

**AN INVESTIGATION INTO THE INCIDENCE OF ENVIRONMENTAL POLLUTION IN
ONITSHA METROPOLIS: THE ROLE OF SCIENCE TECHNOLOGY MATHEMATICS
(STM) EDUCATION IN REVERSING THE INCIDENCE**

BY

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Abstract

This study investigated the incidence of environmental pollution in Onitsha metropolis and the role which STM education can play in reversing the incidence. This study was carried out in Anambra State of Nigeria. The population of the study comprised of all the professional/ career groups living in Onitsha. A sample of 200 respondents drawn from those professional/carrier groups was obtained using purposive sampling method. Data collection was done using structured questionnaire. The instrument was validated and pilot tested. The reliability of the instrument was determined using Pearson's product moment co-relation and a reliability of 0.78 was obtained. Analysis of data was done using frequency, percentage (%) and χ^2 for testing the hypothesis at 0.05 level of significance. The result of the study showed that the incidence of pollution as perceived by the respondents is pervasive due to lack of effective sanitation department to combat pollution in the city.

Keywords: Atmosphere, Education, Health, Mathematics, Pollution, Science, Technology, Waste

1.1 Introduction

The accumulation of wastes can rightly be said to be a forerunner of present day's environmental problems. The causes of these environmental problems have been identified as population growth and industrialization, overloading our environment with pollutants like noxious substances of our daily household, industrial and agricultural wastes. If refuse is not properly disposed, it could be very hazardous to human health industrialization and its consequently rapid population growth and population concentration are the major contributions to environmental problems on both the developed and developing countries. However the magnitude of the problem varies from country to country depending on various factors including the stage of individual development and the degree of enforcement of environmental regulations (Chukwunke, 2011).

If refuse is not properly disposed, it could lead to an outbreak of disease which could be very hazardous to human health. For instance, sewage being one of the major pollutants of the land and river could cause disease to man and also disturb aquatic ecosystem by killing the aquatic organisms such as fish. Poor disposal of human excreta and urine creates an atmosphere for the development of pathogenic organisms that cause diseases. Human excreta produce an offensive smell and attracts flies which can easily transmit disease to people (Norten, 1974).

Industrial waste such as gases for example sulphur dioxide (SO_2) hydrogen, sulphide, carbon monoxide produced during the processing of raw materials is the major source of air pollution, constituting danger to the lives of plants (Mellanby, 1972).

Quality of life is dependent on quality of environment. Ecosystem with animals and vegetation should be healthy with clean resources and clean water and air. Pollution is an international phenomenon that destroy land, air, water bodies and building. Pollution is mainly chemical rather than physical as it changes the quality of atmosphere.

Pollutants are transboundary, they travel thousands of miles. Organic pollutants are non-biodegradable and resist degradation by micro-organisms, therefore they accumulate in the ecosystem and stay for a long time. They can interrupt food chain leading to drastic changes in the structure of and they destroy biota and habitat.

Concentration of CO_2 in the atmosphere is increasing drastically, we must reverse this trend by cutting CO_2 and other greenhouse gases to protect and prevent damage of sensitive ecosystem. While the air we breathe has become cleaner, it is still unhealthy or even deadly. These health impacts carry enormous cost to societies around the globe. It is not only people that suffer, but pollution damages nature and biodiversity. Temperature is increasing globally due to emission of CO_2 , SO_2 , CO , methane and volatile organic matter (VOCs) from industries and domestic activities (Ibrahim, 2018).

The totality of the surrounding in which a person, animal or plant lives is known as an environment. The components of an environment are basically air, land and water. The environmental components have been adversely affected by man's continuous interaction with his environment, such that there has been a growing need to address the challenge posed by factors and activities that instigate unsustainability. Udo and Osu (2013) reported that there have been growing realization that human activities are having major and potential long-term adverse effect on the environment at a global scale, particularly disruption of the biosphere's life support system. Among the effects of most concern are unprecedented rates of loss of species and many local populations (biodiversity), changes in the composition of the atmosphere, over-exploitation of the great aquifer upon which irrigated agriculture depends, reduction of productive soils on all continents, depletion of ocean fisheries, a growing demand for energy or exploitation of fossil energy sources and increasing problem of waste disposal. Incidences such as flooding, tsunamis and soil erosion have had devastating effects on human lives, plants and animals all over the world (Wilkinson, Smith, Joffe and Haines 2007).

What then is this, environmental pollution? Holdget (1979) gave a simplified definition of pollution when he pointed out that, pollution is something in the wrong place, in the wrong time and in the wrong quantity. The World Health Organisation (WHO, 1974) in Chukwuneke (2011) noted that the environment is considered pollution when it is altered in composition or condition directly or indirectly as a result of the activities of man so that it becomes less suitable for some or all of the uses for which it would be suitable in its natural state. From these definitions, it can be said that pollution is something undesirable. It affects human life and its resources. An accusing finger is often pointed at man as an important agent of environmental pollution.

The problem of environmental pollution and how to control it has for sometimes drawn the attention of ecologist, biologist, economist and many people in other disciplines. Pollution as the destruction of purity or sanity is a serious issue. It has been perceived by diverse people from various perspectives as determined by the variability of control and orientation. Otto and Towel (1977) indicated that pollution is the adding of impurities into the environment. When substances are introduced into air and water which makes them harmful to be used they are said to be polluted, noting that such harmful substance are called pollutants. The process can be natural or man-made (Akpuaka, 1991). There are different types of pollution. These include, water, air, land, sound, radioactive, vibrational, noise and thermal pollution.

Water in wells, lakes, rivers and oceans may be polluted with untreated sewage, garbage, factory waste, laundry detergent, pesticides residues and oil spillage, indiscriminate injection of agricultural, domestic and industrial waste into water channel is the primary cause of water pollution which is an issue of great concern because of the very many important uses of water (Okolie 1994). Land pollution may make the environment unsightly, produce repugnant odour, promote the survival of rodents and other disease vectors, cause blockage along water ways and drainages enter food chain and then concentrate in high organisms. Pollutions of land are of various types or classes. These include solid wastes of domestic and industrial origin eg. Empty cans, broken bottles, plastic containers, waste papers of all sorts, chemicals, eg, agro-chemical and fertilizers, radiation and oil (Esomonu 1993). Pollution of the air alters the composition of the gaseous components of the air or introduces new gaseous and particulate matter into the atmosphere. Pollutants of the air induced smoke, ash, soot, sawdust. Pollen dust etc. gases are the

main causes of air pollution and constitutes what is called an atmosphere soup. The offensive gases are mainly oxides of carbon, sulphur and nitrogen.

Onitsha the biggest city in Anambra State of Nigeria was just a small burgeoning township with few buildings about the year 1940 (Henderson 1972). But presently, Onitsha has grown to a very big city with the population of 216604 (Two hundred and sixty-one thousand, six hundred and four) according (2006) census figure. There was no zoning in Onitsha with the result that you find market place, residential building, mechanic workshop, banks, industries, kiosk etc citing at the same place, causing disharmony in the environment. There are refuse dumps beside a residential building, poor refuse and sewage disposal, stagnant dirty ponds and pools here and there, poorly constructed and blocked drains with the result that water cannot flow out. All these create unnecessary eyesore and health hazard to Onitsha inhabitant and visitors.

This is not good for the growth and development of Onitsha. At the instance of these, the present research work goes to study the incidence of environmental pollution in Onitsha metropolis, the role STM education and way forward.

1.2 Statement of the Problem

There is a growing concern about the incidence of pervasive pollution in Onitsha urban area of Anambra State. Such pollution has arisen from the ever growing pressure of different sorts on the environment. It may have arisen as a result of abuse and misuse of the environment. While these may be true, there is need to empirically document the major incidence of pollution in Onitsha urban and the role which Science, Technology and Mathematics Education can play in reversing the incidence. Therefore posed as a question, the problem of this study is: what are the major incidence of pollution in Onitsha urban and what role can STME play in reversing the incidence?

1.3 Research Questions

1. What are the major incidence of pollution in Onitsha urban?
2. What role can STM education play in reversing the incidence of pollution?

1.4 Hypothesis

The incidence of pollution in Onitsha as perceived by the respondents is significantly pervasive because of lack of effective sanitation department to combat pollution in the city.

1.5 Research Design

This is a case study research design. It is an intensive study geared towards a through and in depth investigation of the incidence of pollution in Onitsha metropolis.

1.6 Population of the Study

According to (2006) National population census figure, the population of Onitsha is 261604 (two hundred and sixty one thousand, six hundred and four). But presently it is likely that Onitsha has the population of approximately 400,000 (four hundred thousand). The population of Onitsha is more or less stable since the vast majority of the inhabitants are traders and businessmen. This population is also cosmopolitan in the sense that virtually all the other tribes of Nigeria and other parts of the world are represented in Onitsha. Onitsha has a wide diversity of people from different works of life eg. Engineers, Doctors, Architects, Lawyer, Teachers etc. therefore, the population of the study comprised of all the professionals/career group living in Onitsha.

1.7 Sample and Sampling Techniques

For composing the sample, the researcher identified ten professional/career groups which are commonly found in Onitsha. The professional/career groups sampled are as follows:

Table 1: sample distribution by professional/ career groups.

Professional/ career groups.	Number
Sanitation authorities	10
Teachers	50
Doctors	10
Artisans	10
Engineers	10
Layer	5
Urban planning authorities	5
Supervisors of schools	20
Traders	60
Nurses	20
Total	200

A total of 200 subjects therefore formed the sample. The sample was purposively composed by the researcher since she purposefully identified and contracted different individual within the ten professional/career groups. Those ultimately used as sample were sole informed and fortunately they agreed to participate in the study.

1.8 Instrument for Data Collection

The instrument used for data collection was questionnaire titled, questionnaire on status of pollution in Onitsha (QSPO). It was a thirty-two items questions. The instrument was pilot tested and the reliability of the instrument was found using Pearson's product moment co-relation and the co-relation co-efficient R of 0.78 was obtained. The researcher considers this a good reliability characteristic. The researcher distributed the questionnaire with the help of some research assistants .The instrument was distributed and collected on the spot from the respondents. In this way, no questionnaire was lost.

1.9 Method of Data Analysis

The data was the responses from the respondents and the data was treated using some descriptive statistics which include frequencies and percentage. For the hypothesis the researcher used inferential statistics like the chi-square (χ^2) test.

1.10 Results

The data collected through the use of questionnaire were dully analyzed. Table 2 below shows the major incidence of pollution in Onitsha urban.

Research question one:

What are the major incidences of pollution in Onitsha metropolis?

Table 2: Major incidence of pollution in Onitsha metropolis.

Incidences of pollution in Onitsha	F	%
Indiscriminate dumping of refuse	30	15
Blocked gutters	15	7.5
Noise arising from high sounding gazette, cars, electric plants etc	7	3.5
Poor refuse and sewage disposal system	33	16.5
Bad roads	10	5

Over population	21	10.5
Congestion of buildings	21	10.5
Lack of necessary equipment for sanitation	4	2
Indiscriminate dumping of human faces	2	1
Inactive sanitation authorities	28	14
Illiteracy on the part of the inhabitants	12	6
Lack of punishment for offenders	2	1
Industrial waste	7	3.5
Indiscriminate citing of markets	2	1
Lack of incinerator	1	0.5
Ineffective town planners	5	2.5
Total	200	100

From table 2 above, 15% of the respondent were of the view that the major incidence of pollution in Onitsha metropolis is indiscriminate dumping of refuse while 75% said that it is as a result of blocked gutters. 3.5% was of the view that noise arising from high sounding gazette, cars, electric plants are the major incidence while 16.5% highlighted that there is poor refuse and sewage disposal system. 5% stated that bad road is a factor while 10.5% was of the view that the major incidence is over population, another 10.5% pointed out that, there is congestion of buildings. 2% was the view that there is lack of necessary equipment for sanitation while 1% was of the view that indiscriminate dumping of human faces is a major factor. There is inactive sanitation authorities pointed out by 14% of the respondents while 6% said that illiteracy on the part of the inhabitants is a factor. 15% of the respondents were of the view that lack of punishment for offenders is a contributing factor, while 3.5% said that it is as a result of industrial waste. Another 1% heighted that the major incidence is indiscriminate citing of markets while 5% said that there is lack of incinerator and finally 2.5% maintained that ineffective town planners contributed to the incidence.

Research Question Two:

What role can STM education play in reversing the incidence of pollution?

Table 3: The role of STM education in reversing the incidence of pollution in Onitsha urban.

The role of STM education in reversing the incidence of environmental pollution in Onitsha urban.	F	%
Organizing seminars and workshops on environmental pollution	18	9
Throw more light on the importance of a healthy environment	24	12
Encouraging aforestation and reforestation	13	6.5
Train students on how to carry out public enlightenment campaign on	19	9.5

pollution and how to avert it		
Making health science compulsory at all levels of education	16	8
Pollution education should be included in the school curriculum	10	5
Making strict laws against pollution and enforcing them	9	4.5
Reinforce war against indiscipline	13	6.5
Organizing radio and television workshops and symposium on environmental pollution	11	5.5
Educate the masses on the need for personal and environmental cleanliness and how to maintain a healthy environment	19	9.5
Through research findings, STME will help to eradicate the issue of environmental pollution	6	3
Making the school environment a model of clean and comfortable environment	7	3.5
Total	200	100%

Table 3 above shows that 9% of the respondents said that STME will help in organizing seminars and workshops on environmental pollution. 12% said that they should throw more light on the importance of healthy environment. 6.5% was of the view that afforestation and reforestation should be encouraged. Another 9.5% indicated that students will be trained on how to carry out public enlightenment campaign on pollution and how to avert it while 8% advocated that health science should be made compulsory at all levels of education. 5% suggested that pollution education should be included in the school curriculum. 4.5% suggested making strict laws against pollution and enforcing them while 6.5% urged STME to reinforce war against indiscipline. 5.5% was the view that STME should help to organize radio and television workshops and symposiums on environmental pollution. 9.5% maintained that masses should be educated on the need for personal and environmental cleanliness. 3% said that through research findings, STME will help to eradicate the issue of environmental pollution while 3.5% maintained that school environment should be made a model of a clean and comfortable environment.

1.11 Hypothesis

The incidence of pollution in Onitsha as perceived by the respondents is significantly pervasive due to lack of an effective sanitation department to combat pollution in the city.

Table 4: observed and expected frequencies of the effectiveness of sanitation department of 200 respondents in Onitsha.

Response	Fo	Fe	(fo-fe)	(fo-fe) ²	$\frac{\sum(fo-fe)^2}{Fe}$	X ²	Df	Lev. of sig.	X ² critical
Yes	55	100	-45	2025	20.25	40.5	1	00.5	3.84
No	145	100	45	2025	20.25				

From table 4 above, the calculated x^2 is 40.5 while the critical x^2 is 3.84. Since the calculated value is higher than the critical value, the null hypothesis which says that the incidence of pollution in Onitsha as perceived by the respondents is significantly perceived due to lack of effective sanitation department to combat pollution in the city is therefore accepted. The observed difference in response pattern may have arisen from chance factors. This implies that the incidence of pollution in Onitsha was due to lack of effective sanitation department in Onitsha.

1.12 Discussion of Result Findings

The result in **table 2** revealed that the following incidence of pollution in Onitsha: indiscriminate dumping of refuse, blocked gutters, bad roads, poor refuse and sewage disposal system, over population, congestion of buildings, industrial wastes, inactive sanitation authorities etc. this is in agreement with the findings of Dike (1985) which states that industrialization and its congestion, rapid population growth and population concentration are major contributors to environmental problems on both the developed and developing countries. Again Ibrahim (2018) commenting in this said that temperature are increasing globally due to emission of CO₂, SO₂, CO, methane and volatile organic matters from industries and domestic activities.

Again **table 3** revealed the following roles which STME can play in reversing the incidence of pollution in Onitsha: organizing seminars and workshops on environmental pollution, making health science compulsory at all levels of education, encouraging afforestation and reforestation etc. this is in agreement with Udo and Osu (2013) which states that, Advances in Science, Technology, Engineering and Mathematics (STEM) Education can provide means and ways of solving man's contemporary environmental challenges.

Table 4 shows that the incidence of pollution in Onitsha as perceived by the respondents is pervasive due to lack of effective sanitation department to combat pollution in the city.

1.13 Conclusion and Way Forward

Quality of life is dependent on quality of the environment. Ecosystem with animals and vegetation should be healthy with clean resources and clean water and air. Concentration of CO₂ in the atmosphere is increasing rapidly due to environmental pollution. We must reverse the trend by reducing the concentration of CO₂ and other greenhouse gases from our environment to protect and prevent damage to sensitive ecosystem. The air we breath is not so clean, it is unhealthy or even deadly. It is obvious that nothing is needed now more than pollution education.

To move forward, the following precautionary measures are recommended:

1. Proper disposal of refuse and sewage
2. Appropriate processing and recycling of wastes
3. Development of improved technology to check the menace of pollution.
4. Enactment of relevant laws, rules and regulations to control uncooperative attitudes of people.
5. Establishment of an effective and well equipped sanitation department in the city.

All hands must therefore be on deck at all levels of government to make the well intended proposal materialize successfully in the city.

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