Science, Schooling And National Development In Nigeria: An Analysis Of Kano State Science Secondary Schools Project As A Development Strategy

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INTRODUCTION

Due to the importance of science and technology in development, there is a high level of commitment, in both developed and developing countries, to the provisions of educational facilities serving as the basis for much more effective training of manpower in science and technology disciplines. This was, for instance, emphasized in the declaration of the UNESCO Conference of Ministers of African Member States Responsible for the Application of Science and Technology to Development in Dakar 1974, where

The Conference...noted..the continuing weakness of African scientific and technological potential. Since men represent a country's main wealth as well as the agents of its development, the first task must be to develop...an education policy aiming at the democratization and reorganization of instruction, including more especially the upgrading of scientific and technical training at all levels. UNESCO 1974 p.10)

The initial attention of such commitment is on the nature of the science curriculum, and in some other cases, the institutional context of teaching and learning science subjects to children at all levels of schooling. This commitment is further reflected in wide-ranging science curricular reforms that swept to most parts of the world at the beginning of the 1960s, although starting in the United States and Britain.

The pressure for the reforms served as either catalyst in a reformulation process which led to newer curricula, or the creation of more radical contexts of learning science in many developed and developing countries. This was with the view of placing greater emphasis on the role of science in national development.

As an added dimension to this objective in both developed and developing countries (although more so in the latter), the emphasis of some of the reform movements also included the view that science education should prepare the learner for absorption into the labour market which is rapidly becoming technological in its orientation and aspirations.

The various projects that sprang up especially with the purpose of providing newer educational contexts for the production of scientific and technological manpower in

developing countries included the Turkish Science Lycee (Maybury 1975), the Kenya Science Teachers College (Gumo and Kann 1982) and the MARA Technical Institutes and Science Schools in Malaysia (Malaysia 1976).

In Kano State, Nigeria, a science education development strategy with emphasis on providing context facilities for manpower training in science and technology disciplines was initiated by the State government in September 1977. This was the Science Secondary Schools project, created to offer science education to specially selected senior secondary school students (Grades 10-12) under different conditions from conventional senior secondary schools in the State. The main objective of establishing the Science Schools was to provide an educational framework where Kano State students with a high inclination and aptitude for science and technology disciplines could be carefully selected and developed into a large stock of skilled scientific and technological manpower for the effective social development of Kano State.

This paper traces the development of the project. Data for this study was obtained during a seven month field work in Kano Sate, Nigeria, during which four schools - two Science and two Non-Science - formed the main focus of the study. This was part of a larger study (Adamu 1988). Structured classroom observations in these four schools, and interviews with science teachers, school administrators and policy initiators of the project all contributed to providing primary insights into the development of the project.

THE GENESIS OF THE SCIENCE SCHOOLS PROJECT

Kano State was created in 1968 out of the then Northern Region of Nigeria. However, the creation of the new State in 1968 was not without some problems for the State administration because Kano State lacked the indigenous (especially of Kano State origin) expert scientific and technical manpower considered essential for social development. For instance, in 1968 when Kano State was created, there were 25 medical doctors in the whole State, out of which only three were State indigenes; 22 were expatriates. Similarly, of the only six civil engineers at that time, only one was from Kano State. There were no mechanical agricultural or electrical engineers from the State at that time (Kano State 1970). The situation did not improve much in the 1970s. As observed in a government document,

> Although Secondary education in the State has expanded very considerably over the last few years, the number of students graduating in Science and technical subjects remain a very small fraction. For example in 1975/76 West African School Certificate Examinations only 12% of our candidates took science subjects...In 1977, it was noted that although the first indigene of Kano State in field of medicine graduated over 20 years ago, yet the State cannot boast of more than 10 medical doctors who are indigenes of the State. (Kano State 1979 p. 43 and 139)

This situation arose because modern schooling, as the main agency for manpower training in Kano, was still to gain wide acceptance among the populace even in the 1970s. This was caused by historical antecedents which linked the development of modern education in Nigeria with Christian Missionary activities (Williams 1960; Graham 1966). Education therefore was viewed with suspicion as a forum for

conversion to Christianity in a predominantly Islamic society (Kano State 1976; Kano State 1983).

However, the Nigerian oil boom era of the 1970s saw the initiation of massive social projects all over Nigeria. As part of this new found prosperity, the Kano State Government launched a very ambitious four year Development Plan in 1970, whose strongest feature was its attention to industrial and agricultural development (Kano State 1971).

The responsibility for the implementation of the development Plan was given to a newly created (1975) Manpower Development Committee of the Kano State Ministry of Economic Planning. However, the major obstacle to the development plans, as the Committee quickly discovered, was lack of expert manpower, especially in the scientific and technological fields necessary to guide the implementation of these projects. With the vibrant Nigerian economy of the early to late 1970s, the Kano State Civil Service Commission could afford to recruit the required manpower from overseas, but the government was also aware such manpower could not relied on to remain for a long period.

This situation was complemented by the general feeling among government officials in Kano that schooling was not functioning in a way which matched the hopes for social and economic development in a contemporary technological society. Again as stated in a Kano State Government document in referring to the situation in 1970s,

The acute shortage of manpower in Kano State results largely from the lack of the right kind of educational facilities. In more of our secondary schools, the available science teaching facilities, laboratories, equipment, materials compared against actual school requirements are far too inadequate. In almost all secondary schools there is a general shortage of qualified science teachers. The students going into secondary schools do not appear to appreciate the career prospects of personnel with the needed science qualifications. (Kano State 1979 p.138).

With these events in mind, the Manpower Development Committee started to focus its attention on the ways of acquiring a large stock of scientific and technological manpower to control and direct the various development projects in the State. There was, of course, no enough manpower to do so, especially from Kano State. And during one of the meetings of the Committee, as a former Chairman recalled,

A member of the Committee just suggested that one of the best ways of dealing with this kind of situation potentially is to set up a Science Secondary School which will be a specialist school with nothing but concentration in science training. (Interview 7/1/87)[1]

Based on this rather spontaneous suggestion during a meeting, the Committee arrived at the general consensus that extensive and specialist schooling in secondary science education, which would be structurally different from the existing conventional schooling in Kano State, was the most viable long term solution to the problem of scientific and technological manpower output in Kano State. This led to the Committee suggesting to the Ministry of Education Kano in early 1977, the

establishment of specialist Science Secondary Schools. This suggestion provided three distinct characteristics for the schools.

First a new body called the Science Secondary Schools Management Board would be created to implement the project, and it would be independent of the Ministry of Education in most aspects of its operations. This later became the Kano State Science and Technical Schools Board in 1982 (Kano State 1982).

Secondly, the Science School students would be drawn from academically excellent students selected from Form II cohort of all secondary schools in Kano, after a selection examination1. This meant the Science Schools, staring with Form III, would be Senior Secondary Schools under the newly envisaged National Policy on Education (Nigeria 1981) which splits secondary education in two tiers of Junior and Senior Schools of three years duration. At the end of the Senior years, the students would take the Senior School Certificate Examination (SSCE).

Thirdly, each student would have to offer the following subjects only: Biology, Chemistry, Physics, Mathematics, English, Geography, Hausa Language or Islamic Religious Knowledge, and for girls, Food and Nutrition. Boys would take one elective chosen from Technical Drawing, Further Mathematics, or Agricultural Science. Interestingly, it was mainly this rigid curricular offering that characterise, in the main, the Science Schools.

In April 1977 the Kano State Military Governor indicated the Government's acceptance of this proposal with the announcement during a policy speech that

Two existing secondary schools have already been converted to schools of science. These schools will emphasize science in their curriculum so as to enable us compete in gaining university places in the field of science in which we were very deficient. (Kano State 1977 p.4).

THE SCIENCE SECONDARY SCHOOLS

The first science schools established in September 1977 were two boys schools at Dawakin Kudu and Dawakin Tofa; both towns exactly 32 kilometres from Kano. The schools were normal Ministry of Education schools and taken over and converted to Science Schools by the Science Schools Management Board. The conversion included building two science laboratories for each of the three major science subjects of Biology, Chemistry and Physics, as well as a workshops for Geography and Technical Drawing. These were facilities, in addition to the rigid curricular offering and competitive selection examination that sets the Science Schools in Kano apart from conventional schools.

Students for the Science Schools are selected after a very rigid and competitive examination. The Selection Examination papers were in Science, Mathematics and English Language. Students had to pass each at a level determined by the Science Board to be eligible for interviews, after which, if successful they were placed in one of the Science Schools. In 1980, the first ordinary level examinations in the school were taken. In 1981, a Girls' Science School was eventually established (and like the entire Science Secondary Schools concept, the first of its kind in Nigeria). In 1985,

another boys' school at Kafin Hausa was also started, while in 1987 a second Girls' Science School was opened in Jahun, bringing to five the total number of Science Schools in Kano in 1987, with a combined student population of over 3,000 students studying pure science subjects - the highest number of such a category of students since the establishment of modern schools in Kano in 1913.

THE OUTCOMES OF THE SCIENCE SCHOOLS PROJECT

Two criteria were used to determine the outcomes of the project as a manpower development strategy in science and technology disciplines. The first looks at the examination outcomes of the schools since 1980, and the other looks at the distribution of the students in science and technology faculties in higher institutions.

a) Examination Outcomes

The first question about outcomes asks to what extent has the establishment of the Science Schools made any difference to the number of GCE ordinary level science graduates from Kano? This is difficult to answer without accurate information about the number of science graduates produced by secondary schools in Kano before the establishment of the Science Schools. But according to figures made available by the Science and Technical Schools Board, an average of 3,626 science students from the science Schools have graduated between 1980 and 1988. And from various discussions with policy initiators of the project, this alone justifies the project since this number exceeded the number that all the conventional secondary schools in Kano have produced since the establishment of Kano State in 1968.

However, a more important measure of success of the project is provided by the Nigerian General Certificate of Education Ordinary Level examination results of these students. The results, from four of the schools that have submitted candidates in the WAEC GCE examination (Dawakin Kudu, Dawakin Tofa (from 1980-1988), Kafin Hausa (1988 only) all for boys, and Taura (1981-1984) for girls) in six core subjects and are shown in Table I.

TABLE I

SCIENCE SCHOOLS GCE ORDINARY LEVEL
EXAMINATION RESULTS, 1980-1988

SUBJECT	NUMBER	CREDITS	%	PASSES	%	FAIL	%
GEOGRAPHY	3445	1634	47	2402	70	1043	30
CHEMISTRY	3683	1529	41	2523	69	1160	31
BIOLOGY	3690	1337	36	2517	68	1173	32
MATHS	3686	1302	35	2470	67	1216	33
PHYSICS	3668	1129	30	2019	55	1649	45
ENGLISH	3584	424	12	1354	38	2230	62
AVERAGE	3626	1225	33	2214	61	1411	39

(Source: Science and Technical Schools Board, Kano)

Table I indicates an average pass rate of 61% in the six2 core science subjects in the Science Schools and 39% failure rate in the same subjects - results which the officials of the Science and Technical Schools Board are quite happy with since it enables a lot of Kano State students gain admission into higher institutions to study science and

technological disciplines at various levels. As an official of the Science Board explained,

Our achievements have been that we have produced the calibre of students envisaged in the programme. I'll say on the average between 50-60% of those students in the schools meet university admission requirements. In the past Kano State has been lagging behind in the science based areas. But with the maturity of the Science Schools we have been able to get our students in all areas where our quota (in admission to Nigerian universities) is earmarked. In fact in some cases we even fill up the quotas of other states. (Interview 23/10/1986).

But by far the most significant single achievement of the Dawakin Tofa Science School was the examination success of Sarki Abba Abdulkadir a former student who, in 1984 obtained the best results in WAEC GCE ordinary level examinations in Nigeria. For this, the school was awarded the Oba of Benin Trophy by WAEC as a prize while the student was awarded a National Merit Award and cash prize at the 23rd Annual conference of WAEC on 20th November 1984 at Abeokuta, Ogun State. In appreciation of his efforts, the school named its library building after him. (See Sunday Triumph 29th December 1985 p.5)

b) Labour Market Implications

The second question about the outcomes looks at the extent to which the Project has provided a basis for specialised manpower production in the areas required. As with the examination focus, this also has its problems, not the least of which is follow up services do not exist within the Science and Technical Schools Board that would enable more accurate investigation of the various careers of the former students to be carried out. However, a population check on the distribution of the former Science School students in various degree courses in just three universities, Ahmadu Bello University at Zaria (ABU), Bayero University, Kano (BUK) and Usman Danfodio University, Sokoto (UNISOK) provides an indication of the discipline specialization of 308 of the former Science School students. This distribution is shown in Table II.

TABLE II

COURSE DISTRIBUTION OF SCIENCE SCHOOLS STUDENTS
IN ABU, BUK AND UNISOK 1984-86

	GRADUATION			
COURSE	NO	%	ABU	BUK	SOK
SCIENCE	87	28.2	1987	1989	1990
ENGINEERING	40	12.9	1989	1988	----
AGRICULTURE	39	12.6	1989	----	1990
HUMAN MED	22	7.1	1989	1991	1991
PHARMACY	13	4.2	1988	----	----
ENVIRONMENTAL DESIGN	11	3.5	1988	----	----
VET MEDICINE	6	1.9	1989	----	----

PRELIM SCIENCE	87	28.2	----	----	----
NONSCIENCE:					
LIBRARY SCIENCE	1	0.3		----	----
EDUCATION	1	0.3		----	----
BUSINESS ADM	1	0.3		----	----
TOTAL	308	100.0			

(Source: Adamu, 1988)

The expected year of graduation of the most recent student in that course is also given. This means, for instance, by 1991 Kano State expects to have 22 medical doctors, since by then all of them will graduate from their courses; 11 of the 22 potential doctors will graduate from ABU by 1989, the rest from BUK and Sokoto until 1991.

Similarly, by 1990, Kano State expects to have 87 scientists graduating in various disciplines ranging from Biochemistry, Microbiology, Physics, to Computer Science and Chemistry. Engineering, like medicine is also a discipline for which the policy initiators of the Science Schools expected high turn-out. It is therefore significant to note 40 engineers will be available to the Kano State labour market by 1988 from two of the universities in various sub-disciplines which included civil, mechanical, agricultural and chemical engineering.

CONCLUSIONS AND IMPLICATIONS.

The purpose of this paper has been to determine the mechanism of initiation and outcomes of the Science Secondary Schools project in Kano as a long term scientific and technological manpower development strategy.

The findings in this paper clearly demonstrate the powerful stimuli of economic forces in the development of science education innovations aimed at social transformation. There was some amount of satisfaction from policy makers that the project has achieved its objectives in enabling a considerable number of science students from Kano State to proceed to institutions of higher learning and study disciplines considered necessary for social and economic advancement in Kano State. And although the rate of production is small but steadily increasing, policy planners of the project envisaged a decade from now (1989-1999) Kano State will satisfy its scientific and technical manpower requirements, and indeed may have surplus manpower in these disciplines. But taking into consideration the nature of resistance to general western style of education in Kano, the Science Schools project represent some remarkable policy achievement in the development of education in Kano State.

But an unforeseen problem is associated with this. Education cannot be isolated from economic development. The Science Schools are in the danger of producing a large supply of highly qualified manpower which may not be utilized (or employed) because social development has not kept pace with their production. But in effect, this has always characterized science education changes. Policy makers wishing to bring about rapid social transformation through science education in developing countries

rarely pay adequate attention to the provision of context facilities where the products of the process can be adequately absorbed in the society.

So far science education changes have provided little avenue for a consideration of the integration of the product of the changes into their predominant, and often traditional societies. This might be because such changes as envisaged by the mainstream science curricular changes are not as explicit as in the case of the Science Schools project. Thus a rethink on the impact of science education policies, particularly in relation to overall economic development of the society, would seem to be in order.

NOTES

[1] Transcript of interview I held with a former Chairman of the Manpower Development Committee during my field work.

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Notes

1. In the later years, however, selection of the students was based on the Selection Examination being given to Junior Secondary School Students in JSS III. This Selection Examination is different from the standard Placement Examination of the JSS system.

2. These were not the only subjects taken by the students in the schools. However, these constitute the main subjects for an effective career in science and technology disciplines in Nigeria, and as such they are isolated for analysis here.