

**INFLUENCE OF THINK PAIR SHARE INSTRUCTIONAL STRATEGY ON SENIOR
SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE AND
RETENTION IN SCIENCE SUBJECT IN AKWA IBOM NORTH EAST
SENATORIAL DISTRICT, NIGERIA**

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ABSTRACT

This research is out to investigate the influence of think pair share instructional strategy on Senior Secondary School Students Academic Performance and Retention in Science Subject in Akwa Ibom North East Senatorial District. The study adopted a Quasi Experimental Design. Six research question and six hypotheses were formulated to guide the study and eleven thousand, seven hundred (11,700) SSII students in Akwa Ibom State. Chemistry Achievement Test (CAT) and chemistry retention test (CRT) were developed by the researcher and used for data collection. Data collected were analyzed using mean, standard deviation and analysis of covariance (ANCOVA). The findings of the study were that there was a significant difference between the mean achievement scores of chemistry students taught in the class using think pair strategy and those taught using lecture method and there was no significant interacting effect of gender and teaching methods on students mean Achievement in science subject. It was recommended among others that science educators should incorporate think pair share as an innovative strategy in teaching and learning science subjects.

KEYWORDS: Think Pair Share Strategy, Academic Performance, Retention, Science Subject, Matter.

INTRODUCTION

Chemistry is a branch of science which deals with the properties, composition, formation and product of matter, Brain (2023).

Majekodummi (2007) observed that chemistry has contributed to the development and growth of Nigeria and the world at large. Brain (2023) opined that the following subjects make up what is known today as rocket science today in the sense that more than 80% of what life depends on the foundation and existence of the following subjects which include Mathematics, Chemistry, Physics, Biology, Agricultural Science, Integrated Science, hence chemistry for instance is applied in medical field, Biology, Physics, Pharmacy, Food, Nutrition, Engineering among other sciences for better knowledge in chemistry before undertaking courses in any of the fields mentioned. It is a co-operative strategy that encourages student's interest which could be used in the following ways.

- **Think**

In this step, teachers instruct their students to be actively engaged in solving questions independently.

- **Pair**

Students in each group are given topics for deliberations.

- **Share**

Students discuss their ideas with their partner, thereafter one person presents the answer to whole class (Presley as cited in Goodman, 2010). The question now is can think pair share instructional strategy yield the same effect on achievement and retention on male and female students in science subject.

STATEMENT OF THE PROBLEM

Available statistical data reveals that populated secondary school student perform poorly in science subjects in various topics like Titrations, Algebra, photosynthesis, research method, light etc. Some of these topics should be taught with appropriate method of instruction in other to enhance better understanding of another difficult concept.

According to WAEC Chief Examiner reports 2014-2018 concern have been raised why student have poor academic performance in science subject's and the problem has been attributed to poor teaching and learning methods which lead to the research title Influence of Think Pair share Instructional Strategy on Senior Secondary School Students Performance and Retention in Science Subjects which has to be investigated.

OBJECTIVES OF THE STUDY

The purpose of this study is to investigate the influence of think pair share instructional strategy on students' performance and retention in science subject. Specifically, the study sought to determine.

- Student mean achievement scores in matter when taught using Think Pair Share Instructional Strategy and Lecture Method respectively.
- Influence of gender on students mean achievement scores in matter when taught using Think Pair Share Instructional Strategy.
- Influence of gender on students mean achievement scores in matter when taught using Think Pair Share Instructional Strategy.
- Influence of gender on students mean retention scores in matter when taught using Think Pair Share Instructional Strategy.
- Interaction influences on gender and teaching methods on students mean achievement scores in analysis.
- Interaction influences on gender and teacher method on students mean retention scores in matter.

RESEARCH QUESTIONS

The following research question guided the study.

- What is the mean achievement score of students in matter when taught using Think Pair Share Instructional Strategy and Lecture Method?
- What is the mean retention score of students in matter when taught using Think Pair Share Instructional Strategy and Lecture Method?
- What is the influence of gender on students' mean achievement scores in matter when taught using Think Pair Share Instructional Strategy?
- What is the influence of gender on students' mean retention scores in matter when taught using Think Pair Share Instructional Strategy?
- What is the interaction influence on gender and teaching methods on students' mean achievement scores in matter?
- What is the interaction influence on gender and teaching methods on students' mean retention scores in matter?

HYPOTHESES

The following hypotheses were formulated to guide the study and were tested at 0.05 level of significance.

Ho1: There is no significant difference between the mean achievement scores of students taught using Think Pair Share and those taught using lecture method.

Ho2: There is no significant difference between the mean retention scores of science student's taught using matter using Think Pair Share and those taught using lecture method.

Ho3: There is no significant difference between achievement mean scores of male and female students in matter when taught using Think Pair Share instructional strategy.

Ho4: There is no significant different between the mean retention scores of male and female students in matter when taught using Think Pair Share Instructional Strategy.

Ho5: There is no significant interaction influence of gender and teaching methods on students' mean achievement scores in matter.

Ho6: There is no significant interaction influence of gender and teaching methods on students' mean retention scores in matter.

SIGNIFICANCE OF THE STUDY

At the end of this research, the findings of this research will be beneficiary to the research World, Nation, Student's Science Teachers, Curriculum Developers etc.

It is hoped that when the findings of this study are presented in seminars, workshops, conferences and when implemented the following may be achieved. It may enhance students' achievement and retention in science subject and increase the number of students that will go in to study professional science courses like Engineering, Pharmacy, Medicine, Architecture, Estate Management, Chemistry etc. It is believed that it will enhance male and female achievement and retention scores in science subject.

SCOPE OF THE STUDY

The scope of the study is delimited to senior secondary II students in Uyo Educational Zone in Akwa Ibom State. The content scope for the study includes; Type of matter, Physical properties of matter, chemical properties of matter etc.

REVIEW OF RELATED LITERATURE

The literature related to this work reviewed under the following headings; Conceptual framework, Theoretical framework, Empirical studies and Summary of the Literature review.

CONCEPTUAL FRAMEWORK

This covers the concept of matter, teaching and learning of matter, difficulties students undergo in understanding matter, teaching method, lecture method, concept of think pair share instructional strategy, retention as a factor in learning students' achievement in any of the science-oriented courses.

- **Matter**

According to Okeke (2011) define matter as anything that has mass and occupies space. Mass is a measure of quantity of matter. Matter exists in three physical states which are gas, liquid and solid. Owoyemi (2007) state that the chemical properties of matter are those that describe the chemical changes (chemical reactions) that matter undergoes. For example, rusting iron, properties that are not characteristics of any particular type of matter such as mass, length and temperature are known as extrinsic properties.

- **Teaching Methods**

According to Aniaku (2013), the method of teaching could be recorded as a vehicle through which message is delivered. Teaching is a process of communicating information that involves the learner.

- **Lecture Methods**

Lecture method is simply the way that leads to easy completion of the curriculum and information are easily disseminated through teaching.

- **Think Pair Instructional Strategy**

Rowe as cited in Sampsel (2013) described Think Pair as a high intensity talk arena due to the engaged directly in speaking and listening

BENEFITS OF THINK PAIR SHARE

- Initiates individual involvement about a particular topic.
- Helps the students to be focused by comprehending the reading materials.
- Engages the entire class and allows quiet students to answer questions without having to stand out from their classroom.

THEORETICAL FRAMEWORK

This deals with theories that are related to this study. These theories are Vygotsky's theory of social cognitive development and Jerome Brunners.

METHOD

This study adopted Quasi experimental design. Quasi experimental design involved the pretest, post-test non-equivalent control group design. This study was conducted in Uyo Local Government Area of Akwa Ibom State and the population for the study consisted of all the senior secondary II chemistry study in Akwa Ibom State and there are eleven thousand seven hundred and forty (11,740) students in the two hundred and fifty-four public secondary schools in Akwa Ibom State.

The instruments used for data collection were Chemistry Achievement Test (CAT) and Chemistry Retention Test (CRT). These instruments were developed by the researcher for the data collection. The instruction was validated by 3 validators from the Department of Integrated Science, Akwa Ibom State College of Education, Afaha Nsit. The CAT and CRT were administered to forty students in the sampled schools outside the study area in order to obtain the reliability of the test items, the reliability estimate of CAT was calculated to be 0.77 mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of the significance.

RESULT AND DISCUSSION

What is the mean achievement score of students in matter when taught using Think Pair Share Instructional Strategy and Lecture Method?

Table 1: Mean Achievement Scores of Students Taught Using Think Pair Share Strategy and Lecture Method.

Teaching Method	N	Pretest	Mean	SD	Mean Post-test	Gain Score
Think-Pair Share	100	24.18	5.28	33.16	4.57	10.98
Lecture	1N00	21.00	5.66	25.62	4,75	3.63
Mean Difference			7.54			

Table 1 show that students taught matter and its properties using Think Pair Share recorded a mean achievement score 24.18 and standard deviation of 5.28 in a pretest and recorded a mean and standard deviation score of 33.16 and 4.57 respectively in a post-test. The data showed that students taught with lecture method had a mean achievement score of 23.99 with standard deviation of 5.66 in a pretest and as well recorded mean achievement of score of 26.5 with standard deviation of 3.6 in a post-test.

Think Pair Share had the mean of 7.54 higher than those taught using lecture method.

HYPOTHESIS ONE

There is no significant difference between the mean achievement scores of chemistry students taught matter using Think Pair Share and those taught using lecture method.

Table 2: Analysis of Covariance of Chemistry Student's Achievement Using Think Pair Share and Lecture Method.

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	21.616	2	11.258	1.202	.303
Intercept	2386.682	1	2386.682	267917	.00
Pretest	20.536	1	20.536	2.289	.132
Group	.436	1	.436	2.81	.021
Error	1681.404	197	8.535		
Total	197996.000	200			
Corrected Total	1701.920	199			

The f- calculated value of 2.51 and significant p-value 0.021 since the significant p-value is less than 0.05 level of significant, the null hypothesis stated is rejected.

Research Question Two

What are the students mean retention scores in matter when taught using Think Pair Share Strategy and Lecture Method?

Method	N	Post-test Mean	SD	Retention Mean	SD
Think-Pair Share	100	32.16	3.57	34.58	3.01
Lecture	25.65	3.57	25.96	2.85	
Mean Difference	100	6.51	8.62		

The above table shows that students taught with Think Pair Share had a mean retention of 34.58 with standard deviation of 3.01 while those taught with lecture method had a mean of 25.96 with standard deviation of 2.85.

Research Question Three

What is the influence of gender on students' mean achievement score in matter when taught using Think Pair Share Strategy?

Influence of gender on students' mean achievement score in matter when taught using Think Pair Share Strategy is shown in the table below.

Table 4: Mean Achievement Score of Male and Female Students Taught Using Think Pair Share Strategy

N	Mean SD	Mean	SD	Pretest	Post-test
Male	69	24.96	4.22	30.23	3.59
Female	31	25.08	4.46	29.21	3.59

Data in Table 4 shows that male students taught using Think Pair Share had a pretest mean score and standard deviation of 24.96 and 4.22 respectively and post-test mean and standard deviation scores of 30.23 and 3.59 respectively. The table also showed that the female students had a pretest mean and standard deviation scores of 25.68 and 4.46 respectively and 29.21 and 3.59 for their posttest mean achievement and standard deviation respectively. This implies that males recorded a slightly higher posttest mean achievement scores than their female counter parts.

Hypothesis Three

There is no significant difference between the mean achievement scores of male and female students in matter when taught using Think Pair Share Strategy.

Table 5: Analysis of Covariance on the Mean Achievement Scores of Male and Female Chemistry Students Taught Using Think Pair Share.

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	13.131a	2	6.565	.487	.615
Intercept	5357.392	1	5357.392	397.599	.000
Pretest	.063	1	.063	.005	.946
Gender	13.125	1	13.125	.974	.325
Error	2654.449	197	13.474		
Total	181350.000	200			
Corrected Total	2667.580	199			

a. R Squared = .005 (Adjusted R Squared = -.005)

Data in Table 5 shows the F-calculated value of 0.97 and significant p-value of 0.33. Since the significant p-value of 0.33 is greater than 0.05 level of significance, the null hypothesis is accepted. Therefore, there is no significant difference in the mean achievement scores of male and female students taught matter using Think Pair Share.

Research Question Four

What is the influence of gender on students' mean retention scores in matter when taught using Think Pair Share Strategy?

Influence of gender on students' mean retention scores in matter when taught using Think Pair Share is shown in the table below.

Table 6: Mean Retention Scores of Male and Female Students Taught Using Think Pair Share

Gender	N	Posttest Mean	SD	Retention Mean	SD
Male	69	30.23	3.59	34.59	2.98
Female	31	29.21	3.59	33.58	3.11

Table 6 shows that male students exposed to Think Pair Share had a mean retention score of 34.59 and standard deviation of 2.98 while their female counter parts had mean retention score of 33.58 and standard deviation of 3.11. This implies that male students exposed to Think Pair Share had slightly mean retention scores than the females.

Hypothesis Four

There is no significant difference between the mean retention scores of male and female students in matter when taught using Think Pair Share.

Table 7: Analysis of Covariance on the Mean Retention Scores of Male and Female Chemistry Students Taught Using Think Pair Share.

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	20.648a	2	10.324	1.120	.300
Intercept	2288.296	1	2288.296	268.127	.000
Pretest	20.456	1	20.456	2.397	.123
Gender	.568	1	.568	.067	.797
Error	1681.272	197	8.534		
Total	1879996.000	200			
Corrected Total	1701.920	199			

a. R Squared = 0.12 (Adjusted R Squared = .002)

The data in Table 4.7 shows an F-calculated value of 0.07 and significant p-value of 0.80. Since the significant p-value of 0.80 is greater than 0.05 level of significant, the hypothesis above is accepted. Therefore, there is no significant difference between the mean retention scores of male and female students in matter when taught using Think Pair Share.

Research Question Five

What is the interaction on the influence of gender and teaching methods on students' mean achievement scores in matter?

Table 8: Mean Interaction influence of Gender and Teaching Methods on Students' Mean Achievement Scores in Matter

Group	Gender	N	Mean
Experimental	Male	69	32.23
	Female	31	30.00
Control	Male	56	26.91
	Female	44	25.25

Summary of results presented in table 4.8 reveals that there is no interaction between gender and method on students' achievement scores in matter. This is because the mean achievement scores of male and female are higher with Think Pair Share strategy than with the lecture method. This indicates that Think Pair Share is superior to the lecture method at two level of gender (male and female).

Hypothesis Five

There is no significant interaction on the influence of gender and teaching methods on students' mean achievement scores in matter.

Table 9: Analysis of Covariance for Test of Significant of Interaction on the Influence on Gender and Teaching Methods on Students' Mean Achievements.

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	26.501a	4	6.625	.489	.744
Intercept	5364.681	1	5364.681	396.093	.000
Pretest	.014	1	.014	.001	.974
Group	13.094	1	13.094	.967	.327
Gender	9.136	1	9.136	.675	.412
Group * Gender	2.096	1	2.096	.155	.614
Error	2641.079	195	13.544		
Total	181350.000	200			
Corrected Total	2667.580	199			

a. R Squared = 0.10 (Adjusted R Squared = .0.10)

The result presented in Table 9 shows the F-calculated value of 0.155 and significant p-value of 0.614. Since the significant p-value of 0.614 is greater than 0.05 level of significant, the null hypothesis stated is accepted. Therefore, there is no significant interaction on the influence of gender and teaching method on students' mean achievement scores in matter.

Research Question Six

What is the interaction on the influence of gender and teaching methods on students' mean retention scores in matter.

The interaction on the influence of gender and teaching method on students' mean retention scores in matter.

Table 10: Mean Interaction on the influence of Gender and Teaching Methods on Students' Mean Retention Scores in Matter

Group Gender	N	Mean
Experimental	Male 69	34.59
Female	31	33.58
Control	Male 56	27.38
Female	44	26.54

Summary of results presented in table 4.10 reveals that there is no interaction between gender and method on students' retention scores in matter. This is because the mean retention scores of both males and females are higher with Think Pair Share strategy than with the lecture method. This indicates that Think Pair Share is superior to the lecture method at two level of gender (male and female).

Hypothesis Six

There is no significant interaction on the influence of gender and teaching methods on students' mean retention scores in matter.

Table 11: Analysis of Covariance for Test of Significant of Interaction on the Influence on Gender and Teaching Methods on Students' Mean Retention Scores.

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	2.833a	4	.708	.081	.988
Intercept	5472.497	1	5472.4.2251	.225	.026.873
Group * Gender	.421	1	.421	1.28	.106
Error	1699.087	196	8.713		
Total	187996.000	200			
Corrected Total	1701.920	199			

a. R Squared = .002 (Adjusted R Squared = .019)

The data in Table 11 reveals the F-calculated. Value of 1.28 and significant p-value of 0.106. Since the significant p-value of 0.105 is greater than 0.05 level of significant, the null hypothesis stated is accepted. Therefore, there is no significant interaction on the influence of gender and teaching method on students' mean retention scores in matter. Mean retention scores of male and female students in matter when taught using Think Pair Share at 0.05 level.

DISCUSSION OF FINDINGS

The results of the study showed that students taught matter using Think Pair share recorded higher mean achievement scores than others taught using Lecture Method. The findings from the study showed that the mean retention scores of students taught matter using Think Pair Share was higher than those who were taught using lecture method, hence the academic achievement of chemistry students taught matter had a good academic performance than student taught with lecture method.

CONCLUSION

The findings revealed that: Students taught matter using Think Pair Share had higher mean achievement scores than those taught with Lecture Method. Also, there was a significant difference between the mean achievement scores of chemistry students taught matter using Think Pair Share and those taught using Lecture Method at 0.05 level of significance in favour of experimental group. Educators Think Pair Share strategy which involve students in the learning process and also allow learners to retain the concepts learnt during the teaching and learning process.

RECOMMENDATION

Based on the findings of the study, the following recommendation was made.

- Since Think Pair Share Strategy was found to be an effective strategy for improving students' mean achievement scores and mean retention scores in matter, chemistry teachers should adopt it as a teaching strategy in chemistry teaching.

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ASSESSMENT OF MANGROVE AND ECONOMIC BENEFITS

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ABSTRACT

Mangroves provide a diverse array of quantifiable economic benefits, ranging from fisheries support and tourism revenue to timber and non-timber forest products, storm protection, carbon sequestration, and water quality improvement. The study assessed the economic benefits of mangroves. Mangrove ecosystems provide significant socioeconomic benefits, such as timber, fish, tourism opportunities, and environmental services (e.g., coastal protection, water regulation, carbon sequestration, and nursery habitat for a wide-ranging diversity of species). The study concluded that the economic benefits of mangroves are multifaceted, ranging from direct contributions to fisheries and tourism to indirect advantages like storm protection and carbon sequestration. Mangrove ecosystems are among the most productive and biologically complex ecosystems on the planet and provide us with a myriad of essential ecosystem services. One of the recommendations made was that economic incentives such as Payments for Ecosystem Services as a source of local income from mangrove protection, sustainable use and restoration activities and ensure beneficiaries of mangrove services can find opportunities to invest in mangrove MANAGEMENT AND RESTORATION PLANNING.

KEYWORD: Mangrove and Economic Benefits

INTRODUCTION

In tropical and subtropical regions, mangrove forests are found along the brackish water border between land and sea. A wide range of economic and environmental services and goods are provided by these diverse ecosystems. A wide range of social and economic activities are indirectly supported by mangroves in addition to their direct benefits, such as the support they provide for other ecosystems like coastal fishing. The notion of a mangrove, various varieties of mangroves, their habitats, significance, and origins of the economy, as well as the economic advantage of mangroves and the concept of economic benefit, are all explored in this article. Mangroves offer a wide range of quantifiable economic advantages, including improved water quality, fisheries support, tourism revenue, storm protection, wood and non-timber forest products, and carbon sequestration.

For well-informed decision-making, sustainable management, and the preservation of mangroves to continue playing a vital role in advancing regional economies and global environmental goals, it is crucial to acknowledge and value these advantages. A peculiar shrub-like tiny plant known as a mangrove thrives along the coasts of tropical and subtropical areas, including tidal creeks, lagoons, backwaters, and marshes. According to Gagwani (2021), Mangrove ecosystems provide significant socioeconomic benefits, such as timber, fish, tourism opportunities, and environmental services (e.g., coastal protection, water regulation, carbon sequestration, and nursery habitat for a wide-ranging diversity of species). Global damage to mangroves has become substantial in recent years, even though some areas still have very rich mangrove forests (Alongi 2012). They are threatened by climate change, natural impacts such as hurricanes, and human impacts such as deforestation, pollution, and alterations in freshwater management regimes. Approximately 35% of mangrove trees were lost during the last two decades of the 20th century. Part of the problem is that mangroves are still considered by some to have little value (Dahdouh-Guebas et al., 2005).

Mangrove habitats offer us a wide range of crucial ecosystem services and are among the most productive and biologically complex ecosystems on the planet (Warne 2017). Mangroves play a critical role in supporting commercial fisheries by serving as offshore fisheries' nursery, breeding, spawning, and hatching habitats and exporting organic matter to the marine environment, where it produces nutrients for fauna both inside the mangroves and in nearby marine and estuarine ecosystems. As natural barriers that diffuse the destructive energy of waves and lessen the effects of hurricanes, cyclones, tsunamis, and storm surges, mangroves are also essential for protecting shorelines. Several studies have documented that regions with intact mangroves were exposed to significantly lower levels of devastation from cyclones than those with degraded or converted mangroves. Mangroves play a significant role in stabilizing fine sediments, contributing to shore stabilization and erosion control. Additionally, mangrove forests are often a rich source of timber, fuel wood, honey, medicinal plants, and other raw materials (Barbier, 2017). Finally, they attract ecotourists, fishermen, hunters, hikers, and birdwatchers, providing a valuable or potential source of national income.

Mangroves are under threat everywhere despite the crucial ecological services they offer. They are being quickly transformed into aquaculture, housing projects, roadways, ports, hotels, golf courses, and farmland in various regions of the world. Shrimp farms are being built on the grounds of former fertile mangrove swamps in South and Southeast Asia, which is home to 41.4% of the world's mangroves. In addition to being cut down for agriculture, mangrove trees are exploited in places like Indonesia for their resources, including wood, fuel, and charcoal. Oil spills, chemical pollution, excessive sedimentation, and disturbance of the mangroves' delicate water and salinity balances frequently pose threats to those who survive conversion (Warne 2017).

CONCEPT OF MANGROVE

Mangrove is a shrub or tree that grows mainly in coastal saline or brackish water. Mangroves grow in an equatorial climate, typically along coastlines and tidal rivers. They have special adaptations to take in extra oxygen and remove salt, which allow them to tolerate conditions that would kill most plants. The term is also used for tropical coastal vegetation consisting of such species. Mangroves are taxonomically diverse as a result of convergent evolution in several plant families (Giri et al., 2011). Mangroves are shrub-like small plants that grow on the shores, tidal creeks, lagoons, backwaters, marshes, and shores of tropical (regions near the equator) and subtropical regions. These amazing, specialized plants can grow in an environment with high temperatures, high salinity, muddy anaerobic conditions, and extreme tides. These plants also get periodically submerged in the water. Mangroves form a unique ecosystem that enhances the biodiversity around them (Gagwani, 2021). Mangroves have an amazing ability to grow and survive in niches where it is difficult for other plants to grow. They grow around the beaches and marshy waters of the ocean. High salinity can kill the majority of plant species, but mangroves have a unique ability to tolerate high salt concentrations.

MANGROVE

SOURCE: SHUTTERSTOCK (2019)

Mangroves are salt-tolerant trees, also called halophytes, and are adapted to live in harsh coastal conditions. They contain a complex salt filtration system and a complex root system to cope with saltwater immersion and wave action. They are adapted to the low-oxygen conditions of waterlogged mud (Flowers & Colmer 2015), but are most likely to thrive in the upper half of the intertidal zone. The mangrove biome, often called the mangrove forest or mangal, is a distinct saline woodland or shrubland habitat characterized by depositional coastal environments where fine sediments (often with high organic content) collect in areas protected from high-energy wave action. The saline conditions tolerated by various mangrove species range from brackish water through pure seawater (3 to 4% salinity) to water concentrated by evaporation to over twice the salinity of ocean seawater (up to 9% salinity).

TYPES OF MANGROVES.

Mangroves are a diverse group of salt-tolerant trees and shrubs that thrive in coastal and estuarine environments. They play a crucial role in protecting coastlines, providing habitat for various species, and serving as important carbon sinks. There are several types of mangroves found around the world, and their specific species composition can vary depending on the region. Here are some common types of mangroves:

- **Red mangrove (*Rhizophora mangle*):** Red mangroves are characterized by their distinctive prop roots that help stabilize them in muddy, intertidal zones. They are often the most visible type of mangrove due to these aerial roots. *Rhizophora mangle* grows on aerial prop roots, which arch above the water level, giving stands of this tree the characteristic "mangrove" appearance.

Red mangroves are found in subtropical and tropical areas in both hemispheres, extending to near 28°N to S latitude. They thrive on coastlines in brackish water and in swampy salt marshes. Because they are well adapted to salt water, they thrive where many other plants fail and create their own ecosystems, the mangals. Red mangroves are often found near white mangroves (*Laguncularia racemosa*), black mangroves (*Avicennia germinans*), and buttonwood (*Conocarpus erectus*) though often more seaward than the other species.

- **Black mangrove (*Avicennia germinans*):** Black mangroves are known for their pneumatophores, which are specialized root structures that allow them to obtain oxygen in waterlogged soils. Unlike other mangrove species, it does not grow on prop roots, but possesses pneumatophores that allow its roots to breathe even when submerged. It is a hardy species and expels absorbed salt mainly from its leathery leaves. The name "black mangrove" refers to the color of the trunk and heartwood. The leaves often appear whitish from the salt excreted at night and on cloudy days. It is often found in its native range with the red mangrove (*Rhizophora mangle*) and the white mangrove (*Laguncularia racemosa*). Like many other mangrove species, it reproduces by vivipary. Seeds are encased in a fruit, which reveals the germinated seedling when it falls into the water.
- **White mangrove (*Laguncularia racemosa*):** White mangroves have distinctive white or silver leaves and typically grow in the upper intertidal zone. White mangroves grow inland from black mangroves, which themselves grow inland from red mangroves. The three species work together to stabilize the shoreline, provide buffers from storm surges, trap debris and detritus brought in by tides, and provide feeding, breeding, and nursery grounds for a great variety of fish, shellfish, birds, and other wildlife.
- **Buttonwood (*Conocarpus erectus*):** Buttonwood mangroves are often found along the edges of mangrove ecosystems and have characteristic button-like fruits. *Conocarpus erectus* is usually a dense multiple-trunked shrub, 1–4 m (3.3–13.1 ft) tall, but can grow into a tree up to 20 m (66 ft) or more, tall with a trunk up to 1 m (3.3 ft) in diameter. The tree is used as an ornamental plant and in bonsai. The variety *sericeus*, with silvery leaves, is especially prized for landscaping. It is an important host plant for epiphytes. As a result of ornamental planting, it has become naturalized in Hawaii. It has been used extensively in landscaping in Kuwait and became the most abundant tree/shrub. *Conocarpus* is widely believed to be fodder for the African buffalo, and it is understood that this is the source of their acidic urine.

CONCEPT OF ECONOMY

An economy is a complex system of interrelated production, consumption, and exchange activities that ultimately determines how resources are allocated among all the participants. The production, consumption, and distribution of goods and services combine to fulfill the needs of those living and operating within the economy (Kenton, 2023). An economy may represent a nation, a region, a single industry, or even a family. An economy consists of the economic system in a certain region, comprising the production, distribution or trade, and consumption of limited goods and services in that region or country. In other words, an economy is the total sum of product and service transactions of value between two economic agents in a region, be it individuals, organizations or states. Transactions only occur when both parties agree to the value or price of the transacted good, commonly expressed in a certain currency (Kenton, 2023). In the past, economic activity was theorized to be bounded by natural resources, labour, and capital. This view ignores the value of technology (automation, accelerator of process, reduction of cost functions), and creativity (new products, services, processes, new markets, expands markets, diversification of markets, niche markets, increases revenue functions), especially that which produces intellectual property (Gilis 2016).

THE MANGROVE HABITAT

The mangrove habitat, also known as a mangrove ecosystem or mangrove forest, is a distinct type of coastal habitat found in tropical and subtropical regions around the world. This habitat is characterized by the dominance of salt-tolerant trees and shrubs known as mangroves, which have adapted to thrive in the challenging conditions of intertidal zones where land meets the sea. Mangroves are extremely important to the coastal ecosystems they inhabit. Physically, they serve as a buffer between marine and terrestrial communities and protect shorelines from damaging winds, waves, and floods. Mangrove thickets improve water quality by filtering pollutants and trapping sediments from the land, and they reduce coastal erosion. Ecologically, they provide habitat for a diverse array of terrestrial organisms, and many species of coastal and offshore fish and shellfish rely exclusively on mangroves as their breeding, spawning, and hatching grounds (kezia,2021).

Mangroves grow in the transition zone between land and sea, where they are subject to daily tidal fluctuations. They thrive in muddy or sandy soils that are often waterlogged and have a high salt content. Mangroves have specialized root systems that help them survive in waterlogged soils and take up oxygen. Some species have prop roots that emerge from the trunk and provide stability, while others develop aerial roots that extend above the water's surface to facilitate gas exchange. Mangroves have specialized root systems that help them survive in waterlogged soils and take up oxygen. Some species have prop roots that emerge from the trunk and provide stability, while others develop aerial roots that extend above the water's surface to facilitate gas exchange. The mangrove habitat is a dynamic and ecologically important coastal ecosystem that provides a range of benefits to both the environment and human communities. Its unique adaptations, biodiversity, and contributions to carbon sequestration and coastal protection make it a crucial

element of the global landscape. Conservation and sustainable management are essential to preserve and protect these valuable ecosystems.

IMPORTANCE OF MANGROVE

Mangrove communities provide food directly and indirectly e.g., fish, crabs, shellfish, prawns and edible snakes and worms. The fruit of certain species, including the nypa palm, can be eaten after preparation along with the nectar of some of the flowers. The best honey is considered to be that produced from mangroves, particularly the river mangrove (*Aegiceras corniculatum*).

Medicines are derived from mangroves. Ashes or bark infusions of certain species were applied to skin disorders and sores, including leprosy. Headaches, rheumatism, snakebites, boils, ulcers, diarrhoea, haemorrhages and many more conditions are traditionally treated with mangrove plants. The latex from the leaf of the blind-your-eye mangrove (*Excoecaria agallocha*) can cause blindness, but the powerful chemicals in it can be used on sores and to treat marine stings. The leaves are also used for fishing—crushing the leaves and dropping them in water stupefies fish which float to the surface. (Department of Environment and Science, 2019).

Certain tree species, notably the cedar mangrove, cannonball mangrove (relatives of the red cedar) and the grey mangrove, are prized for their hard wood and used for boat building and cabinet timber as well as for tools such as digging sticks, spears and boomerangs. The fronds of the nypa palm are used for thatching and basket weaving. Various barks are used for tanning, pneumatophores (peg roots) make good fishing floats. The wood from yellow mangroves (*Ceriops*) has a reputation for burning even when wet. (Department of Environment and Science, 2019).

OTHER IMPORTANCE OF MANGROVE INCLUDES:

Mangroves act as carbon sinks: Due to mangroves' roots which anchor the plants into underwater sediment, nutrients and organic material from the tidal waves enriches the soils, giving mangroves the ability to store carbon, otherwise known as blue carbon. Mangrove forests are able to store up to four times more carbon than other tropical forests. Cutting down mangroves will only result in a mass release of carbon into the atmosphere.

Mangrove forests are biodiversity hotspots: Mangrove ecosystems are home to a myriad of species from marine life (fish, crab, shellfish, sea turtle, etc) to birds. The habitat serves as a nesting, breeding, and nursing ground for the plethora of local wildlife. As more and more mangrove forests are cleared, valuable habitat is lost and species such as the Bengal tiger are at risk of extinction.

Mangroves improve and maintain local water quality: Mangroves' network of roots and lush vegetation filters pollutants and traps sediments, preventing contamination of the waterways and protecting the habitats and the species within them. Local groups and those that live near the rivers, lakes, or other bodies of water nearby are also protected by the trees' maintenance of the water quality.

Mangrove forests double as coastal protection: Mangrove forests act as a physical buffer between marine and terrestrial communities. The trees protect the coastlines from severe weather events as well as slow down erosion. The mangroves provide valuable protection for those nearby communities that are prone to storms and are at risk of sea-level rise (Dhaliwal, 2023).

Mangroves provide essential resources for people: The mangrove forests hold a variety of resources ranging from leaves used in tea and livestock feed to plant extracts used as medicine. Millions of people rely on the mangroves for food, income, and wellbeing, particularly, the forest waters provide an abundance of fish for local fishermen to sell and maintain financial stability. To estimate, 80% of the global fish catch relies on mangrove forests either directly or indirectly through the support of terrestrial and marine food webs.

ECONOMIC BENEFIT OF MANGROVE

Mangroves are one of the most productive and biologically complex ecosystems on Earth. The mangrove root systems below the water provide safe nesting and breeding habitats for fish and shellfish. The fish species which thrive in mangrove forested areas can create jobs for local fishermen and provide a source of protein in the diets of the local communities. In fact, it has been estimated that 80% of the global fish catch relies directly or indirectly on mangrove forests.

On land, the mangrove forests provide habitats for migratory birds, sea turtles and a range of endangered species. The presence of these species and the mangroves themselves can attract ecotourists which can provide jobs and income to local communities. The forests can also attract tourists for other recreational activities including sport fishing. As well as being a suitable breeding and nesting ground for a range of species, the mangrove forests are also important feeding grounds for thousands of species. Some organisms feed on the leaves directly, others wait for leaves to fall to the ground and feed on the decaying materials.

- **Fisheries:** Mangrove ecosystems serve as critical breeding and nursery grounds for many fish species. They provide a safe habitat for juvenile fish, crabs, and other marine organisms, which ultimately support commercial and subsistence fisheries. According to a study published in the journal "Fisheries and Aquaculture Journal" in 2012 (Hasan et al., 2012), mangroves contribute significantly to coastal fisheries, enhancing fish stocks and providing livelihoods for millions of people dependent on fishing.
- **Storm Protection:** Healthy mangrove forests act as natural barriers that help protect coastal communities and infrastructure from storm surges, hurricanes, and tsunamis. The value of these protective services can be substantial, as demonstrated by studies such as "Valuing the storm protection service of estuarine and coastal ecosystems" (Narayan et al., 2011).
- **Carbon Sequestration:** Mangroves sequester and store large amounts of carbon dioxide (CO₂) from the atmosphere, helping mitigate climate change. The economic value of carbon sequestration by mangroves is recognized in

international climate change agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC).

- **Tourism and Recreation:** Mangrove ecosystems can attract tourists, contributing to local economies through tourism-related activities like boating, bird watching, and eco-tours. This was highlighted in a report by the World-Wide Fund for Nature (WWF) titled Medicinal and Traditional Uses. Many coastal communities rely on mangrove ecosystems for traditional medicines and as a source of building materials, which can have economic significance at the local level.
- **Water Filtration and Quality:** Mangroves help filter and improve water quality by trapping sediment and filtering pollutants. This can lead to cost savings in water treatment for nearby communities and industries.

CONCLUSION

The study concludes that the economic benefits of mangroves are multifaceted, ranging from direct contributions to fisheries and tourism to indirect advantages like storm protection and carbon sequestration. Mangrove ecosystems are among the most productive and biologically complex ecosystems on the planet and provide us with a myriad of essential ecosystem services. Mangroves provide pivotal support to commercial fisheries, acting as nursery, breeding, spawning, and hatching habitats for offshore fisheries and exporting organic matter to the marine environment, producing nutrients for fauna in both the mangroves themselves and in adjacent marine and estuarine ecosystems. Recognizing and valuing these benefits is essential for sustainable management and conservation efforts.

RECOMMENDATION

- There should be economic incentives such as Payments for Ecosystem Services as a source of local income from mangrove protection, sustainable use and restoration activities.
- The government and international organizations ensure the beneficiaries of mangrove services find opportunities to invest in mangrove management and restoration planning.
- There should be an encouragement of mangrove conservation and restoration through carbon credit markets such as REDD+, the “Bio-Rights” mechanism and corporate and private sector investments.

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IRREGULAR POWER SUPPLY FROM NEPA AS A PROMOTER OF AIR AND NOISE POLLUTION BY GENERATING PLANTS: AN IMPLICATION TO THE SCHOOL ENVIRONMENT

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ABSTRACT

Irregular power supplies and noise pollution pose significant challenges in the school environment, affecting both students and teachers. The lack of a stable power supply can disrupt classroom activities, hamper the use of electronic devices, and hinder teaching and learning processes. The study aimed to analyze irregular power supply from Nepa as a promoter of air and noise pollution by generating plants: an implication to the school environment. Irregular power supplies in school environments have a direct connection to air pollution, posing numerous challenges. The inadequate and inconsistent availability of electricity leads to an increased reliance on backup power sources like diesel generators, which contribute significantly to air pollution. The study concludes that power supply challenges in the nation, which seem not to be ameliorating, have encouraged the acquisition and utilization of generators in all sectors of the nation's economy. The noise emitting from these generators adversely affects both humans and the environment. Irregular power supply from NEPA and the resulting reliance on generating plants in the school environment can have significant implications for air and noise pollution. The use of generators as a backup power source often leads to the emission of harmful pollutants and excessive noise levels, which can negatively impact the well-being and health of students, staff, and the surrounding community. One of the recommendations made was that Schools should prioritize energy efficiency by implementing measures such as energy-efficient lighting, appliances, and HVAC systems. This can help reduce the overall energy demand and reliance on generators, thus minimizing air and noise pollution.

KEYWORDS: Irregular Power Supply, NEPA, Air, Noise, Pollution Generating Plants and School Environment

INTRODUCTION

An electrical device known as a power supply provides electricity to an electrical load. A power supply's primary function is to transform electrical current from a source into the proper voltage, current, and frequency needed to drive a load. Because of this, power supplies are sometimes known as electric power converters. While some power supplies are separate pieces of hardware, others are incorporated into the appliances they power. Power supply used in desktop computers and consumer electronics devices are examples of the latter. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply) (Wikipedia, the free encyclopedia, 2023).

The provision of a reliable and consistent power supply is crucial for the smooth operation of various sectors, including educational institutions. However, in many regions, such as Nigeria, irregular power supplies are a persistent challenge. The Nigerian Electric Power Authority (NEPA) and its successor, the Power Holding Company of Nigeria (PHCN), have faced difficulties in meeting the electricity demands of the nation, resulting in frequent power outages and the reliance on backup generators and generating plants (Chukwuocha & Onyegegbu 2018). While the use of generating plants can temporarily alleviate the power supply issue, their operation comes with a host of environmental consequences. This article aims to explore how irregular power supply from NEPA, coupled with the utilization of generating plants, contributes to air and noise pollution, particularly in the context of school environments.

CONCEPT OF POWER SUPPLY

An electrical device known as a power supply provides electricity to an electrical load. A power supply's primary function is to transform electrical current from a source into the proper voltage, current, and frequency needed to drive a load. Because of this, power supplies are sometimes known as electric power converters. While some power supplies are separate pieces of hardware, others are incorporated into the appliances they power. Power supply used in desktop computers and consumer electronics devices are examples of the latter. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply) (Wikipedia, the free encyclopedia, 2023).

According to Morgan (2012), a converter is a device that converts one voltage to another, more convenient voltage while delivering power. Power supplies are designed from the output back to the input. Since they are designed after the amplification stages, it is tempting to think of them as an afterthought; indeed, some commercial products reflect this attitude. It is most important to realize that an

amplifier is merely a modulator that controls the flow of energy from the power supply to the load. Power supplies are often designed as subassemblies of larger devices. Many power supplies are cooled by natural convection (Meng et al., 2018). The enclosure is usually fabricated from sheet metal or plastic. The enclosure could also have many openings. Power supplies can also be installed to form a separate, dedicated power supply unit. This could be as large as a cabinet. However, power supplies usually experience a relatively favorable corrosion environment, according (Hahn, 2015). Power supplies are usually kept dry and warm. Unfortunately, some of the power supplies are directly exposed to external airflow as part of the heat management system. Such a situation can alter the power supply's environment drastically as the conditions become contaminating and thus much more corrosive. (Elsevier, 2023). A power supply is a hardware component that supplies power to an electrical device. It receives power from an electrical outlet and converts the current from AC (alternating current) to DC (direct current), which is what the computer requires. Power is the backbone of any electronic system, and the power supply is what feeds the system. Choosing the right supply can be the critical difference between a device working at optimum levels and one that may deliver inconsistent results (Wavelength Electronics, Inc. 2018). Power supplies need a source of power to function, like a garden hose needs a source of water. A power source, or energy source, is a method of producing electricity. Power sources convert either mechanical or chemical energy into electrical energy, which is then used by the circuitry of a device to power that device.

CONCEPT OF AIR POLLUTION

Air pollution can be defined as an alteration of air quality that can be characterized by measurements of chemical, biological, or physical pollutants in the air. Therefore, air pollution means the undesirable presence of impurities or an abnormal rise in the proportion of some constituents of the atmosphere. Air pollution is caused by the presence in the atmosphere of toxic substances, mainly produced by human activities, even though sometimes it can result from natural phenomena such as volcanic eruptions, dust storms, and wildfires, also depleting the air quality (Solar Impulse Foundation, 2023). Air pollution is the contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere.

Household combustion devices, motor vehicles, industrial facilities, and forest fires are common sources of air pollution. Pollutants of major public health concern include particulate matter, carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide. Outdoor and indoor air pollution cause respiratory and other diseases and are important sources of morbidity and mortality. WHO data show that almost all of the global population (99%) breathes air that exceeds WHO guideline limits and contains high levels of pollutants, with low- and middle-income countries suffering from the highest exposures. Air quality is closely linked to the earth's climate and ecosystems globally. Many of the drivers of air pollution (i.e., the combustion of fossil fuels) are also sources of greenhouse gas emissions. Policies to reduce air pollution therefore offer a win-win strategy for both climate and health, lowering the burden of disease attributable to air pollution as well as contributing to the near- and long-term mitigation of climate change (WHO, 2023).

CONCEPT OF NOISE POLLUTION

The word noise is derived from the Latin word *nausea*, which means sickness in which one feels the need to vomit. Noise is an unpleasant and undesirable sound that causes discomfort in humans. The intensity of sound is measured in decibels (dB). The faintest sound that the human ear can hear is 1 dB. Due to increasing noise around civilizations, noise pollution has become a matter of concern (BYJUS, 2023). Noise pollution is any unwanted or excessive sound that can have deleterious effects on human health, wildlife, and environmental quality. Noise pollution is commonly generated inside many industrial facilities and some other workplaces, but it also comes from highway, railway, and airplane traffic and from outdoor construction activities. Noise pollution can cause health problems for people and wildlife, both on land and in the sea. It is an invisible danger. It cannot be seen, but it is present nonetheless, both on land and under the sea. Noise pollution is considered to be any unwanted or disturbing sound that affects the health and well-being of humans and other organisms. (National Geographic Society, 2023) Noise pollution, or sound pollution, is the propagation of noise or sound with ranging impacts on the activity of human or animal life, most of which are harmful to a degree. The source of outdoor noise worldwide is mainly caused by machines, transport, and propagation systems (Wikipedia, 2023).

Noise pollution is the pollution caused by sound, which results in various problems for Humans. Sound is a form of energy that enables us to hear. We hear the sound in the frequency range of 20 to 20000 Hertz (20 kHz). Noise pollution is the pollution created by loud noises that adversely affect the surroundings. (Geeks for Geeks 2023), Noise Pollution is the presence of unwanted, undesirable, and unnecessary sounds in our environment. Our environment is such that it has become difficult to escape the noise. Even electrical appliances at home have a constant hum or beep. Rockfon (2022), Noise pollution is an unseen threat. It exists both on land and beneath the sea, indoors and outdoors. Noise pollution is defined as any unwanted or disturbing sound that has an adverse effect on the health and well-being of humans and other living organisms.

According to Mondal, (2023), Noise pollution is a physical form of pollution and is not directly harmful to the life supporting systems namely air, soil and water. Its effects are more directly on the receiver i.e., man. Noise pollution is the result of modern industrialized urban life and congestion due to over population. Noise is generally harmful and a serious health hazard. Conserve energy future (2023), Noise pollution is defined as unwanted sounds that disrupt normal sound in the environment. Noise pollution often emanates from railroads, road traffic, aircraft, loud music, construction sites, and industrial activities. Noise pollution is the only form of pollution that is ever-present but rarely noticed despite its adverse effects. Noise pollution is generally defined as regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms. It is also known as unwanted or harmful noise, as from automobiles, airplanes, or industrial workplaces.

IRREGULAR POWER SUPPLY SITUATIONS IN NIGERIA

The issue of erratic and epileptic power supply in Nigeria has been a major concern not just for the citizens but also for the Federal Government and companies in various industries. Every Nigerian greatly believes that the current rate of electricity supply is not regular and is in a low state. One cannot easily forget the power crises that hit the Nigerian states for about two weeks during the month of May, 2015. This unfortunate state grounded most businesses, and the ones that were not grounded had to use electricity at very high costs. The reason at that time, according to the National Electricity Regulation Commission (NERC) Chairman, Sam Amadi, was that 18 out of the 23 power plants in the country were unable to generate electricity due to a shortage of gas supply to the thermal plant, with one of the hydro stations facing a water management issue, leading to the loss of over 2,000 megawatts (MW) in the national grid. Nigeria, as Africa's most populous black nation and the bedrock of the West African regional economy, suffered a nationwide blackout as the national grid totally collapsed on March 31, 2016; it was an event unheard of in the nation's history (Jimah et al., 2019).

According to Chukwuemeka (2021), power supply is basically devices providing electric power to fund electronic equipment. In Nigeria, the electricity sector is in charge of supplying electricity to the whole country. However, the megawatts of Electric power supplied by the Electricity sector are less than what is standard and what should be obtainable in a country like Nigeria. In Nigeria, electricity is generated from fossil fuels, especially gas. Initially, a body was in charge of the distribution of power in the whole of Nigeria, known as NEPA. In 2014, this public sector was privatized, and bits were sold to private investors charged with fulfilling the former obligations of NEPA. However, even with the privatization of NEPA, there is still a lack of power supply in most places in Nigeria. People still complain of high electricity rates and a lack of a steady supply of electricity. Due to a lack of electricity, people have diversified and sought other means of generating electricity, one of which is the use of generators. In present-day Nigeria, almost every home owns a generator. In addition to the air generated from these generators also constitutes a nuisance in society, and they are usually very loud. It is quite a challenging period at this crucial stage in Nigeria, where there is an enormous gap in power supply and demand. The major causes of irregular power supply in Nigeria are believed to be inconsistencies in government policies and a shortfall in gas supply to power plants. Power generation and distribution have remained epileptic for quite some time in Nigeria, despite government efforts to improve the system. Efforts have been intensified by successive governments to develop a broad-based plan for power generation and distribution in Nigeria, as evidenced by the decentralization of the Nigeria Electric Power Authority (NEPA) and the subsequent emergence of the Power Holding Company of Nigeria (PHCN) (Adekomaya, 2016).

IRREGULAR POWER SUPPLY AND AIR POLLUTION IN SCHOOL ENVIRONMENT

Irregular power supplies in school environments have a direct connection to air pollution, posing numerous challenges. The inadequate and inconsistent availability of electricity leads to an increased reliance on backup power sources like diesel generators, which contribute significantly to air pollution.

- The first issue is the disruption caused by an irregular power supply. Schools heavily rely on continuous power for lighting, ventilation, and the operation of essential equipment. When power outages occur, it hampers the learning environment and negatively impacts educational activities, ultimately affecting students' academic progress and productivity.
- The second concern is the adverse effects of air pollution. During power outages, schools often resort to diesel generators to maintain basic operations. However, these generators emit harmful pollutants such as nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulate matter (PM), leading to deteriorating air quality. The combustion of diesel fuel releases these pollutants into the atmosphere, contributing to air pollution in and around school premises.

Moreover, air pollution resulting from an irregular power supply can have severe health implications. Exposure to pollutants like PM can trigger respiratory problems, allergies, and asthma among students, teachers, and staff. Prolonged exposure to these pollutants may increase the risk of cardiovascular diseases and have long-term effects on overall health. Furthermore, the environmental impact of irregular power supplies in schools is a growing concern (Zhang, & Rothman 2018). Diesel generator emissions contribute to the release of greenhouse gases, exacerbating climate change. The pollutants emitted can also harm local ecosystems, vegetation, and wildlife, affecting the overall environmental balance. Various solutions can be implemented. Schools should strive to adopt renewable energy sources like solar panels and wind turbines, reducing reliance on diesel generators (Chen, Kwong, & Copes 2019). Implementing energy-efficient measures such as LED lighting and energy-saving equipment can also minimize power supply issues and reduce energy consumption. Irregular power supplies in schools have a detrimental impact on air pollution. The reliance on diesel generators during power outages contributes significantly to air pollution, which poses health risks, harms the environment, and worsens climate change (Smith, Johnson & Anderson 2018). By adopting sustainable energy solutions and energy-efficient measures, schools can mitigate these issues and create healthier and greener environments for students and staff.

IRREGULAR POWER SUPPLY AND NOISE POLLUTION IN SCHOOL ENVIRONMENT

Irregular power supplies and noise pollution pose significant challenges in the school environment, affecting both students and teachers. The lack of a stable power supply can disrupt classroom activities, hamper the use of electronic devices, and hinder teaching and learning processes. Students may be unable to access digital resources or engage in multimedia presentations, negatively impacting their educational experience. Additionally, power outages can lead to discomfort and frustration, affecting the overall productivity and atmosphere within the school (Bakis & Öztop 2015).

Noise pollution in schools can arise from various sources, such as construction activities, nearby traffic, or inadequate soundproofing within the premises. Excessive noise levels can hinder concentration and impede effective communication between teachers and students. Continuous exposure to noise can lead to increased stress levels, reduced cognitive performance, and negative health effects. It is essential for schools to provide a quiet and conducive learning environment that promotes concentration and academic achievement (De Vos, Leroy, Vercruyssen & Pedde 2013). To address the issue of irregular power supply, schools can consider implementing alternative energy solutions such as solar panels or wind turbines.

These renewable energy sources can provide a stable and uninterrupted power supply, reducing reliance on the traditional grid system. Moreover, schools can invest in backup power generators to mitigate the impact of power outages and ensure the continuity of educational activities. By diversifying their energy sources, schools can enhance their resilience and create a more sustainable learning environment. To combat noise pollution in schools, measures such as proper insulation, soundproof windows, and acoustic treatment can be employed (Jibiri, 2017). These strategies help reduce the transmission of external noise into classrooms and other learning spaces. Furthermore, schools can establish guidelines and policies to minimize noise disruptions within the premises. This can include enforcing quiet zones, setting noise limits in common areas, and raising awareness among students and staff about the importance of maintaining a quiet learning environment (Oghuvbu & Ibadode 2014).

SUBSTITUTE TO ELECTRIC POWER SUPPLY

Electrical Energy has always been one of the vital requirements of human societies, and presently its demand is far greater than ever in both developed and developing nations. These are the possible substitutes for electric power supplies:

- **Solar**

Solar electricity has clear advantages in terms of accessibility, cost, and reliability compared to traditional means of rural electrification. In the medium to long term, solar electricity will also be competitive on the grid. As of 2018, Ethiopia had launched the National Electrification Program, which aimed for 65 percent of the population to be grid-connected by 2025 (HAILU, 2023).

- **Wind energy:**

Wind energy systems harness kinetic energy from wind and turn it into mechanical or electrical energy, much the same way hydropower systems gather energy from water. The primary device wind systems use is a wind turbine, which is available as a vertical axis and a horizontal axis turbine. The most commonly used type of wind turbine is a horizontal axis turbine, which is typically used in large-scale wind systems that harness 100 kilowatts and higher. Most turbines include the following elements: a rotor, a nacelle, a tower, and some electronic equipment (Thomas, 2023).

- **Batteries:**

These are used as conduits to charge inverters. When there is a public power supply, the batteries are used to charge the inverter. When the DISCOs cut off supply, the inverter provides power with the aid of the batteries (Okonkwo, 2016).

- **Biomass:**

Biomass energy encompasses a huge range of potential sources, all of which have one thing in common: they are alive. The sheer breadth of possibilities presented by this alternative power source makes it an excellent place for investment and innovation. This type of power system extracts the solar energy that plants and microorganisms use for food. (Layton, 2023) Biomass-derived energy has been a primary heat source since man discovered firewood, a combustible biofuel used all over the planet for heating and cooking. Other forms of biomass are already in use in the form of corn ethanol, biodiesel, and methane captured from landfills, where active microorganisms release the stinky gas through natural, ongoing processes.

- **Geothermal**

Humans have been harnessing the power of super-hot steam beneath the Earth's surface for more than 10,000 years, but the first geothermal power generator wasn't built until 1904 in Italy. (Guardian, 2015), The first geothermal power plant in the United States came online in 1921 to help run a hot spring resort at The Geysers in northern California. The Geysers, which cover 7,769 hectares are the world's largest geothermal field and home to nearly a dozen power plants. Geothermal makes up 3% of the country's renewable energy generation.

CONCLUSION

The study concluded that power supply challenges in the nation, which seem not to be ameliorating, have encouraged the acquisition and utilization of generators in all sectors of the nation's economy. The noise emitting from these generators adversely affects both humans and the environment. Irregular power supply from NEPA and the resulting reliance on generating plants in the school environment can have significant implications for air and noise pollution. The use of generators as a backup power source often leads to the emission of harmful pollutants and excessive noise levels, which can negatively impact the well-being and health of students, staff, and the surrounding community. To mitigate these issues, it is crucial to implement sustainable and environmentally friendly solutions. This can include prioritizing energy efficiency measures within schools to reduce overall energy demand and reliance on generators. Integration of renewable energy sources, such as solar panels or wind turbines, can further decrease dependency on fossil fuel-powered generators and promote cleaner energy alternatives.

RECOMMENDATIONS

- Schools should prioritize energy efficiency by implementing measures such as energy-efficient lighting, appliances, and HVAC systems. This can help reduce the overall energy demand and reliance on generators, thus minimizing air and noise pollution.
- Schools should explore the integration of renewable energy sources like solar panels or wind turbines to supplement their energy needs. This can help reduce dependency on fossil fuel-powered generators and mitigate air and noise pollution.
- Adequate noise control measures should be implemented to minimize the impact of generator noise on the school environment. This may include installing noise barriers, relocating generators to less disruptive areas, or utilizing soundproof enclosures.
- Schools should educate students, staff, and the wider community about the environmental and health impacts of air and noise pollution as this awareness can encourage responsible energy consumption and foster a culture of sustainability.

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