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Educational Waste Audit and Reduction Plans for Sustainable Utilization of Instructional Facilities in Public Secondary Schools in Rivers State

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Abstract

The study examined Educational Waste Audit and Reduction Plans for Sustainable Utilization of Instructional Facilities in Public Secondary Schools in Rivers State. Two research questions and two hypotheses were answered and tested in the study respectively. The design for the study was the analytic descriptive survey. The population comprised all the 268 public senior secondary schools in Rivers State with 268 principals (218 males and 50 females) from which a sample of 215 male and female principals, selected using the purposeful proportionate and stratified random sampling technique. Respondents of the study responded to a 21 – item instrument titled "Educational Waste Audit and Reduction Plans for Sustainable Utilization of Instructional Facilities Scale (EWARPSUIFS), designed by the researchers in the modified 4-point Likert Scale Module of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE), with a reliability index of 0.85, obtained using Cronbach Alpha Model. In all, 218 copies of the questionnaire were administered to the respondents in their various schools, 217 (99%) were retrieved, while 215 (99%) survived after coding and were used in the statistical procedures. Mean and Standard deviation were used in answering the research questions while z-test was used in testing the hypotheses at 0.05 level of statistical significance. The results of the study show that educational waste audit and reduction plans enhance the sustainable utilization of instructional facilities in secondary schools in Rivers State to a high extent. The study also established no significant difference between the mean ratings of male and female principals on the extent to which educational waste audit and reduction plans enhance the sustainable utilization of instructional facilities in secondary schools in Rivers State. The study concluded that waste audit and reduction plans are viable strategies for effectively enhancing sustainable utilization of instructional facilities in secondary education. Consequently, it was recommended that school leaders and other stakeholders should continue to conduct educational waste audits and apply good reduction plans in managing school facilities for sustainable utilization.

Keywords: Education, Educational Waste Audit, Waste Reduction Plans, Sustainable Utilization, Instructional Facilities

Introduction

Sustainability is non-discriminatory, it is healthy and meets needs without affecting the future. It takes care of today without compromising tomorrow. It is a necessary tool for success in all facets of endeavour.

Sustainability is necessary in education, economy, social inclinations, politics and even religion. There is economic sustainability if the basic needs and aspirations of the people are adequately taken care of. In politics, the kind of leadership we have should be such that is healthy and all encompassing. Social inclinations should be mutual and symbiotic and not parasitic. Our education should be such that guides the moulding of our students' attitudes, skills and mental development, same goes for religion.

Satander Open Academy (2024), proffers that sustainability consists of fulfilling the needs of the future generations while ensuring a balance between economic growth, environmental care and social well-being. This brings to fore, the importance of sustainability.

The researchers say sustainability is taking care of now and not compromising tomorrow, as a man is wise if his actions are guided by anticipated consequences. If a man's action today endangers the future, his actions are not sustainable. There is therefore, evidential need for the sustainable utilization of instructional facilities which is inevitable if educational needs must be satisfied.

Instructional facilities as defined by Law Insider (2024), means indoor facilities used for private commercial instruction in arts, crafts, physical fitness or other skills; it is the university property that is directly related to the educational mission of the university. Richtmann Publishing (2024), views instructional facilities as facilities that are specifically meant for direct teaching and learning. They include classrooms, classroom seats, laboratories, libraries, experimental equipment, chalkboard, audio-visual learning, equipment, zoological gardens and experimental agricultural farms. University of Bufalo (2024), goes further to give examples of instructional facilities to include classrooms, seminar rooms, instructional laboratories, on-campus clinics, cybaries and other spaces used principally for the purpose of delivering formal instructions to our students. It is however, worth noting that these instructional facilities need to be sustainably utilized.

Sustainable facilities utilization and management go hand-in-hand. Instructional facilities from all indications need to be sustainably utilized through usage and management practices. A step further, incorporating sustainable facility utilization practices in the school system, can be of great benefit. Simply put FMX (2024), offers sustainable management practices that include reducing electricity and water usage, implementing waste management best practices and adopting green cleaning. It is believed that these procedures will keep your building and facilities comfortable, safe and properly functioning. Sustainable utilization of

facilities gives rise to a long-lasting facilities focused on resource and energy efficiency with reduced operational costs.

Some of the benefits proffered by the scholar above for adopting sustainable practices in facilities utilization or management include decrease in the environmental carbon footprint, conducive working environment, cost savings, waste reduction, and enhanced brand reputation.

Waste reduction as a benefit of sustainable practices in facilities utilization, requires waste audit. Educational waste in Nigeria is a narrative as old as education itself. The impact of this waste on our educational system which secondary school is one is a grown concern. The school known for its transmitive and preservative tendencies is a beehive of activities and thus needs to be adequately cared for by stakeholders, for sustainability, to stand the test of time, considering its all-encompassing role.

Damages and loss go hand-in-hand in the process of exploration. The school as an entity, unavoidably, cannot save itself from any damage or loss and as such, needs human resources for its management. This human resource in education system as engraved by ADP (2024), is any person who is compensated for supplying skills or knowledge, to help an organization achieve its business goals. In the school system, Ebong (2006), identifies them as academic and non-academic staff. These human resources are necessary tools for waste audit and reduction plans.

Educational Waste Audit for Sustainable Utilization of Instructional Facilities

Educational waste audit has been identified as an important variable for sustainable utilization of instructional facilities. The opinion of the researchers lies in the fact that education as an instrument of change, should be jealously guarded, to attain return on investment, which will be of benefit to the individuals and the society at large. If education must be held accountable for individual and societal benefit, there is necessary need for educational waste audit.

Educational waste is phenomenal. In the attempt to improve education, methods we know won't work are often employed. With each new government, we employ diverse policies and programmes that often, do not stand the test of time, instead of consolidating on and improving upon policies already in our threshold. This attitude produces the same wasteful results. Waste is dangerous and must be considered as such, with the hunger to crush it, overriding our personal interest and hurry to flaunt new policies to massage our ego, without doing our homework and considering the implications on our educational system.

The Conversation (2024), has defined educational waste as the time and resources that are wasted and could be used more effectively, while trying to educate. UNESCO (2024), defines educational wastage as effects of the associated problems of repetition and dropping out. The scholar believes that whether we are considering education as a social or private investment, allowance must be made for the fact that some students do not complete a course while others repeat parts of the course in order to gain a qualification.

It is worth understanding before we look extensively into educational waste audit that educational waste refers to the inefficient as well as unnecessary use of educational resources, which consists physical and non-physical waste such as unnecessary energy consumption, unused school materials, and redundant administrative tasks and ineffective teaching methods respectively. Educational waste also looks into educational resources and funding. It is different from educational wastage as educational wastage refers to loss or inefficient use of human potential as it looks at students' outcomes and achievement among others. While educational waste considers resources, educational wastage considers human potential.

Educational waste audit is inevitable and has been identified as an important variable for the sustainable utilization of instructional facilities. The researchers define educational waste audit as a plan to address wasted time and resources that could have been more effectively and efficiently utilized in the process of educating. It is the view of the researchers that education should be jealously and zealously guarded as it is an important code to societal fabrics.

Google Search (2024), identified waste audit as allowing teachers and pupils to understand the types and quantities of waste generated within their school and where the waste is generated. Method Recycling (2024), believes that waste audit is a systematic review of all waste that is generated within a workplace. It thus gives an organization a clear idea of what they are throwing out. In another view, Huntington Park (2024), defines waste audit as a formal, structured process used to quantify the amount and types of waste being generated by an organization. The scholars believe that information from audits will help in the identification of current waste practices and how they can be improved. The scholars also believe that being waste wise means a more efficient and effective organization, reduced waste management costs and better use of limited natural resources. Hazimihalis (2023), defines waste audit as a method for analyzing an organizations waste stream.

Educational waste audit with the intent of improving efficiency and enhancing outcomes towards sustainable utilization of instructional facilities, is systematic in its identification,

analysis and quantification of waste in the school system. There are however, different types of educational audit as proffered by some scholars.

Organic Waste Smart School (2004), posits that waste is typically sorted into type of waste and location. The scholars believe that in conducting a simple audit, schools may sort their waste into three distinct waste types which are organics, recyclables and non-recyclables.

As stipulated by Meta Al (2024), there are several types of educational waste audit categorized based on scope, focus and methodology. They include in terms of scope, comprehensive audit, which evaluates the entire institution, departmental audit, which focuses on specific departments, programmatic audit, which examines specific programmes or courses. Focused-based audits has environmental audit that examines energy, water and waste management; financial audit that analyzes financial expenditures and resource allocation, educational audit that evaluates teaching methods, curriculum and students outcomes; operational audit which assesses administrative processes and efficiency. Methodology-based audit from its perspective has quantitative audit which uses numerical data and statistical analysis; qualitative audit that examines non-numerical data such as policies and procedures; mixed-methods audit which combines quantitative and qualitative approaches.

Other specific audits as identified apart from those above are energy audit that evaluates energy consumption and efficiency; water audit examining water usage and conservation; waste audit which analyzes waste generation, reduction and disposal; paper audit that examines paper usage and reduction opportunities. In addition are technology audit that evaluates technology usage, efficiency and waste; curriculum audit that examines curriculum alignment; relevance and effectiveness; facilities audit, evaluating facility condition, maintenance and efficiency; transportation audit that examines transportation operations, usage and efficiency.

Other audits as categorized by the scholar above are internal audit conducted by internal staff; external audit conducted by external experts or organizations; self-assessment audit where institutions evaluate themselves, and third-party audit conducted by independent organizations.

A school waste audit can be identified as a way to ascertain what is being thrown away or wasted. Performing one, can be “a stitch in time that saves nine as institutions identify areas of improvement, waste reduction, for efficiency, effectiveness and sustainable utilization.

Guberman and Fitzgerald (2023), (as cited in Hazimihalis2023), proffered a simple waste audit checklist for any business. They believe that before you can reduce waste that you need data to create the smartest plan of attack. If you don’t have the information on-hand, there is need for a waste audit. The process of conducting waste audit they believe should include

assemble a team and set a date; which involves finding a volunteer from each department to form your waste auditing team with at least five people, making the group an ongoing "sustainability committee" that can oversee any changes you want to make and then pick a week for the audit without any special events. The second point is to determine your waste categories by making a list of the most common trash types your business produces such as glass, paper, signage, cardboard, food waste, plastic bottles, general plastic, aluminium cans, display materials and materials packaging. The third point is to gather your tools. This is to stock up on a few supplies, to make sure our team can work safely. The supplies needed could include an open area for sorting the trash, tongs for each volunteer (optional), clipboards for recording your findings, a bathroom scale for weighing each category, labeled boxes for sorting each waste category, face masks and rubber gloves for each volunteer, trash bags for bagging your waste after the audit. Fourthly, sort your trash. This is done by gathering all the trash and recycling from your building; label each trash bag with the department it came from; weigh all the trash to get a baseline for how much you throw out each week; weigh all the recyclables to establish how much you recycle each week; wearing gloves, sort all materials into the boxes for their categories i.e. if you labeled your trash by department, make sure each has separate boxes; as you work, note any recyclables mixed in with the trash, and once everything has been sorted, weigh each category and fifthly, analyze your results. To analyze your results involves to calculate and record your waste diversion rate using this process such as divide the weight of all your waste (trash recyclables) and multiply the result by 100, to give you a weekly waste diversion percentage; look at the weights you recorded for individual waste categories.

Linkedin (2024), offers seven key steps to successful audit to include set goals and objectives such as, are you aiming to reduce the amount of waste your organization produces? Increase recycling rates? and identify areas for improvement. Secondly, gather data. This involves types of waste produced, amount of waste generated, origins of the waste, and disposal methods. The next steps are to analyze the data; develop recommendations; implement the recommendations; monitor and evaluate; and repeat the process.

For the purpose of this study, the researchers are considering the auditing of inefficient and unnecessary use of educational resources, consisting of physical and non-physical waste, detrimental to sustainability in the utilization of educational resources. Some of these wastes include paper, cardboard, plastic bottles, aluminium cans, vandalization of facilities, school utilities, financial resources among others. Nine steps were proposed by the researchers for a successful waste audit to include assemble your team; set goals and objectives, gather data such

as types of waste; origins of waste; amount of waste generated; and disposal method; analyze the data by categorizing and calculating the total amount of waste generated; note your findings i.e. to show the percentage of each waste category. This however, is not a rejection of those proffered by other scholars.

Educational Waste Reduction Plans for Sustainable Utilization of Instructional Facilities

Another important variable identified for sustainable utilization of instructional facilities is educational waste reduction plans. When reduction is mentioned, what readily comes to mind is a decrease in size, amount, length etc. as the case may be.

Educational waste reduction in the view of Encyclopedia (2024), also known as source reduction, is the practice of using less material and energy to minimize waste generation and preserve natural resources. Waste reduction is believed by the scholar to also mean economic savings as fewer materials and less energy is used when waste-reduction practices are applied. CT. Gov (2024), defines educational waste reduction as the systematic efforts made by educational institutions to minimize waste, optimize resources and promote sustainability in all aspects of their operations. The researchers define educational waste reduction plan as the effort to address waste in the use of time and material in the process of educating, for enhanced outcomes

Educational waste reduction plans can promote sustainability and enhance educational outcomes. Miller (2023), believes that planning to reduce the total amount of waste generated by your school is essential to saving money, protecting health and safety of your people and reaching environmental and sustainability targets. The scholar proposed nine steps to developing an effective waste reduction and management plan to include form a waste management team; conduct a waste audit; establish benchmarks and set achievable goals; keep waste hierarchy top of mind; assess your current methods of waste disposal; select the proper waste management partner; create an action plan; train your employees; track your progress. Meta Al (2024), postulates that educational waste reduction plans are strategic documents outlining specific actions and initiatives to minimize waste, optimize resources and promote sustainability in educational institutions with purpose to reduce waste generation, improve operational efficiency, promote environmental sustainability, conserve natural resources and enhance educational outcomes. The scholar further enumerated the key components of waste audit plan to include waste assessment and analysis, goal setting and targets, strategies and initiatives, implementation timeline, monitoring and evaluation, stakeholder engagement and budget allocation. Fragnani and Guimaraes (2024), are of the view that waste management plan

in the campus can provide at least three advantages which are decreasing the generation of waste by minimizing consumption, promoting income generation for people involved in recycling chain and training human resource as multiplier agents of waste management.

In another dimension, waste managed (2024), believes that by implementing effective waste reduction strategies, schools can play a crucial role in promoting sustainability and educating future generations about the importance of looking after the environment. Some of the strategies the scholar suggested for educational waste reduction plans include implement school recycle programmes, reduce food waste, minimize single-use plastics; education on waste awareness; and partnership and programmes.

The strategies and initiative as proposed by the scholar for educational waste audit plans are reduce paper usage, implement recycling programmes, energy-efficient lighting and equipment, water conservation measures, waste reduction challenges, sustainable procurement practices, educational programmes and curriculum integration staff training and engagement, student involvement and empowerment, and community partnerships and outreach.

The Nature Conservancy (2024), suggested eight ways to reduce waste. They include use a reusable bottle/cup for beverages on-the-go. Use reusable grocery bags, and not just groceries. Purchase wisely and recycle; compost it; avoid single use food and drink containers and utensil; buy second handed items and donate used goods; shop local farmers markets and buy in buck to reduce packaging; and curb your use of paper: mail, receipts, and magazines.

The researchers from reviews, made some deductions. Some educational reduction plans were proffered to include reducing the use of paper through digital alternatives; promote sustainable behaviours among students and staff; implementation of recycling programs; conducting regular financial audits; recycle organic waste for agriculture; encourage transparency and accountability; prioritize needs over wants; educate and engage the school community; implementation of energy; efficient practices; regular maintenance of facilities, and partnership and programmes. This is however, not a rejection of those proposed by other scholars above.

Statement of the Problem

Educational waste is a re-occurring decimal in our school system. This is obvious with the heaps we encounter each day, ranging from paper usage, plastic bottles etc. to reckless use of desks, electricity as well as other school facilities, not missing out the non-accountability and transparency in the use of finances, prioritizing wants over needs, at the detriment of the school system. This is prevalent even with the leadership of school administrators, government and

stakeholders who are supposed to address these challenges. However, a close interaction with the teachers and students reveal that instructional facilities are not sustainably utilized in public senior secondary schools.

It is thus, obvious that educational institutions with these challenges may find it difficult to achieve sustainable utilization of instructional facilities. This becomes a source of worry to the researchers.

This study was therefore, contemplated to address these challenges, hence, the need to investigate educational waste audit and reduction plans as viable instruments for the sustainable utilization of instructional facilities in secondary schools.

Aim and Objectives of the Study

This study examined educational waste audit and reduction plans for sustainable utilization of instructional facilities in secondary schools in Rivers State. Specifically, the study sought to;

1. Investigate the extent to which educational waste audit determines sustainable utilization of instructional facilities in secondary schools in Rivers State.
2. Ascertain the extent to which educational waste reduction plans determine sustainable utilization of instructional facilities in secondary schools in Rivers State.

Research Questions

The following research questions were answered to obtain the findings;

1. To what extent does educational waste audit determine sustainable utilization of instructional facilities in secondary schools in Rivers State?
2. To what extent do educational waste reduction plans determine sustainable utilization of instructional facilities in secondary schools in Rivers State?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance in the study;

1. There is no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste audit determines sustainable utilization of instructional facilities in secondary schools in Rivers State;
2. There is no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste reduction plans determine sustainable utilization of instructional facilities in secondary schools in Rivers State.

Methodology

The design for the study was the analytic descriptive survey because results were tested and described the way they occurred. The population of the study comprised all 268 public senior secondary schools in Rivers State (Planning Research and Statistical Department, RSSSSB, Port-Harcourt, Rivers State 2020), from which a sample of 215 principals (165 males, 50 females were selected using the proportionate stratified random sampling technique. Respondents of the study responded to a 21-item instrument titled "Educational Waste Audit and Reduction Plans for Sustainable Utilization of Instructional Facilities Scale (EWARPSUIFS), designed by the researchers, in the modified 4-point Likert Scale Module of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE), with a reliability index of 0.85, which was considered reliable and obtained using Cronbach Alpha. In all, 218 copies of the instrument were administered to the respondents at their various schools. 217 (99%) were retrieved while 215(99%) survived after coding and were used in the statistical procedures. Mean and Standard deviation were used in answering the research questions while z-test was used in testing the hypotheses at 0.05 level of statistical significance.

Results

The results of the study were obtained from the answers to research questions and results to the test of hypotheses as presented in the proceeding section.

Research Question 1: To what extent does educational waste audit determine sustainable utilization of instructional facilities in secondary schools in Rivers State?

Table 1: Mean and Standard Deviation on the Responses of Male and Female Secondary School Principals on the Extent to which Educational Waste Audit Determines Sustainable Utilization of Instructional Facilities in Secondary Schools in Rivers State

S/N	Items	Male		Female		Wx	Remark
		$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2		
1.	To commence successful waste audit, the principal needs to assemble a credible team to achieve sustainability	3.79	0.98	3.40	0.92	3.60	VHE
2	In carrying out educational audit, the goal and objectives of the exercise need to be defined towards sustainability.	3.32	0.92	3.20	0.90	3.26	VHE
3.	Specifying the types of waste or the audit process aids its identification for sustainability in utilization of school facilities.	3.33	0.91	3.08	0.88	3.21	VHE
4.	Determining the origin of waste addresses it for sustainability in facilities utilization.	3.12	0.89	3.00	0.87	3.06	VHE

5.	The amount of waste generated could be controlled by educational audit to attain sustainability in facilities utilization.	3.54	0.94	3.34	0.92	3.44	VHE
6.	The disposal method employed, as identified by the audit process could be improved for sustainability in school facilities utilization.	2.89	0.85	3.14	0.89	3.02	VHE
7.	Data analysis in educational audit is a necessary step towards achieving sustainability.	2.80	0.84	2.78	0.84	2.79	HE
8.	Categorization of data during audit gives a clearer picture of wastes, towards sustainable utilization.	2.96	0.86	2.86	0.85	2.91	HE
9.	Knowing the total amount of waste generated in the system is necessary to address waste for sustainability.	3.25	0.90	3.10	0.88	3.18	VHE
10.	Audit findings should be noted to show the percentage of waste category for sustainable utilization.	3.02	0.87	3.20	0.90	3.11	VHE
	Grand Mean 3.16	**3.20**	**0.90**	**3.11**	**0.89**	**3.16**	**VHE**

Data on table 1 show that item 1, 2, 3, 4, 5, 6, 9, and 10 had weighted mean between 3.00 and 4.00 and therefore fell under Very High Extent (VHE). Differently, items 7 and 8 had weighted mean scores between 2.00 and 3.00 which fell under High Extent (HE). In summary, with a grand mean score of 3.16 (VHE), male and female secondary school principals agreed that to a very high extent, educational audit plans determine the sustainable utilization of instructional facilities in secondary schools in Rivers State.

Research Question 2: To what extent do educational waste reduction plans determine sustainable utilization of instructional facilities in secondary schools in Rivers State?

Table 2: Mean and Standard Deviation on the Responses of Male and Female Secondary School Principals on the Extent to which Educational Waste Reduction Plans Determine Sustainable Utilization of Instructional Facilities in Secondary Schools in Rivers State

S/N	Items	Male		Female		W$\bar{x}$	Remark
		$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2		
11.	Reducing the use of paper through digital alternatives aids educational waste reduction for sustainable utilization of instructional facilities.	3.59	0.95	3.70	0.96	3.65	VHE
12	Promoting sustainable behaviours' among students and staff helps to achieve waste reduction for sustainable utilization of instructional facilities.	3.63	0.96	3.65	0.96	3.64	VHE

13.	The implementation of recycling programmes reduce waste for sustainability in the utilization of instructional facilities.	3.63	0.96	3.64	0.96	3.64	VHE
14.	Regular financial audits should be conducted to reduce waste for sustainability in facilities utilization.	2.98	0.87	2.96	0.86	2.97	HE
15.	Organic waste should be recycled for agriculture, to reduce waste for sustainable utilization of instructional facilities.	3.20	0.90	2.96	0.86	3.08	VHE
16.	Educational waste reduction plan should encourage transparency and accountability for sustainability in facilities utilization.	3.68	0.96	3.74	0.97	3.71	VHE
17.	Educational waste reduction plans should prioritize needs over wants for sustainable utilization of instructional facilities.	3.12	0.89	3.33	0.92	3.23	VHE
18.	The school community should be educated and engaged in the waste reduction plan.	3.61	0.93	3.37	0.92	3.49	VHE
19.	Energy efficiency practices should be implemented in the waste reduction plan.	3.33	0.92	3.45	0.93	3.39	VHE
20.	Regular maintenance of instructional facilities should be carried out to reduce waste.	3.62	0.95	3.68	0.96	3.65	VHE
21.	Programmes and partnerships should be carried out to reduce waste for sustainable utilization of facilities.	3.25	0.90	2.91	0.86	3.08	VHE
	Grand Mean 3.42	**3.42**	**0.93**	**3.40**	**0.92**	**3.41**	**VHE**

Data on table 2 show that items 11, 12, 13, 15, 16, 17, 18, 19, 20 and 21 had weighted mean between 3.00 and 4.00 and therefore, fell under Very High Extent (VHE). Differently, item 14 had weighted mean score between 2.00 and 3.00 which a grand mean score of 3.42 (VHE), male and female secondary school principals agreed that to a very high extent, educational waste reduction plans determine the sustainable utilization of instructional facilities in secondary schools in Rivers State.

Ho_1: There is no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste audit determines sustainable utilization of instructional facilities in secondary schools in Rivers State.

Table 3: Summary of z-test Analysis of Difference between the Mean Ratings of Male and Female Secondary School Principals on the Extent to which Educational Audit Determine Sustainable Utilization of Instructional Facilities in Secondary Schools in Rivers State.

Subject	N	$\bar{x}$	SD	df	z-cal	z-crit	Results
Male principals	165	3.20	0.90	213	0.60	1.96	Not significant
Female principals	50	3.11	0.89				(Failed to reject)

Data on table 3 show summary of gender, scores, means, standard deviation and z-test of difference between the mean ratings of male and female secondary school principals on the extent to which educational waste audit determines sustainable utilization of instructional facilities in secondary schools in Rivers State. The z-test value calculated and used in testing the hypothesis stood at 0.60, while the z-critical value stood at 1.96, using 213 degrees of freedom at 0.05 level of significance.

At 0.05 level of significance and 213 degrees of freedom, the calculated z-value at 0.60 is less than the critical value of 1.96. Hence, there is no significant difference between the respondents. Consequently, the researchers failed to reject the hypothesis and confirm that there is no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste audit determines the sustainable utilization of instructional facilities in secondary schools in Rivers State.

Ho_2: There is no significant difference between the mean ratings of male and female secondary school principals, on the extent to which educational waste reduction plans determine sustainable utilization of instructional facilities in secondary schools in Rivers State.

Table 4: Summary of z-test Analysis of Difference between the Mean Ratings of Male and Female Secondary School Principals on the Extent to which Educational Waste Reduction Plans Determine the Sustainable Utilization of Instructional Facilities in Secondary Schools in Rivers State.

Subject	N	$\bar{x}$	SD	df	z-cal	z-crit	Results
Male principals	165	3.42	0.93	213	0.13	1.96	Not significant
Female principals	50	3.41	0.92				(Failed to reject)

Data on table 4 show summary of gender scores, means, standard deviations and z-test of difference between the mean ratings of male and female secondary school principals on the extent to which educational waste reduction plans determines sustainable utilization of instructional facilities in secondary schools in Rivers State. The z-test value calculated and used in testing the hypothesis stood at 0.13 while the z-critical value stood at 1.96, using 213 degrees of freedom at 0.05 level of significance.

At 0.05 level of significance and 213 degrees of freedom, the calculated z-value of 0.13 is less than the critical value of 1.96. Hence, there is no significant difference between the

respondents. Consequently, the researchers failed to reject the hypothesis and confirm that there is no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste reduction plans determine the sustainable utilization of instructional facilities in secondary schools in Rivers State.

Discussion of Findings

The first finding of the study is that principals responded that to a Very High Extent (VHE), educational waste audit determines the sustainable utilization of instructional facilities in secondary schools in Rivers State.

The first finding agrees with Hazimihalis (2023), Guberman and Fitzgerald (2023), as cited in Hazimihalis (2023), among others, who in their scholarly papers and research, worked on educational audit towards sustainable utilization of instructional facilities in secondary schools. Corresponding hypothesis resulted in no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste audit determines sustainable utilization of instructional facilities in secondary schools in Rivers State. This shows that educational waste audit is a necessary determinant for sustainable utilization of instructional facilities.

The second finding of the study is that principals to a Very High Extent (VHE) responded that educational waste reduction plans determine sustainable utilization of instructional facilities in secondary schools in Rivers State.

The second finding agrees with Miller (2023), Fragnani and Guimaraes (2024), among others, who in their scholarly papers and research, worked on educational reduction plans towards sustainability in the utilization of instructional facilities in schools. Corresponding hypothesis resulted in no significant difference between the mean ratings of male and female secondary school principals on the extent to which educational waste reduction plans determine the sustainable utilization of instructional facilities in secondary schools in Rivers State.

Conclusion

Based on the findings of the study, it is concluded that educational waste audit and reduction plans to a Very High Extent (VHE), determine sustainable utilization of instructional facilities in secondary schools in Rivers State.

Recommendations

In light of the findings of the study, the discussions on them and the accompanying implications, the following are recommended for implementation:

1. Educational waste audit should be carried out in schools, to check waste and avert its occurrence for sustainable utilization of instructional facilities;
2. Educational waste reduction plans should be effectively put in place for sustainability in the utilization of instructional facilities.

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