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A CASE FOR THE INTRODUCTION OF WASTE RE-CYCLING TECHNOLOGY INTO THE CURRICULUM OF TERTIARY INSTITUTIONS IN NIGERIA

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ABSTRACT

This paper critically examines the introduction of waste recycling curriculum into our tertiary institutions as a means for employment generation for sustainability. The general curriculum components for tertiary institutions have been discussed. It has been suggested that waste recycling curriculum should be designed under Chemistry and Mechanical/Production engineering courses in the Universities and waste recycling Department be introduced in our Polytechnics, Colleges of Educations and Monotechnics. Recommendations made for the way forward include: All stakeholders i.e. Nigerian University Commission (NUC), National Board for Technical Education (NBTE), National Commission for Colleges of Education (NCCE), International Labour Organization (ILO), United Nation Educational Scientific and cultural Organization (UNESCO) and Education Tax Fund (ETF), should constitute a committee comprising members from the Academic, industries and professionals to design a curriculum for waste recycling for our Universities, Polytechnics, Colleges of Educations and Monotechnics.

INTRODUCTION

Employment is one of the most effective means of ensuring a just and equitable distribution of income and raising the standard of living of the majority of the population in a society. The only objection to its widespread use as a solution to economic and development problems is that there is rarely enough of it especially in those countries that need it most. In a survey conducted by the Federal Ministry of Education sometimes in 2006, a very alarming rate of youth unemployment emerged in the country of over 60%, Kabiru (2006). Although, the figures might be higher now after four years, it is an indicator to the crises in which this country finds itself. With a population of over 140 million and a youth population of 80 million, with 64 million unemployed, also with an estimated graduate turnover of 600,000 graduates yearly, the Nigerian Labour Market is in crises (Kabiru, 2006). To this effect, we have every reason to sound an alarm bell especially in a situation where over 70% of working people are either unemployed or underemployed. So far, the country has continued to manifest glaring features of economic and social difficulties, underdevelopment, unemployment and environmental degradation. One major factor that has been identified to be responsible for this unpleasant state of affairs is the curriculum of our tertiary institutions which is static and narrow in occupational focus and based on obsolete and nonfunctional instructional materials.

Definition of Waste

This work is about one field of employment opportunity:
The exploitation of waste, according to (Jon: 1999), waste is one of the world's largest industries, although you could not discover this from any book of statistics, because its activities cut across its normal division into which industries are placed. All human and industrial processes produce wastes. The waste products of a home include papers, containers, Tin cans, Aluminum cans and food scraps as well as sewage. The waste products of industries include metal scraps, wood and Paper as well as Agricultural waste products. If you buy a bottle of Medicine it may have a metal top and be protected by plastic foam padding, in a cardboard box. To recycle these parts after the Medicine has been taken, you will need to sell the bottle to a glass maker, the top to a foundry, the plastic to a molder and the cardboard to a paperboard mill. If you add waste from Agriculture. Animal and meat industries, mining and quarrying, industries that make Iron and Steel and other metals, textiles, rubber, chemicals and oils and all the activities of collecting and disposing of household and

other wastes and the industry becomes apparent. Waste in our Towns and cities drift around the streets as litter and spoils the town for tourists' attraction attract flies or rats and block up the drains if there are any. Waste is free or if not free then very cheap, plentiful, familiar and flexible raw materials, suitable for labour intensive using appropriate technology and little capital and providing a cash income plus other environmental and community benefits. These then are the reasons why waste recycling technologies should be taught in our tertiary institutions.

Energy Situation in Nigeria

In Nigeria, as in all other developing countries, the major promoters of development are the finite fossil fuels (non renewable energy sources) that constitute the main sources of industrial and commercial energy. However, considering their immense polluting characteristics there is need to promote the substitution of fuels (renewable energy sources) for sustainable national development. The processing and production of these renewable energy sources should be taught in our tertiary institutions of higher learning as this will promote positive change in the living standard of the people as well as guaranteeing continuity and improvement in this standard for future generations. Solid wastes are a veritable source of a sustained renewable energy that can be utilized for our present needs and that of the future generations. According to Muye (2003), energy has greatly woven into everything and the future prospects for the growth of infra structural facilities, Agricultural and industrial production and other indices of socio-economic development and directly and closely linked to the provision of adequate, affordable and reliable energy supplies and its conversion technology. Many of the world's present problems are closely related problems of energy distribution, dwindling fossil fuel supplies and environmental effects of various methods of energy production and utilization. According to Mohammed (2003), fear of energy shortages now pervades many nations with Nigeria not being an exception. People are running out of gas, and petrol, lacked fuel to cook their food and have been laid off because of energy and raw materials shortages in the factory. He further maintained that waste products of our industrialized society can be used to provide fuels for our Electric Power and Steam Plants. In fact, burning of waste has been reported to produce Electricity at a very cheap rate compared to burning of coal or oil. Waste (refuse) has about half of energy per unit weight of coal. Solid waste has significantly lower sulphur content and therefore has low level of pollution.

Tertiary Institutions in Nigeria

Nigeria as a country has population estimated to be 138.8 million in 2002 (NBTE, 2007). At the moment the 96 Universities that are either Federal, State or privately owned catered or only 120 thousand students out of over 1 million candidates that sat the University JAMB examination in 2008/2009 academic session (Uzoho and Oti, 2006). The carrying capacity of our tertiary institutions in terms of student's enrollment cannot cater for the growing population in the country. For example, the maximum student enrollment allowable in a tertiary institution taking into cognizance the human and physical resources required to run all programmes in the institution is grossly inadequate. A survey of Polytechnics and Monotechnics in the country revealed that all together, there are about 47 Polytechnics and 51 Monotechnics that are either federal, State or privately owned in the country. In magnitude, these institutions are inadequate in relation to the population of the country. Apart from establishing new ones, the existing ones needed expansion by introducing new courses. These new courses should reflect local Technologies with a view to developing them.

The General Aspects of the Curriculum of Tertiary Institutions in Nigeria

Generally, the curriculum for tertiary institutions particularly for Sciences, Engineering and Technology normally consist of five main components. These are:

1) The general studies education component which includes courses in English Language, communication, Industrial Management, entrepreneurship education, Citizenship Education etc.
2) Foundation courses which includes courses in Mathematics and Science.

3) Professional courses are core courses of a programme which gives the students the theory and professional skills he needs to practice his field of calling i.e. Chemist, engineer,Technologist
Educationist etc.
4) Students Industrial Work Experience (SIWES): students offering career courses in Science, Engineering and Technology are to engage on SIWES in Industrial related to their fields of studies in order to acquire some industrial experience before their graduation.
5) Finally, students expected to execute a project at the end of their programme for them to exhibit all they have learnt. The structure of science programmes consists of the following:

a) Classroom activities and
b) Laboratory activities

This is accompanied by continuous assessment (assignments and test) and examinations. The National Universities Commission (NUC), National Board for Technical Education (NBTE) and the National Commission for Colleges of Education (NCCE) are the three sister commissions that are responsible for designing curriculum, accreditation of academic programmes funding of tertiary institutions
and maintenance of minimum academic standards in the Universities, Polytechnics, Colleges of Education (Technical and Conventional ones) and the Monotechnics respectively.
It is based on the aforementioned curriculum components that students are expected to be employable either self or otherwise for sustainability at their graduation.

Proposed Curriculum for waste recycling in science and Mechanical Engineering Programmes

The professional courses in science (environmental chemistry, organic chemistry and polymer chemistry etc) and mechanical (production) engineering are the areas identified for the introduction of new areas of specialization know as waste recycling. These new courses share one or more of the following possible characteristics:

i) They use local material whenever possible.
ii) They create jobs employing local skills and labour.
iii) They are labour intensive rather than capital intensive.
iv) They can be understood, controlled and maintained by the indigenous people wherever possible without a high level of Education.
v) The technology is flexible so that they can be adopted to fit changing circumstances,
vi) The technology do not involve patents, royalties, consulting fees, import duties, shipping charges, or any of the other strategies of high technology that keep it out of the reach of the masses.

Waste recycling is a new and emerging appropriate technology curricular that needs to be explored. Olaitan, Onyemochi, Nwachukwu, Ibgo and Ekong (1993), observed that it should be known that what is faulty in our education system, is not the idea of specialization but the lack of depth with which the subjects are usually presented and the absence of the specialized knowledge and skills. In such a situation, Okorie, (2001) observed that curriculum and instructional materials are not developed for new occupations and generally emphasis seems to be on obsolete and declining skills. To address this problem, this paper advocates for the development of curriculum in core courses of the following programmes:

1) In the University: Waste recycling curriculum should be developed in organic chemistry by considering the three major methods for conversion of organic wastes to synthetic fuels i.e.
hydrogenation, pyrolysis, and bioconversion/anaerobic digestion. It is hoped that if these courses are designed and fully implemented the problems of energy distribution and graduate unemployment will be a thing of the past; similar curriculum should be

developed in polymer chemistry where plastics and related waste materials are recycled and Environmental Chemistry on how waste (refuse) should be recycled for the production of fertilizer.

2) In the Universities and Polytechnics, Colleges of education and Monotechnics, Mechanical (production)/Technology Education departments for waste recycling should be established with the curriculum designed. The Departments should be equipped with classes, laboratories and foundries. Students should be taught the theoretical and practical aspects of recycling wastes so that they can be employable either self or otherwise on graduation.

RECOMMENDATIONS

1) All stake holders (NUC, NBTE, NCCE, ILO, UNESCO and ETF) should constitute a committee comprising members from the Academia, industries and professionals to design a curriculum for waste recycling for our Universities, Polytechnics, Colleges of Educations and Monotechnics.
2) Universities, Polytechnics, Colleges of Educations and Monotechnics should established these courses in their Institutions and also make provision for laboratories, foundries and classes for these courses.
3) Government should employ qualified staff and also make provision for the training of the existing staff on the new curriculum. Furthermore, enough funds should be pumped into these Departments as these courses are practical oriented courses.

CONCLUSION

It has been estimated that about 65% of our urban wastes is combustible. Thus the potential exist for burning some millions of tones of refuse and using the heat to produce steam for heating or for driving steam turbines to produce electricity. Studies have shown that the heat content of refuse is equal to the heat content of one thousand Kg of coal. By introducing waste recycling courses in our tertiary institutions, the country will no doubt benefit in the following ways:

a) Abundant energy distribution for generating electricity in our industries.
b) Employment generation for the products of these programmes for sustainability and free of Environmental hazards such as pollution, global warming and diseases.

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