivalent, National Policy on Education (1981).

The Objectives of 6-3-3-4 System of Nigeria

The expected goals of the system as outlined by Mgbodile (1986) include:

1. To provide broad-based education to the student at the junior secondary school level.

2. To provide training in basic technical and vocational skills needed for the job market.

3. Students, on leaving secondary school can find employment for themselves instead of waiting for the government to provide this.

4. To reduce unemployment problems in the country as many more people will cater for their own employment and provide jobs for others.

5. To provide functional education as many of the skills acquired in the different subject areas will be put into practical use, not only in providing employment but also in facilitating life in general.

6. The effective study of general education as well as technical and vocational education to provide a firm foundation for the needed growth and development in science and technology.

7. To prevent or reduce over-reliance and emphasis on certificates to help solve the problem of examination malpractices and craze for certificates.

8. To solve dropout problems by providing education suitable to students with varying aptitudes, interests and abilities.

9. To provide secondary education to a greater number of students than would have been possible under the traditional five-year secondary education system.

10. To provide introductory technology to familiarize the students with tools, materials, processes, potential occupation and areas of vocation for later life.

11. Schools to be built within trackable distance for students to attend as day students.

12. The school period to be extended to make room for the additional subjects with the result that dismissal time would be 2.30 p.m.

Strategies for the Implementation of the 6-3-3-4 System

A good number of primary school leavers would have direct access to junior secondary school education and facilities provided for this. In September, 1982, when this programme was launched, access to secondary school was minimal. As Ukeje (1985) puts it,

That the Secondary school population in Nigeria stood at 2,226,114 during the 1981-82 session. It was then estimated that the number would stand at 4,336,680 in secondary schools in 1988-89 session.

This target population was not met following a serious threat posed by increasing school fees in secondary schools, and decrease in primary school attendance.

Facilities in the form of buildings were to be provided in all the 5, 707 secondary schools in the country, out of which 39 were Federal Government schools.

The junior secondary school would be both pre-vocational and academic. It would be free as soon as possible, and all the basic subjects which would enable students acquire further knowledge and develop skills will be taught. The curriculum would be structured to include core-subjects, pre-vocational subjects and non-vocational electives. The core subjects include Mathematics, English Language, Nigerian Language, Integrated Science, Social Studies, Art, Music, Practical Agriculture, Religious and Moral Education, and Physical and Health Education. The pre-vocational subjects include Introductory Technology, Home Economics and Business Studies. These are to offer vocational training to students and prepare them for various jobs.

The basic philosophy behind this broad-based education was to expose the students to a variety of knowledge which would help them discover their talents, interests and capabilities which would be further developed at the senior secondary, technical or full vocational schools. This has a lot of prospects for both the individual and the nation - as a production of appropriate, confident and satisfied work force to be assured, and

accelerated development of the nation guaranteed.

Students for whom the junior secondary school may be terminal would then go to an apprenticeship system or some other scheme for out-of-school vocational training, while the senior secondary school would be for those able academically to do a complete six-year secondary school education.

The system of evaluation and certification for the junior secondary school would be the continuous assessment method, while the final secondary school leaving certificate would be based on a National Examination.

Observed Outcome of the 6-3-3-4 System

As a result of the numerous problems facing the implementation of the above strategies, the following observations have been made.

The recipients of the programme have not received any basic technical and vocational skills needed for the job market. Hence, when they leave school, they still depend on the government for employment which is not readily available. Therefore, the unemployment problem has not been solved, and education is yet to be come functional.

Introductory technology workshops are installed in many schools while others are yet to install theirs. Even in some schools where they are installed, there are no technically qualified teachers capable of operating the machines and identifying the tools. So introductory technology is yet to familiarize the students with materials, processes and areas of vocation for later life.

No out-of-school vocational training schemes have been established for apprenticeship system by those students for whom the junior secondary is terminal. Rather, resit examinations are arranged for them. Those who pass eventually drop out at the end of the senior secondary as well as those who failed the resit examinations. Therefore the problem of school dropouts has not been solved.

Emphasis is still on certificates and as such, the incidence and spread of examination malpractices at all levels of education are on the increase.

Contrary to the expectations, secondary education is now provided for fewer number of students. This is as a result of increasing school fees and general lack of interest occasioned by unemployment and poorer economic status of those who obtained higher education and are in government service. More so, entrance into secondary schools, other vocational-technical, and tertiary institutions is still by competitive entrance examinations which reduce the number of students wishing to receive educations.

Recommendations

In view of the fact that much of the objectives and purposes of the new educational programme have not been realised, the following recommendations are made:

1. Two special technology schools should be located in each educational zone. They are to emphasize the various aspects of introductory technology at the Senior Secondary level to be taken care of by the limited trained and qualified technical teachers and available equipment.

2. The Federal and State Governments should involve themselves directly in the establishment of apprenticeship system in the areas of woodwork, metalwork, typewriting, mechanics, electronics, local craft, fashion designing to

ensure that out-of-school training and self-reliance inherent in the programme are realised.

3. Availability of National Electric Power Authority (NEPA) supply should be a precondition for supplying introductory technology equipment to schools to disallow wastage and vandalism.

4. State and Federal Governments should evolve scholarship schemes for the training of professional vocational-technical teachers exposed to courses that will acquaint them with skills and competencies in teaching.

5. Home Economics should also be emphasized for boys so that they can cope with domestic matters before marriage and during emergencies when married.

Conclusion

Vocational-technical education is expected to lead to the acquisition of practical and applied skills as well as basic scientific knowledge. The acquisition of these skills and competencies can help an individual to function effectively in industries and commercial occupations. To achieve this need and attain social and economic goals of the nation, the 6-3-3-4 system of education was introduced in Nigeria in 1982.

The Objectives of the system were laudable but the implementation so far is disappointing. Departure from the original strategies for the implementation of the programme, no doubt, has slowed down the nation's match towards technological development.

Introduction of special introductory technology schools and increased Federal and State Governments involvement are likely to improve the effectiveness of the programme.

REFERENCES

Abolade, A.O. (1987): "The Role of Educational Technology in Vocational Technical Teacher Education Programmes in Nigeria: An Appraisal" **Journal of Technical Education**: 4, No.1.

Federal Ministry of Education, (1982): **National Policy on Education**, Yaba - Lagos: NERC Press.

Mgbodile, T.O. (1986): **Educational Administration and Supervision** Ibadan: Heinemann Educational Books (Nig) Ltd.

Nwaogwugwu, C.N. (1982): **Observation of the operation of some Junior Secondary Schools in Canada: Implications for Nigeria** Enugu: Government Printers.

Ukeje, B.O. (1985): **Administering Education: International Challenge** London: The Athlana Press.

STUDENTS UNREST IN NIGERIAN VOCATIONAL/TECHNICAL INSTITUTIONS CAUSES AND LASTING SOLUTIONS

E.C. EBONINE

ABSTRACT

The out-break of students' violence and rebellious acts in Nigerian vocational/technical institutions has been a great disturbing and anxiety-provoking issue to people in Nigeria and the world in general. Very often, people hear of one or more academic institutions closed down for a good length of time for one form of students, revolt or the other, and consequently academic activities are paralysed, thus frustrating the noble goals of our vocational education programme. It is in the light of this ugly development that this paper presents the major causes of constant students' unrest in our vocational/technical institutions. Some of these causes include administrative, environmental, socialization and academic influences. Generation gap, psychological and political influences are also among the major causes of students' unruly behaviour on the campuses. Directly or indirectly, these factors are responsible for students, revolts in our vocational institutions. In addition, the paper puts forward a number of lasting measures to control student's unrest and restore tranquility in our vocational institutions. The measures include among other things the introduction of guidance and counselling services in schools, democratic leadership and much sense of commitment to work on the part of teachers.
Provision of adequate learning facilities, establishment of active parent-teacher's association and maintenance of school-community relationship are also included among the effective measures to control students' unrest in vocational/technical institutions.

INTRODUCTION

In recent years, campuses of our vocational institutions-Secondary, post-secondary and universities have increasingly become plagued with occasional outbursts of students' militant approaches towards resolving problems that seem to threaten their welfare. Indiscriminate violent assaults on teachers, lecturers, fellow students and even school administrators and usually wanton destruction of school and public property by students are the order of the day. Surprisingly students regard these violent acts as fashionable and modern style of a student

life on a campus. Looking at this ugly development in our vocational institutions, one may be tempted to ask himself these questions: Why must our educational campuses constantly be under fire? Should vocational educators and administrators in our technical institutions shy away from attacking this chronic disease, an ill-wing that blows nobody any good? When students' violence erupts, a number of individuals suffer loss of property and even lives.

The Student's riots at University of Ibadan in 1978, Ahmadu Bello University in 1978 and 1981, University of Ife in 1981, Bayero University in 1981, University of Lagos in 1994 to mention but a few, are living examples of a violent manifestation of student's unrest. Very many lives and properties were destroyed during these riots. A number of student violent demonstrations were also reported in secondary schools, colleges of education and polytechnics in Nigeria during the last decade.

Today, most administrators in vocational institutions in Nigeria and the world in general feel greatly worried over the alarming rate of student's unrest in our educational institutions. They are therefore, searching for stability, a way out of this crisis and a means to restore some lasting tranquility on the campuses of our vocational institutions. It is in the light of this that this article is being written to identify the causes of student's unrest and spell out possible strategies that could be used to reduce students' violence in our academic institutions.

Causes of Students' Unrest in Vocational/Technical Institutions

There are several causes of students' unrest in our vocational institutions. Some are school-caused and others are home and student-caused. As Denga (1981) puts it:

'Previous studies have shown that students' violence on campuses has linkages with academic, administrative, psychological, political and personal-social problems which serve as both remote and immediate instigators of campus rampage'.

Students at one time or the other need some help to resolve certain issues and failure to receive this help means that the problems will continue to affect the individual until the growing tension is sufficient to find an outlet somehow. This outlet may take the form of a revenge on what is believed to be the cause of the problem. Generally, students need help to resolve their social, health, home, academic, emotional, financial, vocational and religious problems.

Experiences have shown that the causes of students' unrest in Nigerian vocational/technical institutions can be broadly associated with: administrative factor, environmental factors, socialization influence and academic issues. Others are generation gap, psychological and physiological influences and political matters. Some of these are inter-related.

Administrative Factor

The persistent insensitivity of the leadership or management of vocational institutions to the needs and aspirations of students creates a situation whereby the administration becomes invisible in the minds of the students. This may result in the students failing to recognise the effectiveness and viability of administration, and can then take laws into their hands. A weak school administrator can easily be overpowered by students' militant attitudes. This is very

common in dictatorial leadership where neither the students nor the staff are involved in decision-making.

Environmental factors

Unruly behaviour of students has very close relationship with the environment in which the institution is located. Discussing the relationship between the university community and the students' unrest, Lipset (1967) cited in Denga (1981) stated:

'The ecological concentration of universities within a limited area, bringing together many young men and women in a similar situation in life and isolating them for the most part from the motley routine of adult life, contributes to the perpetuation of student restlessness'.

By this statement individuals in the isolated environment tend to lose their individual identities and disappear in the multitude indulging in abnormal behaviour of the mob. This collective behaviour psychologically lures non-aggressive students to join the crowd unquestioningly.

It is necessary to mention here that the writer does not advocate for the abolition of hostels in academic institutions, but cannot help pointing out that the ecological concentration of students in halls of residence enhances the formation of common · student attitudes, a consciousness of a sort and the readiness to mobilise for organised activity when there is need.

Furthermore, another important environmental factor is the absence of seriousness on the part of teachers/lecturers to provide sufficient work for students and aim at a high standard of academic excellence. Definitely when students are idle, they will be

tempted to occupy themselves with something else - mostly bad things. This is common when students do not understand the aims and objectives of their education.

Socialization influence

The social values, norms and cultural context in which an individual is reared greatly influence his attitude. Students generally are influenced in no small measure by their membership in the peer group which serves as a strong socialising force and also as a reference point. The political, cultural and social biases of the peer group are internalised by members and are regarded as the best. Most students' revolts are usually initiated by a few members of the peer group and passed on to others who join in unquestioningly.

In addition, the beliefs of parents and their system of child-rearing also influence students' lives in school greatly. Psychological studies have revealed that students who constitute the militant group in schools are those who enjoyed childhood over-protection from their parents. Thus parental/home influence and peer influence in school seem to be the two important socialising forces that affect the students' behaviour which manifests itself in revolts.

Academic issues

Academic matters are one of the most important causes of students' unrest on the campuses of our vocational institutions. Students enter vocational/technical schools with the primary aim of acquiring practical skills, and pursuing academic studies so as to qualify for gainful employment and improve their status in the society. They therefore, attack anything that threatens or frustrates the attainment of these goals seriously. This explains why

students revolt when they are given poor food because without adequate nourishment, students cannot cope with their studies. In the same way, non-inclusion of sufficient courses into school curriculum, inadequate commitment to work on the part of teaching staff, poor learning facilities such as libraries, workshops, laboratories, classrooms or lecture halls, books, light etc., act as effective instigators of student's unrest.

Student's projects also do arise if teachers are not fair to every student in their methods of student assessment because of some special relationships. Sudden scheduling of examinations and undue delay of results contribute immensely to students' rebellious acts as well. There is no doubt academically frustrated students are prone to revolt against fellow students, teaching staff and the institutional leadership.

Generation gap

Apart from referring to the superficial differences between the old and the young, generation gap also involves fundamental changes in a social system which is essentially a function of age. The activities of present day students in our vocational institutions can be attributed to a generation gap. Certainly the youth of today do not share many value patterns with their elders. This is very common in heterogenous societies like Nigeria. It has been observed that where ideological, political and moral principles of the past generation clash with those of the younger generation, there is bound to be conflict.

There may be a generation gap in some societies regarding moral standards and values. In our vocational/technical institutions especially at secondary school level, the youth may fail to appreciate some of the corrective restrictions imposed by the school in order to nurture them as mentally healthy citizens. They may regard such restrictions as archaic and out of touch with the modern way of student life on campus. This explains why students revolt especially where the school leadership tends to be traditional, slow to change and too strict with students.

Furthermore, as the youth become more educated than their elders they tend to claim more wisdom than their less educated older leaders. Also as the youth try to demonstrate their coming of age they seem to revolt against the established order so as to prove to the adults that they too have grown up. No wonder then, some preliminary students spearhead student's rebellious acts in order to demonstrate their manhood and challenge the adult established status quo.

Psychological and physiological influencies

The psychological and physiological needs of students in many cases lead to students unrest. The developmental needs such as the need for food, water, shelter, physical-comfort, love, recognition, self-actualisation, self-expression and personal satisfaction are very important to students. Denial of some of these needs can lure students into demonstrations on campuses. For example, the 1981 students' demonstrations at Ahmadu Bello University, Zaria and Bayero University Kano were connected with the inadequacy of food and harsh restriction on men's access to women hostels thereby thwarting the love needs for male and female students.

It is believed that frustration is one of the important psychological sources of aggressive behaviour. Nature has made it that when people are frustrated in their efforts to attain their aims and objectives, they certainly revolt against the source of their frustration.

Students are not therefore left out in this common human behaviour. No wonder then students who have suffered any form of frustration towards achieving academic, social and political objectives look for opportunities to fight the cause of their frustration.

Political Matters

As in many other places in the world, Nigerian students show a lot of concern and involvement in political matters that they feel would affect national development. This political desire in some cases leads to fruitful outcomes as students influence the government policy towards the achievement of national goals. But very often, political aspirants and leaders manipulate students in order to champion their selfish political motives. Students are thus used against rival political parties particularly the incumbent government. In general, student's desire to play a role in the society can at times carry political overtones that are critical of the government in power, and this could lead to severed conflict with the school authorities as well as the government in power. In some cases, the students will take their own initiative to agitate against a political view expressed by the government or they are used by unscrupulous politicians. When this happens the students behaviour could jeopardise the national development objectives including vocational education programmes. This problem is very common in Nigeria where rival political parties do instigate students to go on rampage in protest against the policies of the government in power.

At school levels too the students' unions are very often seen falling out with the leadership of institutions on certain policy issues. When the two parties greatly oppose each other, student's revolt becomes inevitable. In our vocational/technical institutions religions and politics also abound where fanatics among students are reinforced by other fanatics from the surrounding community, to revolt against the school authorities for what they believe is not being done in the interest of their particular religion. A good example of this situation is the Samaru Campus violence of Ahmadu Bello University, Zaria in 1978 during which some villagers stormed the campus in order to encourage the students to revolt against the university authorities for what they believed was being done in defiance of their religious teachings.

At the international level the student's concern for civil rights and fundamental human rights particularly those of the blacks in Southern Africa has become the supremely moral and political issue among students in vocational institutions. The students see the violation in practice of the egalitarian values of mankind which are taught to them in school, preached in churches and approved by everybody in theory. Such racial and economic inequities provoke students sufficiently to demonstrate against the governments believed to be encouraging such activities.

This write-up has briefly identified some of the major causes of student's unrest in not only Nigerian vocational/technical institutions, but the world in general. It is therefore necessary to find out some lasting measures or solutions to this ugly development.

Lasting Solutions to Student's unrest in Nigerian Vocational/Technical Institutions

To restore tranquility and make student's unrest in our vocational/technical institutions a thing of the past, the following measures are suggested in this write-up:

1) Introduction of guidance and conselling service programme in schools.

Frustration is an important psychological cause of aggressive behaviour. It is the driving force for student's revolts on campuses. When students are frustrated academically, socially, politically etc, they indulge in violent acts. This calls for effective guidance and counselling services in schools. Counselling is an interaction process which facilitates meaningful understanding of self and environment and results in the establishment and clarification of goals and values for future behaviour.

In realization of the great importance of guidance and counselling services in our vocational institutions, the Federal Government of Nigeria in her National Policy on Education of 1977 section 10 paragraph 11, said:

'In view of the apparent ignorance of many young people about career prospects, and in view of personality maladjustment among school children, career officers and counsellors will be appointed especially in post-primary institutions'.

Surprisingly, till this moment, the Federal Government's idea in this regard is still a dream and not a reality. Why? The answer is poor planning and implementation of educational programmes in the country.

Vocational and religious problems

The need to assist students in resolving these problems cries out for counsellors, administrators and other paraprofessionals to team up together and provide services which are essential for the comfort of students in their struggle to attain their academic goals in vocational institutions. In this respect the government is hereby advised to endeavour to make effective guidance and counselling service programmes available to students in all vocational institutions in the country. This will go a very long way in reducing the incidence

of student's psychological frustrations on our campuses. It is now clear that student's counselling is as important to them as their academic studies.

2) School administrators/leaderships should imbibe the spirit of democracy in their administration. They should try as much as possible to involve both the staff and students especially student union executives in decision-making. It is true that some of the students problems are beyond the competence of school administration to resolve, but the need to listen to student's grievances and make genuine efforts to resolve them will give a good impression of the administration.

3) Teachers/lecturers should show high degree of commitment to work by preparing their lectures well, attending their lectures as and when due with appropriate teaching methods and classroom management. Teachers should give sufficient exercises and assignments to students to keep them busy all the time. Unnecessary victimization of students should be avoided and where that is noticed the teacher/lecturer concerned should be seriously disciplined. Teachers should be fair to every student in their student's assessment and promotions.

4) Adequate learning facilities should be provided. Libraries and laboratories should be well equipped; and adequate classrooms/lecture halls should also be provided. There should be regular water and light supplies in the school. Good medical centres and adequate hostels should also be made available for students. Proper arrangement has to be made for student's food. Experiences in Nigerian vocational institutions have shown that the absence or inadequacy of these facilities is the chief cause of student's demonstration.

5) Studies have shown that parental/home and peer group influences in school seem to be the two important socializing forces that affect the student's special behaviour which manifests itself in revolts. Mass education programmes should be launched by the government during which parents will be educated on the dangers of nurturing children with unruly behaviour. This is very important because a good number of Nigerian students come from illiterate homes. If parents are made to understand the dangers of over-restriction, over-protection and over-pampering on children, they would aim at rearing children with desirable behaviour. Effective student counselling and serious academic work will rescue children from the bad socialising influence of peer group on them.

6) Establishment of effective parents-teachers association and maintenance of good school-community relationship especially at secondary and post-secondary institutions will contribute immensely in curbing or controlling student's unruly behaviour. In particular, these will control students' demonstrations arising from religious and political matters. In societies with multiple religions such as Nigeria, effective parents-teachers association (P.T.A.) and good school-community relationship will offer parents and members of the public opportunities to interact and learn from the teachers the need to allow every student to practise his religion in his own way at the appropriate time. Furthermore, politicians and religious fanatics should be educated on the dangers of instigating students to demonstrations in order to achieve their selfish political or religious ambitions.

From the measures suggested above, it is now very clear that controlling students occasional unrest and unruly behaviour in our vocational institutions require combined efforts of the government, school administrators, counsellors, teachers/lecturers, parents and well meaning members of the public.

Conclusion

For the well articulated and laudable goals of vocational education programme in the country to be achieved, our vocational/technical institutions have to be saved as a matter of urgency from wanton destruction of institutional property and at times human lives in the name of student demonstrations or revolts. It is always easier to destroy than to build. Every lover of national development in this country is by this write-up advised to join in the campaign to restore tranquility on the campuses of our vocational institutions, and make student unrest a thing of the past. We should all bear in mind that a stitch in times saves nine.

REFERENCES

1. Adefemi, S (1990) "In search of Appropriate strategies for Third World Development," Nigerian Journal of Technical Education Vol.6; National Board For Technical Education.

2. Atavi, H et al (1982) Introduction to the Sociology of Developing Societies. New York Monthly Press Review.

3. Belling, I. Y. (1975) Basic Principles of Teaching. Ibadan: Spectrum Books Ltd and John Wiley & Sons.

4. Denga, D. I. (1981) Student Counselling: A major Solution to Campus Unrest. Orit Egwa Ltd Lagos.

5. Ebenezer. R. (1991) Technical Education in Nigeria: Challenges and Prospects. ECHO A news letter publication of the National Board for Technical Education.

6. Esogwa, C.O. (1983) A Handbook of Vocational/Technical Education For Nigeria. Anu books Meerut.

7. Ozoro, O. (1973) "Introducing Technology into Nigerian Secondary Schools." West African Journal of Education.

8. Salisu. S. (1980) "Thoughts on Technical Education Nigeria" Journal of Education Vol.I. National Board for Technical Education.

9. Sherif, C. et al (1966) Attitude and Attitude change: Philadelphia - W.B. Saunders.

ABOUT OUR CONTRIBUTIORS

AFUGBUOM, Mrs. Uche, J, is currently a Lecturer in the Department of Continuing Education, Federal Polytechnic, OKO, Nigeria. She holds B.Sc. Ed. (Hons) Degree from the University of Nigeria, M.Ed. (Hons) Degree from Abia State University and is a member of STAN and TEWAN.

ANAND, Y.K. is an Assistant Professor in the Curriculum Development Centre of the Technical Teachers' Training Institute, Chandigarh, India. He is also the Professor in change of continuing Education.

BENJAMIN, E.O. is a Principal Lecturer in Mathematics and Statistics. He holds B.Sc. and M.Sc. Degrees in Maths and PG Diploma in Education, all of the University of Nigeria.

EBONINE, E.C. is currently a Lecturer in the Department of Science Education, Federal Polytechnic, OKO, in Anambra State of Nigeria. A B.Sc. Ed. (Hons) in Chemistry, he is also a member of STAN and TEWAN.

IKEAGU, Mrs. Carol N. is working in the Department of Science Education, Federal Polytechnic, OKO, Nigeria.

MENON, P.N. is an Assistant Professor in the Department of Education of Technical Teachers' Training Institute, Chandigarh, India. With Masters' Degrees in Sociology and Education he is also a Ph.D. in Education.

MITTAL, L.N. is the Professor and Head of the Curriculum Development Centre of TTTI Chandigarh, India.

NJAKA, C.A. is currently a Senior Lecturer in Printing Technology of Federal Polytechnic, OKO, Nigeria. An alumnus of California State University, Los Angeles, U.S.A. he is a member of Epsilon Pc Tau and I.G.A.E.A. of U.S.A. and of 10 PN easternzone of Nigeria.

OCHUBA, Mrs. Ogugua E. is working in the Division of General Studies of Federal Polytechnic, OKO, Nigeria.

ODUNUKE, G.E., is currently a Lecturer in Federal Polytechnic, OKO, Nigeria. A B.Sc. (Hons) in Zoology, a P.G. Diploma in Education and an M.Ed. in Educational Psychology, he is a member of STAN and TEWAN.

OGBUKA, C. I., is currently a Lecturer in the Department of Science Education, Federal Polytechnic, OKO, Nigeria. She holds a B.Sc. (Chemistry) Degree and a P.G. Diploma in Education of the University of Nigeria, Nsukka.

OKEKE, S.I., is Lecturer I in the Department of Science Education, Federal Polytechnic, OKO, Nigeria. With a B.Sc. and M.Sc. in Botany he is a member of six Professional bodies in Nigeria - SAN, VEAN, TEWAN, BOSON and GESON. His research interests are Genetics/Cytogenetics, pollutions, Ecology, Bio-systematics, Science Education and Technical and Vocational Education.

ONWUKA, B.E. is a Principal Lecturer in Maths and Statistics. He holds B.Sc. and M.Sc. Degrees in Maths and a P.G. Diploma in Education of the University of Nigeria.

SRINIVASAN, R. is currently a Research Assistant in Education, TTTI, Madras. Besides his Masters' Degrees in Economics, Demography and Education he is also an M.Phil. and Ph.D. in Education.

SUNIL DUTT, is a Lecturer in Education, TTTI, Chandigarh, India.

CALL FOR CONTRIBUTIONS

Contributors are invited to send their papers for publication in the next issue No.13/1996 before 31 May 1996.

This journal is priced as follows:

	India	Other Countries
Annual Subscription	Rs.50/-	10/- US $
Long Term (10 yrs) Subscription	Rs.300/-	60/- US $
Month of Publication		Every December

Subscription by D.D. favouring the Principal T.T.T.I. Madras, to be drawn on Indian Overseas Bank, Madras, India.