Perspectives from Nigeria on the Science & Technology Continuum – from School to University

Long term sustained growth can be assured only if the money invested in science and technology is matched by the provision of funds for complementary educational programmes directed both to the preparation of scientists and technologists and to the improvement in science literacy of the population as a whole … At all levels from the ubiquitous "man-in-the- street" to the most influential ministers, there is a tendency to take education for granted. But unless it is supported on the necessary scale, long term development will not be successfully achieved.

If science and technology hold the key to sustainable development in Africa, this revelation should constitute a beacon to the continent. The corollary is that prominence must be given to science technology education in African schools. That is why in recent years attempts have been made to improve the quality of delivery of science, technology and mathematics education (STME). In the pursuit of this goal, Nigeria, for instance has formulated its policy on S & T, the examination of which we now turn to.

The Nigerian National Policy on Science and Technology

The National Policy on Science and Technology (revised, 1999) is prepared for a 25-year time frame with a provision for revision at 5-year intervals. Its basic philosophy emphasizes Nigeria's commitment to the creation of an independent, integrated and self-sustaining economy, with the National Policy itself being the framework for effort towards the fulfilment of the commitment.

- National Space Policy and Programmes
- National Policy for Information Technology
- National Policy for Biotechnology.

Nigeria launched a communication satellite NIGCOMSAT-1 on 13 May, 2007 in consort with Xinchang Satellite Launch Centre in China.

It is noteworthy that in arriving at the national policy on science and technology, Nigerians are seeking a retreat into their traditional base to reconstruct technological capability and chart a true evolutionary course of development. This will be achieved through evolving a synergy amongst the natural resource endowments, cultural heritage and scientific and technological humanpower as a means of addressing effective developmental options that will keep the citizens abreast of the trends in the modern age.

The African Institute for Science and Technology (AIST): Abuja (Nigeria)

- Human capital development, which includes production of scientists and engineers with leadership and entrepreneurial skills in African communities;
- Improvement of the education system, especially tertiary and secondary institutions by setting an example through a competitive system of admission and collaboration within SSA;
- Scientific and technological knowledge development, incubation, and dissemination through collaborative research and links with other centres of excellence within SSA and abroad.

State Policies on Science & Technology

In response to the national policy, and to ensure that science and technology programmes get grassroots patronage, Nigeria's federating state governments have in turn established State Ministries of Science and Technology, with some developing science and technology policies to suit their local needs. One of such States is Akwa Ibom State.

Major Questions S & T Policy seeks to Provide Answers

The contents, concepts, and contexts of the S & T policy presented here attempt to provide specific answers to the following questions:

What role will Science and Technology policy play in setting the charter of intellectual invention, innovation and creation of wealth in Akwa Ibom State?

- How can scientific principles and applications be utilized to create wealth and prosperity for people of Akwa Ibom State?
- How should Akwa Ibom State people be developed to respond to the impact of future challenges in Science and Technology at national and international levels.

- **Policy Implementation Guidelines**

  The implementation approach suggested shall be on short-medium-and long-term plans where the time horizons are defined as:

- ***Short Term (0-4 years).***
- ***Medium Term (5-10 years), and***
- ***Long Term (11-20 years)***

The Science and Technology Continuum: from School to University

In order to gain an insight into the S & T continuum in Nigeria, it would be of interest to consider herein the results of four separate studies conducted by the World Bank. Following are the summaries of the studies.

Review of Policies in Science, Technology and Innovation in the Science and Technology Post-Basic Education Sub-Sector.

The S&T policy also sets enrollment targets in the education system for science and technology. For conventional universities, the science: non science targeted proportion is 60:40% ratio; for polytechnics, 70:30; for federal universities of technology, 80:20%.

In terms of access, equity and S&T Ratio:

- Only about 30% of the secondary school cohort is in school and only about 8% of the tertiary cohort is in tertiary education.

- Only about 30% of all secondary education students are studying S&T subjects in the country but the proportion in the federal colleges is over 60%; with only about 25% of girls enrollment in colleges in the North studying S&T.

- Females account for only 30% of the student population in universities and only 16% of the academic staff population with over 70% of them in non-S&T areas.

- The science: arts ratio in the federal universities in 2000 was 57:43 as against the policy prescription of 60:40; in the polytechnics, it was 46:54 as against the policy prescription of 70:30.

- There are no sufficient data on access to technology institutions to analyze student characteristics across gender, income variation and geopolitical zones, hence recommend strategies to promote equity between rich and poor, gender or zones. School data tend to show higher enrollment of girls in some high schools but distribution across subjects is unknown at the moment.

Access in senior secondary may vary across geopolitical zones (e.g. 25% girl enrollment in Northern states versus 50% in the South) and require improvement but accurate data are still unavailable.

In terms of quantity, post secondary education data shows a low intake in science and technology but no data are available to indicate numbers actually enrolled in various science subjects (physics, chemistry, biology, mathematics, integrated science) or various technical and vocational programs (carpentry, mechanics, ICT, electrical, etc.) as a % of the age groups to recommend improvement.

There is a general feeling that most secondary school students favor academic university qualifications instead of polytechnic training.

The issue of autonomy for universities and other higher institutions of learning needs to be clarified as it is crucial in repositioning them to face the challenges of the knowledge economy; international trends indicate increased autonomy in financial and administrative management of higher education institutions to give them the opportunity to freely engage in knowledge production within existing policy framework.

Science and technology teaching methods should be modernized to bring life back into science. To do this, a policy on standards of professional development of teachers should be implemented, requiring teachers to maintain a reasonable level of pedagogical content knowledge and skills.

Science and Technology Education Post Basic Study: Teaching and Learning, Curricula and Assessment Practices.

For effective implementation of S & T programmes, substantial investments need to be made for resources, not only at SS level, but at all Post-Basic levels.

Employers have poor perceptions of *University* graduates. The message is that students are not prepared for their future jobs. Reforming the curriculum to be competency-based, interactive and problem-based teaching and learning will provide students with the necessary skills for future employers to build on for further fine-tuning with very specific skills. Professional development opportunities for lecturers implementing the curriculum are essential. Productive links with industry need to be established in aid of the curriculum reform process.

At all levels, female students in S&T based studies are under-represented. Male students outnumber female students by far in S&T programmes at Federal Colleges (81%), Polytechnics (60%) and Universities (73%). At Polytechnics female students often take the ‘softer’ options, business management, leaving technical subjects like Welding and Plumbing completely untouched (0%). It is only at the Colleges of Education that female students outnumber their male counterparts especially in the South of the country, but not so in S&T teacher education programs.

Removing gender biases in instruction and instructional materials and the positive presence of female role models are strategies to keep in university S&T programmes once they are there. Special programmes and scholarships should stimulate girls who want to enter S&T programmes.

Financing Trends and Expenditure Patterns in Nigerian Post-Basic Education: A Focus on Science & Technology

The data reveal that federal financial allocations to all portions of the tertiary sector have increased significantly over recent years, and the federal government is the primary source of institutional revenue. Growth in federal funding has not kept pace with enrollment growth, however, and per student allocations have declined.

With respect to funding for Science and Technology Education, the federal government remains the principal source of resources for S&T post-basic education, although parents make contributions of an unknown amount at the secondary level.

Implement strategies to reinforce the science: arts enrollment policy. Government might, for instance, reward institutions for their achievement of the goal or target scholarships at students in particular disciplines.

Labour Market Responsiveness in Nigeria – A Study of the Supply and Demand for S & T Graduates.

In certain S & T subject's areas there are more graduates that can be absorbed by the labor market, but in other areas of S&T the number of job opening are higher than the number of graduates. Official data also highlights the gender bias nature of some S&T programmers, with males tending to study hard science based subjects and females more likely to study business studies. Resource allocation could also be questioned at the tertiary level. Within the polytechnics system over 112 subjects are being delivered, with enrolment levels at some institutions in single figures.

On a qualitative level employers questioned the relevance of existing S&T provision at the tertiary level. Employers thought that S&T graduates had poor ICT skills. Concerns were raised by employers over other key skills, particularly team working and inter-personnel skills.

There is a need to ensure better synergy occurs between trade and investment strategies, developments in S&T, education provision and the requirements of the labour market. Over the short-term, information on the demand and supply of S&T graduates should be improved. This can be achieved through developing the capacity of government departments to commission labour market research and universities to undertake such research.

I thank the symposium leadership for inviting me to give this address and I wish us a very rewarding programme.