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SCIENCE AND TECHNOLOGY EDUCATION POLICY IMPLEMENTATION IN KEBBI STATE: A SITUATION ANALYSIS

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Abstract

Kebbi state and Nigerian educational system as indicated in the national policy on education is oriented towards scientific and technological development of the state and nation in general, among other values. Since the acquisition of sound knowledge, particularly science and technology, is crucial for individual and societal development. The paper seeks to philosophically examine the effectiveness of Kebbi state's school system in providing sound scientific and technological knowledge to their products, with particular reference to Science and Technical schools. The method of philosophical analysis was adopted in undertaking the study. Although some traces of pragmatist's and empiricist's educational ideas could be found enshrined in Kebbi State's guiding policy on education, science and technology, a number of implementation problems renders the practice ineffective. Thus, the paper highlighted the need to ensure that practice is in consistence with the policy to ensure acquisition of sound scientific knowledge.

Introduction

The recommendations of 1969 curriculum conference led to Adebo Commission which eventually culminated into the issuance of the National Policy on Education in 1977. The National Policy on Education gave emphasis on science, technical and vocational education in the interest of the nation's match to greatness (Fafunwa, 1977). The bookish type of education, a remnant of the missionary influence, is severely condemned in the policy. The policy gave emphasis on science, technical and vocational education in the interest of the nations match to greatness. The aim of education is not to produce clerks and shopkeepers, but skillful Nigerians who could fulfill the manpower need of a modern technology nation. The challenge of Nigerian education is the implementation of the vocational component to students as it is aimed to make a difference between the present educational provisions and the inherited colonial system. According to Bagudo (2006), the educational crisis related to policy implementation, particularly science and technical education, in the country especially the northern states is a well documented issue. This crisis is multidimensional, manifesting it self in the areas of general decay of the infrastructural/ instructional facilities (including laboratories and workshops), serious shortage of teachers both in qualitative and quantitative terms, and generally, funding situation of education is also grossly inadequate falling far short of the twenty six percent of the states' and nation's budgets recommended as a minimum allocation for the educational sector, by the United Nations Educational, Scientific and cultural organization (UNESCO). The performances of Kebbi state's students in science and technical subjects like mathematics, physics, chemistry, technical drawing, e.t.c., has been very poor in the past public exams. Although there is an appreciable improvement in the students' academic performance in recent years, the success does not call for celebration as many empirical researches indicated that such statistical figures may be misleading and not the manifestation of the actual students' performance (Bagudo, 2006). Hence the paper sets to examine the problem from dispassionate point of view.

National Policy on Science, Technical and Vocational Education

The goals of science education according to the National Policy on Education (2004, No. 39:4) document shall be: to cultivate inquiring, knowing and rational mind for the conduct of good life and democracy; produce scientists for national development; service studies in technology and the cause of technological development; and provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

Technical and vocational education in the educational policy (No. 43: 2) is understood to be: an internal part of general education; a means of preparing for occupational field and effective participation in the world of work; a method of alleviating poverty.

The goals of technical and vocation education according to the education document shall be to: provide trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical; provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development, give training and impart the necessary skills to individual who shall be self reliant economically. In pursuance of the above goals, the policy document stated that; the main features of the curricular activities for technical colleges shall be structured in foundation and trade modular; the curriculum for each trade shall consist of four components:- General Education; Theory and related courses; Workshop Practice; Industrial Training/production work; Small Business Management and Entrepreneurial training (NPE, No. 46).

For effective participation of students in practical work the teacher-students ratio shall be kept at 1:20. Every state shall encourage at least one of its technical colleges to offer advance craft courses to prepare master craftsmen for supervisory positions in industry and in teaching, according to the policy document. The policy (No. 47) further stipulated that: the range of courses in the technical colleges shall be as wide as possible and include but not limited to:

a. Mechanical trades: These includes; Agricultural Implements and Equipment Mechanics' work; Automobile Engineering practice: Auto body Repair and spray painting; Engineering practice: Electrical work; Automobile Engineering practice: Auto body mechanicals' work; Automobile Engineering practice: Auto body building; Auto engineering practice: Part-Mechandising; Air conditioning and Refrigeration: Mechanics' work; Mechanical Engineering craft practice; Welding and Fabrication Engineering craft practice; Foundry craft Practice; Instrument Mechanics work; Marine Engineering craft. These give the total of 12 courses under mechanical trades.
b. Electrical Engineering Trades: These include: electrical installation and Maintenance work; Radio, Television and Electrical Work; Appliances Repairs.
c. Building Trades: These includes: Block Laying, Bricklaying and Concrete Work; Painting and Decorating; Plumbing and pipe-fitting.
d. Wood Trades: These include: Machine. Carpentry and joinery; Furniture Making; Upholstery
e. Hospitality: Catering craft practice

f. Textile Trades: These include: Garment making (Ladies/ Men Dresses); Textile trade; Dyeing and Bleaching
g. Printing Trades: These include: Printing Craft Practice; Graphic Arts; Ceramics.
h. Business Trade: These include: Stenography; Typewriting; Store Keeping; Book Keeping; Office Practice
i. Beauty Culture Trade: Cosmetology
j. Others: Leather Goods Manufacture including Shoe Making and Repairs.

According to the policy document (No. 50), science and Technology shall be taught in an integrated manner in the schools to promote, in the students, the appreciation of the practical application of basis ideas. Each state and local government, in cooperation with appropriate agencies, shall organize relevant apprenticeship scheme and also entrepreneurial training (NPE, No. 53). Every technical college shall establish and operate a production unit for on the job training of students and for commercial activities to sustain college operation. The policy further states; in recognition of the fundamental importance and cost-intensive nature of technical and vocational education, Government shall provide adequate funds for vocational/technical education. Industrial training fund (ITF) shall organize staff and students industrial attachment as appropriate and in collaboration with the proprietors, institutions and industries.

Science and Technology in Schools under Kebbi State Ministry of Science and Technical Education

In recognition of the importance of science and technical education in technological development, the science and technical education Board was created in the defunct Sokoto State. Kebbi State inherited five schools from its mother state (Sokoto) after its creation in 1991, located in Birnin-Kebbi, Zuru, Yauri and Bunza representing the existing division in the state, with exception of Argungu. The board was changed to the ministry of science and technology and later, in 2009, it was changed to ministry of science and technical education. The objectives of the new ministry are to improve the teaching of science and technical subjects particularly in the schools under the ministry. It was also aimed at increasing students' enrolment in science and technical subjects. Presently Nine schools exist under the board, 5 additional schools were proposed as model science colleges. Table 1.1 presents students' enrolment figure in nine schools existing under the ministry as in 2010/2011 academic session.

Table 1.1: Number of Students, Teachers, Laboratories and Workshops in Schools under the Kebbi State Ministry of Science and Technical Education in 2010/2011

S/N	SCHOOL	SS1 students	SSII Students	SSIII students	Total students	No. of teachers	Labor's Avail.	Workshop Available
1.	Nagari college Birnin-Kebbi	445	550	443	1438	85	5	-
2.	Gov't Science and Technical Coll. Bunza	280	340	330	950	75	3	5
3	Gov't Science College Zuru	450	482	381	1313	45	5	--
4	Gov't Girls Science College Yauri	250	290	250	798	36	4	-
5	Gov't Science and Technical college Zuru	387	428	410	1225	80	3	4
6	Govt' Science college Aliero	270	450	392	1,112	45	3	-
7	Gov't Girls Science college Argurgu	335	442	470	1,247	54	4	-
8	Gov't Science college Koko	338	320	423	1,081	24	3	-
9	Gov't science college Dakin Gari	325	320	315	960	25	2	-
	Total	3,080	3,630	3,414	10,124	459	32	9

Source: Inspectorate Department, Kebbi State Ministry of Science and Technical Education, 2011

Table 1.1 indicates an improvement in the laboratories available and average teacher-student ratio of 1:22 (total students/ total No. of teachers). However, a close look at subject teacher-student ratio indicates a higher ratio especially looking at it from Qualified Subject Teacher-Student Ratio, particularly in the area of English, Mathematics, Core Science and Technical Subjects. Table 1.2 indicates total subject teacher, qualified subject teacher and additional subject teachers required by schools under the Ministry.

On the issue of available laboratories and workshops, there is a significant difference over the schools under Secondary Schools Management Board (SSMB). Most of the schools have three to five science laboratories for different science subject's practical, especially physics, chemistry, and biology. The only existing two technical schools also have five and four workshops for Government Science and Technical College, Bunza and Government Science and Technical College, Zuru, respectively. However, an interactive session held with the top Ministry officials indicated that the laboratories are critically ill-equipped, and faces serious shortages of chemicals and reagents. The few available equipments are in high scarcity that necessities only for teacher demonstration before the students, making the practical teacher-centred instead of being student-centred. This however defeats the whole aim of practical laboratories.

The scarcity of qualified science/technical subjects' teachers in the schools according to the officials is related to the teachers' poor condition of service in secondary schools. This among other reasons makes secondary school teaching a temporary appointment. The number of qualified subject teachers in science and technical subjects across the existing schools under the ministry is presented in 1.2 below.

Table 1.2: Number of Schools, Student Enrolment, Subject Teachers, Qualified Subject Teachers, and Additional Subject Teachers Required in Schools under the Kebbi State Ministry of Science and Technical Education.

S/N	SCHOOL	NO OF STUDENT	ENGLISH			MATHS.			PHYSICS			CHEMISTRY			BIOLOGY			AGRIC. SCIENCE		
			ST	QT	TR	ST	QT	TR	ST	QT	TR	ST	QT	TR	ST	QT	TR	ST	QT	TR
1.	NAGARI COL. B/K	1,438	10	10	4	11	4	4	5	2	3	5	3	5	6	3	3	4	2	3
2.	GSTC BUNZA	950	6	4	2	8	4	2	3	0	2	6	4	2	2	2	-	-	-	-
3.	GGSC YAURI	798	4	2	1	6	4	1	2	0	3	3	3	3	3	1	3	4	3	2
4	GSC ZURU	1,313	6	5	2	5	5	2	5	4	3	3	3	3	4	4	3	8	2	-
5	GSTC ZURU	1,225	6	5	2	6	2	2	7	3	2	3	3	2	6	4	-	-	-	-
7	GGSC ARGUNGU	1,247	8	6	3	7	2	4	1	1	4	3	3	4	8	4	4	5	3	4
8	GSC ALIERO	1,112	7	4	2	10	2	3	3	1	2	2	2	4	4	1	2	2	1	2
9	GSC DAKINGARI	960	4	3	3	4	0	3	1	0	3	2	2	4	3	2	3	4	2	3
9	GSC KOKO	1,081	3	2	5	2	1	3	2	0	4	0	0	3	2	2	3	1	1	3
	TOTAL	10,124	54	41	24	59	24	24	29	11	26	27	23	30	38	23	21	28	14	17

Source: Inspectorate Department, Ministry of Science and Technical Education, 2011

NB: ST: Subject Teachers, QT: Qualified Teachers, TR: Teachers Required

The picture of the above condition of subject teachers-student ratio reveals a high ratio of student per teacher, especially if one look at it from qualified subject teacher-student ratio. On average, the subject teacher-student ratio and qualified subject teacher-student ratio (in bracket) for English is 1:172 (1:422), for Mathematics is 1:349 (1:921), for Chemistry is 1:375 (440), for Biology is 1:266 (440) and for Agric Science the ratio is 1:284 (1:568). Note that, GSTC Bunza and Zuru are not offering Agric Science. These figures are too high for a one teacher to handle the worse hitted areas are the core science subjects of Physics and Chemistry. Examining the problem on school basis reveals that, Nagari College located in the state capital has the fairest ratios and the worst hitted schools are GSC Koko and GSC Dakin-Gari located in remote areas away from the state capital.

Table 1.2 reveals that the Ministry has little above half or under half of it teachers requirement in all the subjects listed. For instance, the percentage of its teachers' requirement for English is 44.4%, Mathematics; 40.7%, Physics; 89.7%, Chemistry; over 100%, Biology; 55.3% and for Agric Science is 60.7%. The teacher requirement of five proposed model science colleges of GGSC Dakin-Gari, GGSC Jega, GSC Bayawa, GSC Ribah, GSC Warah in the above subjects amounted to one hundred and fifty (each school needs five teachers in each of the five subjects listed above).

Taking-off of these proposed schools without corresponding teachers recruitment will lead to the transfer of few/limited teachers in the existing schools which will further make, the already poor, subject teacher- student ratio more deteriorated.

Table 1.2 presents the condition of technical education in terms of the available technical subject teachers in two existing science and technical colleges in Bunza and Zuru.

Subjects offered in these schools are divided into two: general education subjects and vocational subjects. General education subjects are being offered in both schools, while Bunza offer five vocational subjects and Zuru four vocational subjects in addition to the general subjects.

General Subjects: English, Mathematics, Information and communication technology (ICT), Physics, Chemistry, Entrepreneurship, and Technical Drawing
Vocational Subjects In GSTC Bunza: Fabrication and welding (FW), Electrical, Building construction (BC), Carpentry and joinery (CJ), Motor vehicle mechanics (MVM).

Vocational Subjects In GSTC Zuru: Electrical, Motor vehicle mechanics (MVM), Fabrication and welding (FW), Furniture making (FM).

These are further sub-divided into the subjects in table 1.3.

Despite shortage in the quantity and quality of subject teachers observed, and the high shortfall of instructional facilities in their schools, students' NABTEB results indicates almost 100% pass in the technical and vocational subjects and science subjects in schools under the ministry. However, there is serious concern over poor quality secondary products in general, and technical and vocational schools, products in particular.

Table 1.3: Technical and Vocational Subject Teachers in GSTC Bunza and GSTC Zuru

S/N	SCHOOLS	GSTC BUNZA		GSTC ZURU	
	Subjects Offered	No of teachers	Qualified teachers	No of teachers	Qualified teachers
1	Technical Drawing	1	0	3	1
2	Motor Vehicle Mechanic (MVM)	2	2	5	2
3	Furniture Making (FM), Carpentry and Joinery (JC)	4	1	4	2
4	Basic Electrical	4	3	8	3
5	Information and Communication Technology (ICT)	2	1	0	0
6	Entrepreneurship	2	1	0	0
7	Fabrication and Welding (FW)	0	0	3	2
8	Service Station Mechanics Work (SSMW)	3	1	2	2
9	Bricklaying	3	1	0	0
10	Practical Building Construction	1	0	0	0
11	Domestic/ Industrial Installation	2	1	1	0
12	Petroleum/ Diesel Engineering	2	0	0	0
13	General Metal Works	0	0	2	1
14	Sheet Metal, Structural Design and Construction (SSDC)	1	1	1	0
15	Machine Winding	2	0	0	0
	Total	29	12	29	13

Source: Inspectorate Department, Kebbi State Ministry of Science and Technical Education, 2011

Table 1.3 above shows a great shortage of technical/vocational subject teachers in the schools with high population of 950 and 1225 in GSTC Bunza and GSTC Zuru, respectively. Unqualified teachers constitute almost half of the technical/vocational subject teachers in these schools. Despite the above problems, the State Government is proposing the take-off of new technical school in Lailaba. This has to be complemented with additional teacher recruitment.

The problems stated in this paper could be related to the under-funding of education from the State Government part as indicated in table 1.4

Table 1.4: The Total State Budget, Education Capital Budget, Education Recurrent Budget, Difference between Total Budget and Total Education Budget and Percentage of Education Budget in Kebbi State Budget for the Ministry of Education from 2006-2010

S/N	2006	2007	2008	2009	2010
1.Total Budget	40,521,993,076	48,094,290,252	61,455,077,805	59,908,740,655	52,044,465,218
2.Actual Capital Released	5,086,170,676	5,369,346,837	5,146,241,904	3,185,353,000	4,126,263,956
3.ActualRecurrent Released.	248,810,008	1,482,925,923	2,388,975,923	6,091,852,450	446,210,508
4. Diff. btw total budget and Actual Capital + Actual Recurr. released	35,187,012,392	41,242,017,492	53,919,859,978	50,631,535,205	47,471,970,757
5. percentage	13.1%	14.2%	12.3%	15.5%	8.8%

Sources: Kebbi State Ministry of Education, 2011.

From the table 1.4 it is clear that government budget on education is far below the minimum requirement of 26% budget on education stipulated by the United Nation Educational Scientific and Cultural Organisation (UNESCO). The highest state's budget on education was 15.5% in 2009 and the worse hitted year was 2010 with only 8.8%budget for education. This shows that the state government did not appreciate the capital-intensive nature of education, science and technical education in particular as well as the deteriorated condition of instructional/ infrastructural facilities in the schools, and poor state of science/technical education in particular, and education in general. This is relevant to the findings of many researchers on the issue of underfunding the educational sector despite the great investment required as revealed in human and material requirements of Kebbi State Schools. For instance, Babalola (2008) associated supervisory and financial problems to reasons for failure in the implementation of education policies in Nigeria. He remarked, "The dilemma associated with shortage of funds during implementation of plans is how to determine which project should suffer from cost reduction. Research shows that education projects are always the victims of fiscal shortfalls in Nigeria".

Conclusion

The failure of education sector in developing Science and Technology in Kebbi State has been traced to lack of basic scientific knowledge and experience of the world which constitute the foundation for professional knowledge and expertise. The paper examined the acute problems bedeviling science and technical education in Kebbi state secondary schools, with particular reference to science and technical colleges. It was discovered that these problems, as in other levels of education, revolves around low students' enrolment in science and technical education, decay of infrastructural/ instructional facilities, funding of education, serious shortage of science and technical subject teachers in the schools both in quantity and quality, among others.

Recommendations

If the idea that technology is an act of making things and making them work for the benefit of man holds water, the approach of teaching in our science, technical/Vocational schools must move from stress on intelligence to creativity, from convergent thinking to divergent thinking, from defensiveness to openness, from safety to growth. We must stress less on the usual and expected and stress more on novel and speculative. Certainty should be disfavoured and risk be favoured in the practice of science and technology in the schools.

This paper has clearly revealed that instructional materials, laboratories/workshops and their equipments are not sufficient and adequate in Kebbi state's secondary schools, science and technical colleges in particular. The saying that what I hear I forget, what I see, I remember, that I do, I understand stresses the need for effective and efficient use of instructional aids/equipments in schools toward enhancing qualitative and effective practice of science and technology in the state's secondary schools.

Kebbi state government should consider the capital intensive nature of science and technology education and the deteriorated condition of science and technical education in the state as clearly revealed in this paper, which stresses the need for the review of its present tradition of under funding education in general, to meet the 26% minimum requirement budget on education stipulated by the UNESCO.

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