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Effect Of Health Education On Environmental Pollution Preventive Practices Among Secondary School Students In Emohua L.G.A

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ABSTRACT
This study investigated the effect of health education on environmental pollution prevention practice among secondary school students in Emohua L.G.A**,** Rivers State. The study was a quasi-experimental study and data for the study was obtained from a sample size of 100 students drawn from the population of 81,343 secondary school students living in Emohua L.G.A, Rivers State using multistage sampling procedure. A validated self-structured questionnaire titled "Environmental Pollution Preventive Practice Questionnaire (EPPPQ) with a reliability index of 0.89 was used for data collection. The data collected was analyzed using the Statistical Package for Social Sciences version 25 employing both descriptive and inferential statistics of percentage, mean, Standard Deviation, paired-sample t-test and ANCOVA. The study found that health education had a significant effect on environmental pollution prevention practices among the students in Rivers State ($P<0.05$), It was also found that health education had no significant effect on environmental pollution prevention practices among students' in Rivers State based on age ($P>0.05$) but had a significant effect based on gender ($P<0.05$). Based on the findings of the study, it was concluded that health education had a positive and statistical significant effect on environmental pollution prevention practices with variations in the effectiveness of the intervention based on demographic factors such as age and gender. Finally the study recommended among others that schools should integrate comprehensive health education programs into their curriculum, focusing on environmental issues and preventive practices.
Keywords: Health Education, Environmental Pollution Preventive Practices

INTRODUCTION

Environmental pollution is a critical issue that poses significant threats to human health, ecosystems, and the overall well-being of the planet. In recent years, the impact of pollution has become more pronounced, affecting air, water, and soil quality, leading to detrimental effects on flora and fauna, and contributing to climate change (IPCC, 2018). Addressing environmental pollution requires concerted efforts from all sectors of society, including education to prevent further deterioration of the ecosystem. This can only be achieve if environmental pollution prevention practices are considered

Environmental pollution prevention practices encompass the actions and behaviours individuals undertake to reduce pollution and protect the environment (Martínková et al., 2019). These practices include reducing waste generation, conserving resources, recycling, adopting sustainable transportation methods, using eco-friendly products, and promoting responsible consumption. Other effective environmental pollution prevention practices is the implementation of pollution control technologies (United States Environmental Protection Agency, 2021). These technologies can reduce the amount of pollutants emitted by factories,

vehicles, and other sources. For example, the use of scrubbers in industrial plants can remove sulfur dioxide and other harmful gases from exhaust fumes. Similarly, catalytic converters in cars can convert harmful gases into less harmful substances. Engaging in pollution prevention practices can have significant positive impacts on mitigating pollution and preserving natural resources (Huang et al., 2017). It requires individuals to make conscious choices and take proactive steps to reduce their environmental footprint.

Rivers State, located in Nigeria, is characterized by its unique socio-cultural and environmental context, including challenges related to industrialization, urbanization, and pollution. The region has experienced rapid economic growth, attracting industries and urban settlements, which have contributed to increased pollution levels. Rivers State is home to diverse ecosystems, including the Niger Delta, a significant oil-producing region. In recent years, studies carried out to assess the levels of criteria air pollutants in cities of Rivers State, including Port Harcourt, and their probable association with air borne diseases, provide evidence of correlation (Yakubu, 2017). Environmental pollution in Rivers State, particularly air and water pollution, poses significant risks to public health and the environment (Ite et al., 2019).

Emohua Local Government Area (LGA) in Rivers State is also facing a critical environmental challenge due to the indiscriminate disposal of waste and activities that give rise to environmental pollution which include the mining of crude oil (illegal mining of petroleum products), vehicular fumes (Rivers State Government, 2019), the clearing of the vegetal belts to cater for roads and housing. This behaviour contributes significantly to environmental pollution, especially non-biodegradable packaging materials end up in open dumps, water bodies, and other inappropriate disposal sites as well as generation of soots (Yakubu, 2017).

The fine particles in soot (PM2.5) present significant health risks. Due to their small size, these particles can be inhaled deeply into bronchiolar tissue, leading to oxidative stress, pulmonary inflammation, and potential DNA damage (Niranjan & Thakur, 2017; Valavanidis et al., 2013). Short-term exposure can cause eye, nose, and throat irritation, coughing, chest tightness, wheezing, dyspnea, and acute asthma exacerbations. Long-term exposure is associated with more severe health issues, such as arrhythmias and lung cancer (EPA, 2017; Niranjan & Thakur, 2017).

In Rivers State, inhabitants are currently facing health challenges that may be ascribed to atmospheric conditions. Since 2017, there has been an observed increase of almost 20% in Acute Respiratory Infections (ARI) among children under the age of 5. An escalating incidence of patients presenting with health conditions associated with soot exposure, surpassing the prevalence observed in the period preceding the onset of soot-related environmental challenges was also observed in the state. Additionally, a substantial rise in the occurrence of asthmatic attacks has been documented in the state, not only in terms of the overall number of incidents but also in their heightened frequency, attributing these trends to the prevalent air pollution within the atmospheric environment which needs to be prevented.

Students play a crucial role in its prevention through education, awareness, and proactive actions. According to Heritage (2021) secondary school students are at a formative stage of their lives, where they develop habits and attitudes that can last a lifetime. Students can adopt sustainable practices in their daily lives to reduce their environmental footprint. Simple actions such as recycling, reducing waste, conserving water, and using energy-efficient appliances can make a significant difference. The Environmental Protection Agency (EPA) emphasizes that individual actions, when multiplied across a community, can lead to substantial environmental benefits (EPA, 2020). For instance, by reducing plastic usage and promoting the use of reusable materials, students can help decrease the amount of plastic waste that ends up in landfills and oceans.

Students have a powerful voice in advocating for environmental policies and practices. They can participate in campaigns, join environmental clubs, and use social media to raise awareness about pollution prevention. According to Karlin et al. (2014), student activism has been instrumental in driving policy changes and fostering a culture of sustainability in schools and communities. By organizing clean-up drives, tree planting events, and awareness campaigns, students can mobilize their peers and community members to take collective action against pollution.

Students can also contribute to pollution prevention through technological innovations and scientific research (Oliani, 2021). Many schools encourage students to develop projects and prototypes that address

environmental issues. For example, students can work on creating biodegradable materials, designing efficient waste management systems, or developing apps that track and reduce carbon footprints. Engaging in such projects not only enhances students' technical skills but also promotes environmental stewardship (Reick, 2020).

Secondary school students can significantly contribute to the global effort to reduce pollution and protect the planet for future generations. In Emohua Local Government Area (L.G.A.) of Rivers State, Nigeria, environmental pollution poses a significant threat due to industrial activities, urbanization, and inadequate waste management (Nwankwoala & Amadi, 2013). There is an urgent need to enhance the environmental cognition of secondary school students in this area, equipping them with the knowledge and skills necessary to engage in pollution preventive practices and contribute to environmental sustainability.

Educating this demographic on environmental pollution and preventive practices is crucial, as they are not only future leaders but also current stakeholders in environmental conservation. Health education, with its broad scope covering various aspects of well-being, can be an effective tool in imparting knowledge and fostering responsible behaviors among young people. Health education serves as an effective tool for improving environmental cognition and encouraging preventive practices among students. Comprehensive health education programs can disseminate knowledge, develop skills, and shape attitudes toward environmental health issues. Research has demonstrated that well-designed health education programs can significantly improve and motivate students to adopt environmental pollution preventive measures (Onyechi et al., 2016). Several educational and psychological theories provide a foundation for understanding how health education can influence environmental pollution preventive practices. This include the Social Cognitive Theory (SCT) and the Constructivist Theory.

Albert Bandura's Social Cognitive Theory (SCT) emphasizes the role of observational learning, imitation, and modeling in behavior change. According to SCT, individuals learn and maintain behaviors by observing others and through the interaction of environmental, cognitive, and behavioral factors (Bandura, 1986). In this context, health education programs that model positive environmental behaviors and provide opportunities for students to practice these behaviors can significantly enhance their preventive practices.

Constructivist Theory, particularly as proposed by Jean Piaget and Lev Vygotsky, posits that learners construct knowledge through their experiences and interactions with the world. Piaget's theory of cognitive development highlights that as children grow older, their ability to understand complex concepts improves (Piaget, 1952). Vygotsky's concept of the Zone of Proximal Development (ZPD) further suggests that learners can achieve higher levels of understanding with appropriate guidance and support (Vygotsky, 1978). These principles underscore the importance of interactive and experiential learning in health education to foster a deeper understanding of environmental issues among students.

Certain demographic features are capable of influencing the effectiveness an intervention as they can influence how students perceive and respond to environmental education. Among the numerous factors, age and gender (Champion & Skinner, 2018). In the context of this study, age plays a crucial role in students' cognitive development and their ability to comprehend and engage with environmental pollution-related information. Younger secondary school student may have limited knowledge and awareness of environmental issues compared to older secondary school student. As they progress through their teenage years, their cognitive abilities, including critical thinking and decision-making skills, develop (Giedd et al., 2008). Age-related differences in pollution cognition and preventive practices have been observed in previous studies. For example, a study by McKenzie-Mohr et al. (2012) found that older secondary school student showed higher levels of environmental awareness and were more likely to engage in pro-environmental behaviours. Therefore, age should be considered as a potential influencing factor in the study's analysis and intervention design.

Research has shown that gender differences exist in environmental concern and engagement in environmental behaviours. For example, women have been found to have higher levels of environmental concern and engagement in pro-environmental behaviours compared to men in some studies (Gatersleben et al., 2002; Nordlund & Garvill, 2003). This includes behaviors such as recycling, reducing energy consumption, using public transportation, and supporting environmentally friendly products (Zeidler et al.,

2021). Females are also more likely to participate in environmental organizations, volunteer for conservation efforts, and advocate for environmental policies (Stefanski et al., 2020).

However, findings on gender differences in environmental attitudes and behaviours have been mixed, and contextual factors may influence these differences. Therefore, exploring the potential influence of gender on pollution cognition and preventive practices among secondary school student in Rivers State is essential to develop targeted interventions.

Existing research on environmental pollution preventive practices among secondary school students in Nigeria is limited, particularly in the specific context of Emohua L.G.A, Rivers State. the effect of health education interventions in Rivers State is important to tailor interventions to the specific needs and challenges of the region.

This study aims to explore the effect of health education on environmental pollution preventive practices among secondary school students in Emohua L.G.A., Rivers State. It seeks to determine whether structured health education programs can significantly influence the students' knowledge, attitudes, and behaviors towards preventing environmental pollution. By focusing on this group, the study hopes to contribute to the broader efforts of fostering an environmentally conscious generation capable of making informed decisions that benefit their communities and the environment at large.

Research Questions

The following research questions were raised and answered to guide the study:

1. What is the effect of health education on environmental pollution preventive practices among secondary school students in Emohua L.G.A?
2. What is the effect of health education on environmental pollution preventive practices among secondary school students in Emohua L.G.A based on age?
3. What is the effect of health education on environmental pollution preventive practices among secondary school students in Emohua L.G.A based on gender?

Hypotheses

The following hypotheses were postulate and tested at .05 level of significance

1. Health education has no significant effect on the environmental pollution preventive practices of secondary school students in Emohua L.G.A.
2. Health education has no significant effect on the environmental pollution preventive practices of secondary school students in Emohua L.G.A based on age.
3. Health education has no significant effect on the environmental pollution preventive practices of secondary school students in Emohua L.G.A based on gender.

METHODOLOGY

Quasi-experimental non-randomized pre-test, post-test control group design was adopted for this study. Hence, the study involved two groups, one experimental group and one control group. The sample for this study was one hundred (100) students drawn from the population of eighty one thousand, three hundred and forty three (81,343) students living in Emohua L.G.A., Rivers State using multistage sampling procedures which included simple random sampling technique and systematic sampling technique.

The instrument for data collection was a validated self-structured questionnaire titled “Environmental Pollution Preventive Practice Questionnaire (EPPPQ)” with a reliability index of 0.89 structured in a “True or False” and 4point likert formats. The questionnaire had two sections A and B. The section A was dedicated to gathering demographic information while section B gathered data on the students’ environmental pollution prevention practices. The researcher obtained permission from the Principal of the three sampled schools for the study through an official letter signed by the Head of Department of Health Promotion, Environmental and Safety Education. Before the commencement of the treatment and administration of the research instruments, the researcher had an orientation and familiarization talk with teachers in those schools selected on the instructional strategies, since they served as research assistants.

Thereafter, pretest was administered to both the experimental and control groups before the commencement of treatment to establish the entry behaviour. After the pretest; the intervention was administered on the experimental groups (Group A and B) for a period of six (6) weeks respectively while

a random placebo (a random health talk that do not have the content of the intervention) was administered on the control group. The treatments was facilitated by regular physical and health education teachers (research assistants) in those schools. Each lesson period in the experimental schools lasted 40 minutes (a period). The intervention administration lasted for one month and two weeks. Two weeks after the intervention administration, the researcher administered the post test on both treatment groups and control group. The questionnaire was retrieved at the spot.

The completed copies of the questionnaire were collated, coded and analyzed using the statistical package of social sciences (SPSS) version 25. Descriptive statistics of mean and standard deviation were used to answer the research questions while inferential statistics of Z-test and Analysis of Covariance (ANCOVA) were used to test the hypothesis at .05 alpha level.

RESULTS

Figure 1 illustrates the distribution of study participants by gender. The study findings revealed that within the control group, 15 participants (30%) were female, while 35 participants (70%) were male. In

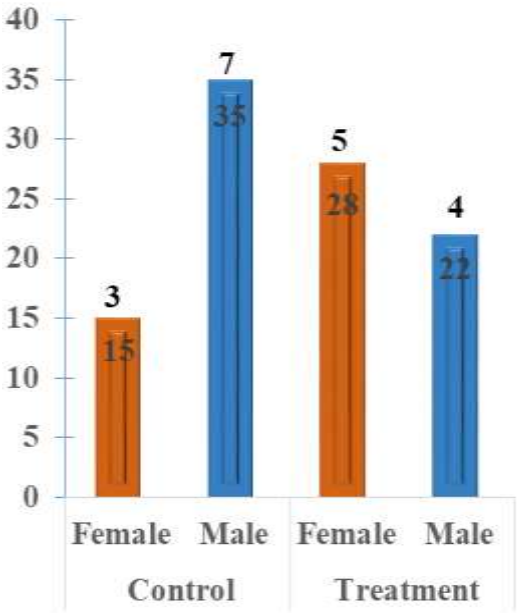

Fig 1: Gender of Respondents

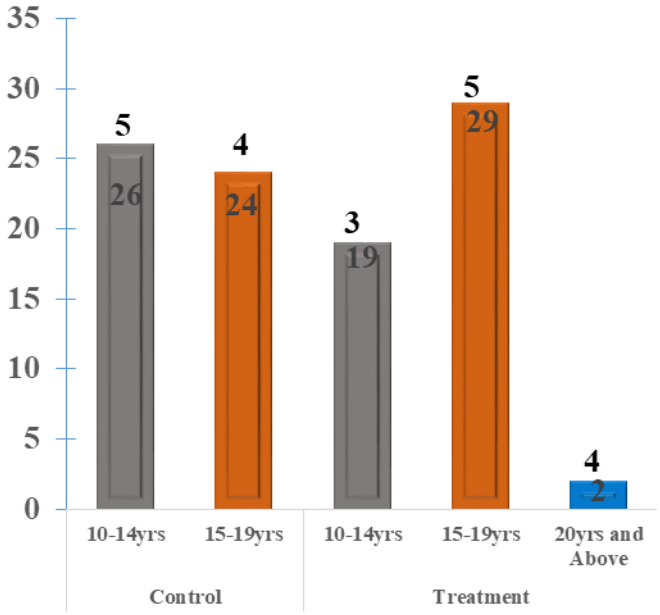

Fig 2: Age of Respondents

contrast, within the treatment group, 28 participants (56%) were female, and 22 participants (44%) were male.

Fig 2 presents the age distribution of the study participants. In the control group, 26 participants (52%) fell within the age range of 10-14 years, 24 participants (48%) were in the 15-19 years range, and none of the participants were aged 20 years and above. On the other hand, in the treatment group, 19 participants (48%) were in the age range of 10-14 years, 29 participants (58%) fell within the 15-19 years range, and 2 participants (4%) were aged 20 years and above.

Table 1: Summary of Z-test analysis of effect of health education on environmental pollution prevention practices of secondary school students.

	N	Mean	SD	Df	Z-cal	Z-crit.	P. val	Decision
Pre-test Prevention Practices	50	2.41	0.333					
Post-test Prevention Practices	50	2.84	0.119	49	9.345	2.009	0.000	H_0 Rejected*

*Partial $Eta^2 = 0.202$

Table 1 revealed that for the Pre-test practices, the mean score before the health education intervention is 2.42, with a standard deviation of 0.333 while the mean preventive practices score after the health education intervention is 2.84, with a standard deviation of 0.119. The paired sample t-test shows a highly significant difference between pre-test and post-test preventive practices scores ($Z.cal = 9.345$, $p < 0.000$). The effect size, measured by the partial eta square, is 0.202. This indicates a positive level effect, suggesting that health education explains a substantial proportion (20.2%) of the variance in the participants' prevention practices about environmental pollution. Based on the statistical analysis, the null hypothesis (Ho) stating that health education has no significant effect on students' environmental pollution prevention practices is rejected. This implies that the health education intervention had a significant impact on improving the participants' environmental pollution prevention practices.

Table 2: Summary of ANCOVA analysis on effect of Health education on environmental pollution prevention practices of secondary school students based on age

Dependent Variable: Treatment Group Posttest Data on Environmental pollution prevention practices

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.028[a]	3	.009	.653	.585	.041
Intercept	.010	1	.010	.684	.413	.015
Comparing Group (Control)	.004	1	.004	.288	.594	.006
Age	**.025**	**2**	**.012**	**.848**	**.435**	**.036**
Error	.667	46	.014			
Total	402.840	50				
Corrected Total	.695	49				

* a. R Squared = .041 (Adjusted R Squared = -.022)

The results presented in table 2 revealed that the overall model was not statistically significant (F = 0.653, p = .585), and it explained a very little significant portion of the variance in the post-test level of on students' environmental pollution prevention practices (R-squared = .041). The main effects of age (F = 0.848, p = .435), were found not to be significant, indicating that age had no significant effect on the post-test level of the participants environmental pollution prevention practices.

Table 3: Summary of ANCOVA analysis on effect of Health education on environmental pollution prevention practices of secondary school students based on gender

Dependent Variable: Post-test level on environmental pollution prevention practices

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.206[a]	2	.103	9.922	.000	.297
Intercept	.018	1	.018	1.690	.200	.035
Comparing Group (Control)	.002	1	.002	.153	.698	.003
Gender	**.203**	**1**	**.203**	**19.478**	**.000**	**.293**
Error	.489	47	.010			
Total	402.840	50				
Corrected Total	.695	49				

* a. R Squared = .297 (Adjusted R Squared = .267)

The results presented in Table 3 revealed that the overall model was statistically significant (F = 9.922, p = .000), and it explained a significant portion of the variance in the post-test level of on students' environmental pollution prevention practices (R-squared = .297). The main effects of gender (F = 19.47, p = .000), were found to be significant, indicating that gender had a significant effect on the post-test level of the participants environmental pollution prevention practices.

DISCUSSION

The in-depth examination of the effect of health education on environmental pollution prevention practices among students in Rivers State, as summarized in Table 4.4 reveals a notable aggregate mean difference of 0.44 in the treatment group compared to the control group, where the mean difference is 0.34. This suggests a positive and statistically significant effect of the health education intervention on the participants' environmental pollution prevention practices.

The findings of this study align harmoniously with the research of various scholars, indicating that the employed health education program effectively enhanced environmental pollution prevention practices.

Notably, studies by Chen et al. (2016), Al-Sharif et al. (2015), Dai et al. (2015), and Kirenga and Okot-Nwang (2014) all underscore the effectiveness of environmental health education programs in improving practices related to food safety, water sanitation, and indoor air quality.

Moreover, the present study's outcomes are consistent with Oyinloye, Adetunji, and Adejumo's (2020) investigation in Lagos, Nigeria, where an environmental education program significantly influenced knowledge related to land pollution. Similar congruence is observed in the study by Kim et al. (2016), revealing a substantial difference between pre-test and post-test scores in the experimental group.

The findings also correspond to research by Eneanya et al. (2020), and El-Gilany et al. (2014), which explored the effects of health education on solid waste management practices among secondary school students. These studies collectively affirm that health education interventions significantly impacted solid waste management practices within the intervention groups compared to the control groups. Parallel results are found in Mbabazi et al.'s (2018) study in Uganda, where the mean practice score exhibited a significant increase from 1.8 at baseline to 2.8 at the end of the intervention.

Furthermore, studies by Yao et al. (2021), Tsai et al. (2019), Gu et al. (2021), and Shalini, Govindaraju, and Mageshwaran (2018) are in consonance with the present study's findings. These studies highlight the effectiveness of health education interventions in improving prevention practices related to air pollution among students.

The study also found that health education had a significant effect on environmental pollution prevention practices among secondary school students in Rivers State based on gender and no significant effect based on age. The main effects of age were found not to be significant ($F = 0.848$, $p = .435$), indicating that age did not have an independent impact on the post-test level of students' environmental pollution prevention practices while the main effects of gender were found to be significant ($F = 19.47$, $p = .000$), highlighting that gender had a significant independent impact on the post-test level of students' environmental pollution prevention practices. The overall model with age as a predictor was not statistically significant ($F = 0.653$, $p = .585$). The R-squared value of .041 indicates that age, in this particular study, did not significantly contribute to explaining the variance in students' environmental pollution prevention practices. In contrast, the overall model with gender as a predictor was statistically significant ($F = 9.922$, $p = .000$). The R-squared value of .297 suggests that the inclusion of gender in the model significantly explained the variability in students' environmental pollution prevention practices.

The non-significant findings for age suggest that, at least in this study, age alone does not play a substantial role in predicting environmental pollution prevention practices among students while the significant effects of gender underscore the importance of considering gender-specific influences in understanding and promoting environmental pollution prevention practices among students. The different outcomes between the two models highlight the nuanced nature of predictors in environmental behavior studies. While age may not be a significant factor in this context, gender appears to be a more influential determinant of prevention practices this might be because of some factors such as gender role and socialization, varied exposure to environmental information, different perception of environmental issues, socio-cultural influences and age-related cognitive development.

Generally, the consistent alignment of the current study's findings with a robust body of literature reinforces the notion that health education plays a pivotal role in positively influencing environmental pollution prevention practices among students. These findings collectively contribute to the growing body of evidence supporting the efficacy of health education programs in fostering sustainable and environmentally conscious practices among youth

CONCLUSION

Based on the findings of the study, it was concluded that health education had a positive and statistical significant effect on environmental pollution prevention among secondary school students. Notably, the study identified variations in the effectiveness of the intervention based on demographic factors such as age and gender.

RECOMMENDATIONS

The following were made based on the findings of the study:

1. Schools should integrate comprehensive health education programs into their curriculum, focusing on environmental issues and preventive practices.
2. Educational content that is age-appropriate, considering the cognitive developmental stages of students should be designed by the school authorities.
3. Gender-sensitive educational strategies that recognize and address the different levels of environmental concern and behavior among male and female students should also be develop in schools
4. Health education programs in schools should be tailored to address local environmental issues specific to Emohua L.G.A.

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