

Green Chemistry: Senior School Student's Awareness And Practice In Southern Nigeria

Alake Ese Monica

College of Education, Ikere- Ekiti, Ekiti State, Nigeria.

IJERT

Abstract

The level of awareness, understanding and practice of green chemistry was investigated among senior school chemistry students in Southern Nigeria. 624 senior school chemistry students from 12 secondary schools in the region constituted the sample. Data was collected through a 25 item questionnaire (CSQ). Percentages and t-test was used to analyze data collected. The results of findings revealed very low understanding and practice of green chemistry by students. Students in urban locations had better practice of green chemistry. Recommendations suggested include more benign topics in senior school chemistry curriculum.

Key Words: Green chemistry, senior school, awareness, practice and location.

Introduction

The composition of the Earth's atmosphere is undergoing an unprecedented change, largely as a result of human activities, industrial development, fossil fuel burning, deforestation and agricultural practices. This has led to an increase in the atmospheric concentration of pollutant gases. Such gases include carbon (iv) oxide and methane which are gases responsible for the green house effect. The increase in concentration of these gases could have far reaching consequences causing respiratory illness [2] and [8].

[17] opined that the scientific estimates of these gases indicate a rise in the global mean temperature of between 1.4⁰C and 5.8⁰C over the next 100 years. The above is confirmed by the findings of [1] which stated that 400 million tons of CO₂ is released yearly through gas flaring. While [21] opine that more than 70% of the oil fields in Nigeria flare about 0.84 trillion cubic feet of associated natural gas every year. Most oil communities therefore live with gas stacks that flare gas 24 hours a day at temperature of 13-14,000 degrees Celsius as opine by [13].

It is, therefore, obvious that a temperature rise of this magnitude over a relatively short space of time would have a major impact on man and the earth in general. Many forms of pollution arise as by-products of industries. For example, the polymers known as plastics, which are produced in abundance, break down slowly in nature. Much of it is burned or otherwise degraded to smaller vinyl chloride units. Virtually all of the plastic that has ever been produced is still with man (us), in one form or another which constitute a new form of pollution.

Nigeria, like all other nations, sees education as a vital instrument for national development. This fact is contained in the [5] which spelt out broad goals that include: - The acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the

individual to live in and contribute to the development of the society. [5] The school curricula at all levels are not only drawn to meet the spelt out policy, specific disciplines are fashioned out to pursue the itemized goal. Chemistry is essential not only for the pursuance of science and science –based careers in higher studies but also expected to provide knowledge leading to environmental consciousness and accounting [13] and [14].

Chemistry has the four aspects of Ziman's comprehensive description of science. These are; (I) organized knowledge about natural phenomena are uniquely true and real, (II) vocational skills, (III) technology, and (IV) social and emotional aspects. The above categorization is supported by [4] statement that these four aspects constitute viral science teaching and learning. Many teachers do not see chemistry as a science subject in this light. Equally, [12] advocated problem-based chemistry curriculum which is capable of solving daily environmental problems among others. Chemistry as an enabling science will allow economic and environmental progress to proceed in harmony [19]. Despite the outstanding importance of chemistry as a core subject in Nigerian schools, investigations revealed that, it is strongly driven and focused too exclusively on scientific knowledge; as a result chemistry contents are not popular. Students often therefore fail to see the relevance of chemistry in relation to their environment and they often do not see its connection with their everyday life and future. The inadequate capacity for sound management of toxic waste aggravated by the strict regulatory regime and exorbitant treatment costs were responsible for the wave of dumping by developed countries of thousands of tons of toxic waste in developing ones in the 1980's. Nigeria was a victim of this toxic waste terrorism with the discovery of 3,888 tones of assorted toxic radioactive waste in Koko port in the old Bendel State. These dumping coupled with untreated attention render most, if not all the surface water sources in the major urban industrial cities of our country (Nigeria) colorized, odiferous, non-drinkable, non swim able, non-fishable, unhygienic, nor useful to the society, who hitherto use these water sources for drinking and other domestic chores [14].

Today, there is growing awareness all over the world, in industry, academia and the general public, of the need for sustainable environment and development. The international chemistry community is under increasing pressure to change current working practices and to find greener alternatives. Scientists and engineers from both the chemical industry and the academic world are also making efforts to correct pollution problems by the more extensive use of green chemistry principles. The development of methodologies and products that are environmentally friendly is the order of the

day in industrialized nation in the world. These initiatives are yet to gain ground in the developing nations like the Sub-Saharan African nations and Nigeria in particular where environmental consciousness and accounting meant little or nothing to the citizenry [10]. Unfortunately, the study by [7] revealed that people at large had no knowledge of green chemistry. The Nigerian nation is yet to overcome the trauma of 2012 flood disaster in Lagos, Ibadan, Bayelsa State, Ughelli South local Government Area of Delta State and several other places. A visit to computer village Ikeja (Lagos), Aba (Abia), Warri, (Delta), K-Derre (Rivers) revealed illegal and inappropriate disposal through burning of computer wastes that release harmful pollutants such as polychlorinated compounds. These are different from fire outbreaks due to oil spill and flaring of gases resulting in serious climatic change and global warming. Very useful hydrocarbons like ethene (C_2H_4), propene (C_3H_6), butene (C_4H_8) that are important raw materials in petrochemical industries are being wasted through gas flare. Several Nigerians die daily due to unburnt carbon from generators and food poisoning, despite the series of government campaigns against bush burning and sensitization for tree planting exercises. But little has been said and done about curbing these unwholesome environmental practices in Nigeria. This unhealthy negligence and lack of capacity to control and maintain the delicate balance of our environment informs this evaluation research. These problems may continue to threaten and afflict the entire populace as long as we refuse to be environmentally conscious. Any nation paying lip service to environmental consciousness and accounting is doomed. Such negligence is a call to sterner ecological disasters presently ravaging many nations of the world [22]. The current challenge calls for expansion of the concept of green chemistry.

The "green chemistry" concept was introduced in the early 1990s in the scientific community and was first used by P.T Anastas in US Environmental Protection Agency. And soon, it was adopted by mass-media as the new approach to chemistry in opposition to the pollution and the clean-up approach considered as a common industrial practice. The concept rapidly became popular and a focus of various research institutes, authors and journals in seeking concept clarification, meaning and definitions as stated by [23]. Green chemistry involves promoting the design of environmentally benign processes that minimize or eliminate the use of toxic substances (feedstocks, reagents, solvents) and maximize overall efficiency (reduction of unwanted by-products, especially toxic materials). Its guiding principle is prevention rather than cure, it is far better to prevent toxic waste from being produced in the first place, rather than cleaning up after the fact. Those who practice green chemistry

recognize that they are responsible for any effects on the world that their chemicals or chemical processes may have. Despite the implications of human activities to the environment, there is consistent gas flaring, indiscriminate disposal of waste in entrance of cities, bush burning for agriculture, consistent tree felling and high use of fossil fuel in generators, car engines, pipeline vandilization is on daily increase.

It therefore appears that environmental support is not practiced in Nigeria neither is it seen as an important part of collective national development. This calls for an evaluation of conceptual understanding, awareness and practice of green chemistry among senior school students in Southern Nigeria. Such an evaluation will facilitate the inclusion of green chemistry in the curriculum where necessary.

Research Questions

1. What is the level of green chemistry practice among senior school students?
2. Will school location have any influence on SS students' level of green chemistry practice?

Methodology

The study is a descriptive survey research type. An investigation of senior school students' level of green chemistry practice and the possible influence of school location on their practice of green chemistry was carried out. The population consist of all senior school class 3 chemistry students in Southern Nigeria. Six hundred and twenty four (624) class 3 chemistry students which were randomly selected from twelve (12) secondary schools from six local government areas in six States constituted the sample. A chemistry student questionnaire (CSQ) consisting of 25 items adopted from [11] and [24] made the instrument. Using Cronbach Alpha the coefficient of the instrument was calculated to be 0.79 at 0.05 levels. Data was analyzed using t-test.

Results and Discussion

Table 1: SS students and level of green chemistry practice

Category	frequency	Percentage
Know GC	239	40%
Lack GC	385	60%

GC: Green chemistry

The result from the table 1 shows that only 239 (40%) of the students have knowledge and practice green chemistry. 60% of senior school students do not have knowledge and do not practice green chemistry.

Table 2: SS School Location and GC Practice

School P Location	N	Mean	Std. Deviation	df	t
Urban .00*	300	79.20	73.48	623	7.82
Rural	324	73.48	7.60		

The table 2 shows that school location has significant influence on level of green chemistry practice among senior school students. The mean of students in urban locations was found to be 79.1961 while that of the rural was 73.4848.

Discussion

The study revealed that 40% of senior school students have knowledge and practice green chemistry in Southern Nigeria. 60% of the students do not know the meaning and do not support their environment. This may be due to the fact that students at senior school level do not transfer what is learnt in the classroom to life experience. The result conformed to the findings of Moses and [9] who revealed that students do not see the relevance of chemistry to events in life. The above is supported by [6] who stated that students lack the ability to apply what is taught in chemistry to solve problems, produce goods and services. They further iterated that the preparation for useful living within the society is neglected. [21] agrees that the goal of functional education is to prepare its beneficiaries with all it takes to adjust well in the societies, contribute meaningfully to the development of the society, and as well live a fulfilled life. The above is supported by the earlier statement of Eugene (1981) that problem solving approach is significantly better in improving the overall achievement of students and it is practically more effective in facilitating application of principle of science (chemistry) concepts.

While Woodhouse and [25] agreed that exposure of individuals to impact of their activities will restrict the abuse and enhance environmental support. This proves that the curriculum has not fulfilled the objectives of education as stated in the National Policy of Education.

The findings of this study also show that senior school students' school location influences their level of green chemistry practice. This may be due to large land mass available to the students with low population in the rural areas. This encourages discriminate defecation of waste at any point

without any one to coition them. Such groups of people have farming as their major occupation as a result bush burning is high in order to have their daily meals. Since such locations have no electricity many result to using wood that emits carbon (iv) oxide to prepare their meals. This conforms to the findings of [15] who opined that enlightenment of local communities on environmental awareness and monitoring as key intervention for development, adaptation and coping strategies against future disasters. While students in urban location have better practice of green chemistry may be due to stringent laws in the urban areas and availability of waste disposal vehicles, lack of space, high population, availability of scavengers, Government close monitoring of residents and payment for waste disposal.

Conclusion

The findings from this study have given indication that senior secondary school students have very low awareness and practice of green chemistry. These are the groups that engage in more junk food eating and do more of domestic waste disposal because they are in the adolescent age. Students at this level find pleasure in playing than considering the environmental impact of their activities. Students in tertiary institutions engage in more positive practice of green chemistry. This may be due to their level of exposure to chemistry concepts that are more benign than those in senior schools.

On the other hand, students in urban locations have more consciousness and practice of green chemistry better than their counterparts in senior schools located in rural areas. This may be due to the fact that most streets in cities have tarred roads with high concentration of houses. Rural areas having large empty land space encourages indiscriminate defecation by students and as such they exhibit very low level of green chemistry practice. It was also observed that long distances to school encouraged students in urban locations to use more of vehicles to school and use of generators and as such more carbon (iv) oxide are emitted into the environment in industrialized states.

Conclusion

The research findings through the data provided show a low level of the understanding of environmental support by senior school students in Southern Nigeria. The above is supported. Even after graduation, lack of scientific explanations to happenings was the findings of [3]. They concluded that students have difficulty in applying their knowledge and they do not extend their knowledge into the real world.

Recommendation

Base on the research findings, the following recommendations are made

1. The existing curriculum at all levels of education should be reviewed to richly include green chemistry;
2. Such curricula should be backed up with relevant cultural ethics that supports environmental consciousness;
3. The need to create awareness in environmental support and sustainability should be translated into action through green chemistry education through both formal and informal education and
3. The teaching of chemistry should reflect its relevance to student's live and activities such will strengthen their future and their science.

References

- [1]. C.Amanze-Nwachukwu, Nigeria, Norway seal deal on gas flaring, oil spill. <http://www.thisdayonline.com/nview.php?id+99813>. 2008. Accessed January 9, 2012.
- [2]. L.O.Amodu, MNCs and sustainable environmental development: an assessment of the Niger Delta and Texas. *Proceedings of International Conference on the Nigerian State, oil industry and the Niger Delta*, 2008. 323-333.
- [3]. D.B. Botkin and E.A. Keller, Environmental Science, Earth as a living planet (2nd). New York, John Willy and son Inc. 1998.
- [4]. L.L. Fatt, The Understanding of the meaning of science among diploma, undergraduate and master students in education. *Journal of Educational Research* 26, 2006, 181-192.
- [5]. Federal Government of Nigeria. *National Policy on Education*. 2004.
- [6]. F. Irmiya and K. Kehinde, A study on Nigerian senior secondary chemistry curriculum in two academic cities in the country. *Nigeria Journal of Science, Technology and Environmental Education (NIJOSTEE)*. 1 (1), 2005, 34-45.
- [7]. S. Krishnasneancy, New Directions in Teaching Chemistry: Fostering Environmental Consciousness in Chemistry Classroom. *Final Report presented to Chemistry Faculty Chandler Gilbert Community College MIL Fellow*, 2006-2007.
- [8]. S. A. Matlin and B. M. Abegaz, Chemistry for Development: The Chemical Element: Chemistry's Contribution to Our Global Future by Wiley-VCH Verlag GmbH & Co. KGaA. 2011.
- [9]. A. Moses and B.B. Ashu, The effects of industrial and domestic gaseous pollutants on air quality and its health implications. *Nigeria Journal of Science, Technology and Environmental Education (NIJOSTEE)*. 1 (1), 2005, 46-52.
- [10]. K.O. Oloruntegbe and M.A. Ayeni, Process, Profits and Problems of recycling of chemical waste. A Proceeding of Sustainability through Mineral Resource Conference (NCRC) 2009, Cape Town South Africa.
- [11]. K.O. Oloruntegbe, .The Need for Green Chemistry Curriculum in Schools. Book of Abstract/Paper presented at the 21st Biennial Conference on Chemical Education. University of North Texas Denton, IX pp 100, August 1-5, 2010.
- [12]. K.O. Oloruntegbe and E.M. Alake, Chemistry for Today and the Future: Sustainability through virile problem-based chemistry curriculum. *Australian Journal of Basic and Applied Science (AJBAS)* 4(5), 2010, 800-807.
- [13]. K.O. Oloruntegbe, Achieving Green Sustainable Chemistry and Environmental Accounting through SS Chemistry Organic Curriculum, A Symposium presented at the 22nd Biennial Conference on Chemical Education at Pennsylvania State University, USA on August 1-4, 2012.
- [14]. K.O. Oloruntegbe and J.O. Agbayewa, Greening the chemistry curriculum: Catching them young. *British Journal of Education, Society and Behavioral Science*. 3 (3), 2013, 223 – 232.
- [15]. F.C. Onuoha, Oil exploitation, environmental degradation and climatic change: Assessing the vulnerability of the Niger Delta Environment to natural disaster. *International Conference on the Nigerian State, Oil Industry and the Niger Delta Conference Proceedings* 1025-1041, 2008.
- [16]. J.F. Osborne, Science education for contemporary society: problems, issues and dilemmas in O' de Jong, E. R Savelbergh, A Albas (eds). *Teaching for Literacy* Utrecht. The Netherlands. 2010.
- [17]. P. Owen and J. Buchdahl, Climate change and ozone depletion Teaching Pack KS3/4. Atmosphere, climate and Environment Manchester. <http://www.ace.mmu.ac.uk/>, 2002.
- [18]. Y. Sumiani, The need to Review engineering education for achieving sustainable development. *Journal of Educational Research*. Volume 25, 2005, 41-49.
- [19]. J. Thorton, Pandora's Poison: Chlorine, Health and a New Environment Strategy by MIT Press, Columbia, 2000.
- [20]. C. Uguru and H. Abdullahi, The educational implications of the core courses, and elective courses, to agric education lecturers and students: A review. *Journal of Educational Research and Development*. 2 (3). 2007.
- [21]. I. Ugwuaren, Groups petition National Assembly on 2008 gas flaring Deadline Lagos: Leadership, January 21, 2008.
- [22]. United Nations, Report of the world summit on sustainable Development, Johannesburg, South Africa, 26 Aug.- 4 Sept., 2002.
- [23]. W. Wardencki, J. Curyo and J. Namieœnik, Green chemistry – Current and Future Issues. *Polish Journal of Environmental Studies*. 14(4), 2005, 389-395.
- [24]. J. Warner, The Green Chemistry initiative Science Advisory Panel. California, 2008.

[25]. E.J. Woodhouse and S. Breyman . Green chemistry as social movement? Science, Technology and Human Values XX (X), 2004, 1-24.

[26].M. Eugene, The Effect of Problem Solving Strategy on the achievement of earth science concepts .*Journal of Research in science teaching*. 18(1), 1981,295-301.

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