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CHEMICAL EDUCATION: A TOOL FOR WEALTH CREATION FROM WASTE MANAGEMENT

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Abstract
This paper focuses on exposing the indispensible role of chemical education in wealth creation from waste. Every settlement of people has one type of waste or the other to dispose. The challenge of waste management has in recent time occupied researchers such that innovations are geared towards reducing wastes that are generated and converting already generated wastes into useful products. Diversity of people and waste generated are two reasons why no single approach to waste management has been accepted as the best method. The need for chemical education is not only paramount but critical since every human activity leads to the generation of one type of waste or another. Chemical education exposes one to the knowledge of chemical composition of waste matter which will help in their recovery and re-use thus providing opportunity for economic empowerment. Recommendations were made that the techniques of waste processing and management be integrated in the curricula of basic sciences and chemistry. Also financial assistance should be given by financial institutions to chemistry graduates who are willing to apply knowledge gained into converting wastes generated from our environment into useful products that are of economic benefit.

Keywords: Chemical education, waste management, wealth creation.

Introduction

In Nigeria today, few issues have touched the concerns of our society as greatly as the need to manage wastes. Every human settlement generates refuse and ideally, when this refuse is generated, it should be effectively disposed of. This is always operative where the citizens of the given settlement do their civic duties regularly. The interventions of man have caused changes in environment and interruptions of classic Carbon and Nitrogen cycles. The more advanced the community is, the greater the interruptions of the natural processes of waste utilization thus, waste abound in different forms, sizes, posing all kinds of hazards to human health and environment.

The challenge of waste management has in recent time occupied researchers such that innovations are geared towards reducing wastes that are generated and converting already generated wastes into useful products. This is imperative because the earth has a natural capacity for dealing with waste and pollution generated by the society and if exceeded, it becomes unsustainable. This paper therefore aims at unveiling chemical education as a tool for wealth creation from waste management.

What is waste?

According to Okebukola (2001), Wastes are all things we consider as unfit, unwanted and discarded due to economic reasons or ignorance of alternative technologies to re-use them. It can also be seen as a solid, liquid or

things that is discarded as useless but that has a potential of causing death, illness or injury to people or destruction of the environment if improperly treated, stored transported or discarded (Tchnobauoglous, Theisen and Uigil,1993).

Akinyugha (2010) stated in his sponsored bill for an ACT to establish the Chemical Waste Management Commission that there is no waste that does not possess some level of chemical properties in them i.e. having different types and forms of chemicals. An understanding of these properties and their transformation which are acquired through chemical education is the gateway to their proper management and re-use.

The Resources Conservation and Recovery Act (RCRA) of the United States Environmental Protection Agency (US EPA)] outlined some of the different sources of waste as follows; Garbage (e.g milk cartons and coffee grounds), refuse (e.g metal scrap, wall board and empty containers), Sludges from waste treatment plants pollution control facilities. Others are non-hazardous industrial wastes (e.g manufacturing process water and wastewater sludge and solid), other discarded materials including solid, semi-solid, liquid or gaseous materials resulting from industrial and commercial activities (e.g mining waste), crude oil and natural gas waste, construction and demolition debris, medical waste, agricultural waste, household hazardous waste etc, (Drobny, Hall and Testin, 1971).

Wastes generated are categorized into biodegradable and non-biodegradable. Altaf, Deshazo (1996) explains that biodegradable wastes which originate from plant and animal sources may be broken down by other living organisms. This poses environmental concern when disposed in landfills due to its link with global warming as it breaks down under uncontrolled anaerobic conditions to yield some green house gases like methane and carbondioxide. Non- biodegradable wastes cannot be broken down by other living organisms. They are usually bulky and can resist incineration and where possible lead to production of noxious or toxic fumes. Some non-biodegradable wastes are explosive, corrosive and very reactive.

Waste management and disposal

According to Anurigwo (2000), Waste management is the collection, transport, processing, recycling or disposal of waste material usually those ones produced by human activity, in an effort to reduce their effect on human health or the environment. Waste management can involve biodegradable and non-biodegradable wastes with different methods and field of expertise for each. Waste Management practices differ for developed and developing nations, for urban and rural areas and for residential, industrial and commercial producers. As waste management issues gain public awareness, concern has risen about the appropriateness of various disposal methods.

Many countries now have programmes to reduce the amount of waste disposed to the land, air and water through increased recycling and deploying waste minimization initiatives. Disposal of treated and untreated waste should be the last resort. It must be noted that no single solution completely answers the question of what to do with our waste. People diversity and waste diversity are two reasons why no single approach to waste management has been accepted as the best method; therefore every municipality must create its own best approach to deal with its waste (Njoku, 2009).

The crusade for green chemistry which seeks to solve environmental problems by applying highly effective innovative scientific solution to real environmental problems, reducing or

preventing waste and pollution at its source is on-going in many countries of the world, (Ngozi-Olehi, Okenyi & Njoku, 2010)

Wastes can be treated or recycled by converting or reforming the material that would otherwise be considered as waste into another useful product. Some materials that can be recycled include the following; paper, metals, electronics, organic materials etc. Osuntogun, (1994) explains that recycling is often viewed as a resource conservation activity, it may offer greater return for many products in terms of energy saving.

Chemical education, waste management and wealth creation

Chemistry is an enabling science that will allow economic and environmental progress to proceed in harmony (Lancaster, 2001). The earth's environmental resources are unlimited and inexhaustible making it pertinent for proper waste management in the course of economic development. Chemical education sensitizes the citizenry on the appropriate collection, transport, processing and disposal of waste materials that gain entrance into our environment. It equips one with the capability of waste recycling and post-use management practices. The need for chemical education is not only paramount but critical since every human activity leads to the generation of one type of waste or another.

Major breakthroughs in sustainable development can be achieved by changing the mindset of people from the carefree attitude of dumping waste anywhere and everywhere. Chemical education is most expedient now in Nigeria as she is working hard to become one of the topmost twenty countries by the year 2020 (vision 20:2020). This is because it will promote wealth creation and poverty alleviation from waste. Wealth creation from waste has been widely embraced by most developed countries of the world, generating wealth by conversion of biodegradable materials into useful products such as biogas (Ngozi-Olehi, 2009)

Waste management which encompasses waste collection, transportation, sorting, packing, recycling, scientific analysis, treatment etc creates viable business enterprises through which thousands of jobs can be created. A novice in waste management principles which can be acquired through chemical education cannot fit in for the purpose of wealth generation from waste.

Chemical education can expose one to the knowledge of energy properties in waste matter that can be converted to generate energy using different chemical processes such as combustion, anaerobic digestion, pyrolysis, gasification etc. From this, contribution is made to national development through increased energy supply from alternative sources and decreased dependence on fossil fuel, (Ngozi-Olehi, 2009).

Valuable metals such as ferrous metal, aluminum and copper can be recovered and recycled from electronic wastes. According to Environment Canada, it has been estimated that personal computers which are disposed contain 4,400 tonnes of ferrous metal, 3,050 tonnes of aluminum and 1,500 tonnes of copper. Knowledge from chemistry will help in the recovery and re-use of these metals available in e-waste. Recycled metals create new parts and building structures both of which help our economy and lifestyles flourish. Chemical education can also expose one to secondary recycling or down recycling which recycles materials into new and different products such as recycling used plastic milk cans to produce outdoor furniture (Selke, 1990)

The knowledge gained from chemistry can be employed in paper recycling. Recycling old papers uses 60% less energy than

manufacturing from new materials and also consumes less chemicals as well as bleaches which is safer for the environment. These wastes conversion means if harnessed, can lead to economic empowerment.

Conclusion

Waste management in national development is an issue for concern as wastes are generated with increased technological advancement. The place of chemical education in waste management and wealth creation is indispensible. Proper application of knowledge from chemistry in waste management will enhance our environment and improve the economic state of the nation through wealth creation from waste. Converting wastes for re-use gives room for sustainability. Suitability of the treatment process of any waste can only be properly understood through chemical education which guides one on the chemical composition of such waste.

Recommendations

Having identified that chemical education is a tool in waste management, it will be beneficial to expose students of chemistry to the techniques of waste processing and management. This will require integrating waste handling and processing into the curricula of basic science at basic educational levels and chemistry at the higher level. Graduates of chemistry who are willing should be assisted financially to apply knowledge gained into converting wastes generated from our environment into useful products that are of economic benefit.

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