EFFECTS OF MASTERY AND ACTION LEARNING STRATEGIES ON STUDENTS' ACHIEVEMENT IN CHEMICAL EQUILIBRIUM IN UYO SENATORIAL DISTRICT

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Abstract

The study investigated the effects of mastery and action learning strategies on students' achievement in chemical equilibrium in Uyo Senatorial District of Akwa Ibom State. Three research questions and three hypotheses guided the study. The study adopted a quasi=-experimental design in a non-randomized pretest, posttest setting. The study comprised 206 SS2 chemistry students in public coeducational secondary schools in the study area selected using multi-stage sampling technique. Instrument for gathering data of the study was Achievement Test on Chemical Equilibrium that measured students' achievement with a reliability index of .86. The data obtained were analyzed using mean, standard deviation and analysis of Covariance (ANCOVA). The result showed that students taught using mastery learning strategy had the best achievement. Students taught using action learning and those taught using expository teaching strategy had comparable achievement. Gender and school location had no significant influence on students' achievement. Consequently, it was recommended, among others, that chemistry teachers should adopt mastery learning strategy in teaching chemistry.

Keywords: Mastery learning, Action learning, Academic Achievement and Chemistry.

Introduction

Chemistry has long been made an integral part of academic curriculum in schools. It is a core subject in the study of many courses such as Medicine, Pharmacy, Biochemistry, Microbiology, Engineering, Agriculture and Printing Technology. A sound knowledge of chemistry is therefore, of great importance to many students, community and society at large. Considering this critical role of chemistry, it is needful to lay a solid foundation in students to enhance their academic performance. (Umanah, 2017). Furthermore, Nigeria and the world over are talking about sustainable development, for which chemistry cannot be set aside, nor separated from the plans to achieve sustainable development. In order for the students to participate meaningfully, there is a need to equip them with necessary lifelong or process skills such as communication, decision making skills, information searching and utilization skills, thinking skills and leadership skills (Daniel, 2021). Acquisition of appropriate scientific and technological knowledge and skills are necessary to cope with the challenges presented by the evolving needs of modern work place in our industries and overgrowing non-formal sector (Ajayi & Ogbeda, 2017)

Chemistry is a relevant and experimental science subject that demands proactive teaching method with effective students' involvement using hands-on and minds-on experiences to generate knowledge and develop scientific skills (Shadreck & Chukunoye, 2018). Given its application in many professions, it is necessary that every student be given an opportunity to acquire knowledge of its concepts, principles and skills. Unfortunately, the teaching and learning of chemistry has been fraught with challenges which prevent optimum achievement of the objectives of chemistry education in national development and many students from performing well in external examinations such as the West African Senior School Certificate Examination (WASSCE) and National Examination Council Senior Secondary School Certificate Examination (NECO SSCE). It is a well documented fact in science education literature that many students at all level struggle to learn chemistry (Ekanem & Daniel, 2022). With the rate at which scientific and technological inventions are gaining popularity all over the world, the training of the mind is a must. The students should be thoroughly equipped with relevant knowledge and skills for viable functionality and ability to cope with many intellectual and cultural challenges which the rapidly changing environment may demand in future.

In attempts to tackle the above task, the Federal Government of Nigeria formulated goals as spelt out in the National Policy on Education (NPE, 2013) that reflected among others, the acquisition of appropriate skills and the development of mental, physical and social abilities and competencies to empower the individual to live in and contribute positively to the development of the society. In addition, the need to use activity-oriented and learner-centered method of teaching is emphasized in the National Policy on Education (NPE, 2013). It states that educational activities shall be learner-centered for maximum self development and self-fulfillment and the education system shall be structured to develop the practice of self learning. This calls for the use of teaching strategies in which the learners play the most active part in the learning process. Despite the prime position Chemistry occupies in Nigeria educational system and efforts made by Curriculum development bodies and researchers to enhance students' academic achievement and inspite of the emphasis placed on science and technology, it is observed that students' academic achievement in chemistry has consistently been below expectation and unimpressive. (Daniel, 2021; Ndukwe, 2021; Ekanem & Daniel, 2022, WAEC Chief Examiners Report, 2020, 2021, 2022 and 2023).

Researchers have identified several factors responsible for students' poor performance in chemistry to include the following: the abstract nature of the concepts of chemistry (Noah & Sanger, 2012) students' lack of sufficient prior knowledge and cognitive development (Shadreck & Chuknoye, 2018), students' psychological development and mathematical anxiety (Nbina and Obomanu, 2011), misconceptions by teachers and students (Gongden 2016), lack of interest and confidence by Chemistry students in their approach to tackling chemistry problems (Umanah, 2017).

According to West African Senior School Certificate Examination (WASSCE) Chief Examiner's report (2020-2023) low academic performance in Chemistry has been attributed to factors such as students' poor communication skills, poor study habits, abstract nature of the subject, poorly equipped laboratory and lack of experienced Chemistry teachers.

The problem of poor academic performance in Chemistry among Senior Secondary Schools Chemistry students has been of much concern to Chemistry Educators, Achimugu (2013) asserted that for learning to be meaningful and effective in Chemistry classrooms, the teacher

should be able to select appropriate teaching strategy that would stimulate the interest of the learners and get them actively engaged in the process of learning. According to Bamiro (2015), a key determinant of students' achievement in Chemistry is the quality of instructional strategies employed by Chemistry teachers. Teaching methods are the tools of the teacher in reaching the set goals and instructional objectives (Umanah, 2017). If the tools are faulty or inappropriate, instructional goals and objectives may not be achieved. Mastery learning and Action learning strategies are all based on constructivism. Constructivism learning is often associated with pedagogic approaches that promote active learning, or learning by doing.

Mastery learning is a remedial process aimed at bringing students to a level of mastering a concept. Udo and Udofia (2014) sees it as an innovative strategy designed to make students perform beautifully well in an academic task. Frequent assessment and feedback; corrections with emphasis on cues; motivation; allotment of more time on tasks; and Reinforcement through assignments.

Action learning, on the other hand, is an educational process whereby the participant studies his/her own actions and experiences in order to improve performance (Adeyemi 2020). It enables each student to reflect on and review the action he/she has taken and the learning points arising, this would then guide future action and improves performance. It is therefore hoped that a better understanding of the effects of mastery and action learning strategies will serve to evolve an effective plan for enhancing students' achievement and retention of the concept of Chemical equilibrium.

Researchers report that mastery learning and action learning strategies foster high academic achievement in science and chemistry in particular (Furu, 2014; Udo and Udofia, 2014; Mites and Obaitan, 2015; Adeyemi, 2020; Adigun, 2021; and Ogbonna & Ismaila, 2021). However, it seems the use of mastery learning and action learning strategy has not attracted much attention as chemistry classroom activities are still dominated by teacher-centered methods. Hence, there should be paradigm shift from teacher-centered learning to student-centered learning through the use of mastery and action learning strategies. This had therefore made it necessary to investigate the relative effectiveness of mastery learning and action learing strategies on senior secondary school chemistry students' achievement on the concept of chemical equilibrium in Uyo Senatorial District of Akwa Ibom State. The findings of this study would be beneficial to science teachers, Curriculum Planners, Ministers of Education and Educational Researchers.

Problem Statement

The Senior Secondary School Chemistry curriculum has some concepts that are deemed difficult by the teachers to teach and students to learn. One of such concepts is chemical equilibrium. The main aim of science teaching is to promote the understanding of the concept being taught with a view to applying the knowledge of such understanding to real life situations. Unfortunately, students' performance in Chemistry continue to record a persistent and depressing downward trend.

Methods used in teaching Chemistry do not seem to help in improving students' academic achievement. It is therefore inevitable to try out other instructional strategies that could enhance effective teaching and learning of Chemistry. The problem of the study is to determine if students' achievement can be enhanced when taught with mastery, action or conventional strategies and

which of the learning strategies, mastery or action learning strategies will prove more effective in facilitating students' achievement in the concept of Chemical equilibrium? This study is an attempt to find answers to these questions.

Research Questions

In order to achieve the above stated objectives, the following research questions were raised to guide the study:

1. How do students differ in their mean achievement scores on Chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies?
2. What difference exists among the mean achievement scores of students on chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies based on gender?
3. What difference exist among the mean achievement scores of students on chemical equilibrium when taught mastery learning, action learning and conventional expository teaching strategies based on school location?

Research Hypotheses

The following hypotheses were formulated and tested at .05 alpha level.

1. There is no significant difference among the mean achievement scores of students in chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies.
2. There is no significant difference among the mean achievement scores of male and female students in chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies.
3. There is no significant difference among the mean achievement scores of urban and rural students in chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies.

Research Methodology

A quasi-experimental design was used with a 3x2x2 factorial arrangement in a non-randomized pre-test, post-test setting. It is factorial design with treatment varying at 3 levels, gender at 2 levels and school location at 2 levels. This study is described as non randomized since intact classes from selected schools were used for the study. The pre-test provided a check on the non-random assignment of subjects to the groups. Moreover, comparison on the basis of pretest performance provided further process of equating the research groups.

The study was conducted in Uyo Senatorial District of Akwa Ibom State. Uyo Senatorial District comprised of nine local government areas namely: Etinan, Ibesikpo Asutan, Nsit Ibom, Nsit Atai, Nsit Ubium, Itu, Ibiono Ibom, Uruan and Uyo.

There are 55 public coeducational secondary schools and one university in the area. The research chosed the area for the study because of the strategic position in this area. First, it hosts one tertiary institution – the University of Uyo, Uyo, secondly, it is the seat of the government of Akwa Ibom State. By this status the schools in this district are well staffed. Hence, the students can be expected to respond well to the experiment.

The population of the study consisted of all the 6,922 SS2 Chemistry students in all the 55 public co-educational secondary schools in Uyo Senatorial District of Akwa Ibom State. The choice of Senior Secondary Two students is due to the fact that Chemical Equilibrium in usually taught in Senior Secondary Two. Thus, it is assumed that the students do not have any prior knowledge of the concept to be investigated. This enabled the researcher to genuinely investigate on students' academic achievement in Chemical Equilibrium.

The study sample comprised of 206 SS2 Chemistry students in six intact classes in six secondary schools in the study area selected using multi-stage sampling technique. First the study area was stratified into urban and rural strata. Next, three public co-educational secondary schools were randomly selected from each strata for the study using simple random sampling technique. Finally, one arm of intact SS2 class from each of the selected schools was randomly selected and assigned as either Experimental group 1, Experimental group II or control group. Thus, two schools each from the urban and rural strata were randomly assign as Mastery Learning Group, Action Learning Group and Expository Learning Group, respectively.

A researcher developed instrument tagged "Achievement Test on Chemical Equilibrium (ATCE)" was used in collecting data for the study. The instrument was a 50 item 4-option multiple choice test with four options (A-D) designed to measure the achievement of students in Chemical Equilibrium. This instrument was used as a pretest to assess the equality of the group before treatment and reshuffled version of it was used as a pot test to assess the performance of the students after treatment.

In order to ensure face and content validity of Achievement Test on Chemical Equilibrium (ATCE) the instrument was submitted to three independent assessors, two content experts in Chemistry Education and one test and measurement expert, all in the Faculty of Education, University of Uyo. These validators were requested to vet the items for clarity of words, appropriateness to the level of students, content coverage, adequacy in addressing the objectives and problems of the study. Based on their comments and suggestions necessary modifications were made on the instrument

The researcher established the reliability of the research instrument from data that was obtained from the trial testing. The reliability of the instrument was determined using test-retest method. The trial test sample of the item analysis was used and the second test were administered two weeks after the first. Data generated were analyzed using Pearson Product Moment Correlation (PPMC) Coefficient r. The result showed that ATCE has a reliability index of 0.86. This indicated that the instrument is reliable and capable of measuring the intended outcomes.

After selecting the schools, the researcher visited the school principals to request for permission to use their school for the study. Thereafter, the subject teachers of the selected classes were requested to serve as research assistant, one week was used to brief them on the modalities of the research namely; administration of the research instruments, procedure in teaching chemical

equilibrium using the validated notes developed by the researcher as related to the instructional strategies adopted. The use of research assistant was to control the treatment effect. At the end of the briefing session, the researcher assessed the research assistants as each of them taught (using their specific instructional strategies) in order to measure their level of compliance and to help where necessary.

Thereafter, the research assistants administered the ATCE to all he treatment groups as pre-test. This was done in order to establish the homogeneity of the group before the treatment. Thereafter, the lesson notes prepared by the researcher were used by the research assistants in teaching the concepts of Chemical Equilibrium in their respective groups for four weeks. The students in Experimental group 1 were taught using Mastery Learning strategy, those in Experimental group II were taught using Action learning strategy while those in the control group were taught using expository teaching strategy. The teaching in all the groups was done during the normal class periods for chemistry and in intact class setting. At the end of the treatment, the reshuffled version of the ATCE was administered to all the students as post test under the supervision of the researcher. The scripts were collected at the end of the test by the research assistants who submitted same to the researcher for marking and scoring.

Results

In this section, the summary of results used in answering the three research questions and testing the three null hypotheses formulated to guide the study, are presented and interpreted variable by variable.

Answers to Research Question

Research Question 1: How do students differ in their mean achievement scores on Chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies?

Table 1:

Mean and Standard Deviation of students' pre-test and post-test scores classified by treatment groups

Treatment Groups	Sample Size	Pre-test		Post-test		Mean Difference
		$\bar{x}$	SD	$\bar{x}$	SD	
Mastery	63	43.94	15.00	62.06	15.65	18.12
Action	45	30.98	6.33	47.02	11.29	16.13
Expository	98	34.08	8.01	46.84	9.81	12.76

In table 1, the results show that the students taught using Mastery learning strategy had the best post-test pre-test mean difference (18.12), followed by those taught using Action learning strategy (16.13), and those taught using Expository teaching strategy in decreasing rank order.

Research Question 2: What difference exists among the mean achievement scores of students on chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies based on gender?

Treatment Groups	Gender	N	Pretest		Posttest		Mean Gain
			$\bar{x}$	SD	$\bar{x}$	SD	
Mastery	Male	28	41.79	12.68	57.71	15.55	15.92
	Female	35	45.66	16.60	65.54	15.05	19.88
Action	Male	26	30.15	7.00	48.92	12.20	18.77
	Female	19	31.89	5.31	44.42	9.61	12.53
Expository	Male	37	34.11	7.70	45.68	10.23	11.57
	Female	61	34.07	8.25	47.54	9.57	13.47

In Table 2, the results shows that the female students taught using Mastery learning strategy had the best post-test pre-test mean difference (19.88), followed by the males taught using Action learning (18.77), the male in Mastery (15.92), the female in the Action learning (12.53), the female in the Expository teaching strategy (11.57), in decreasing rank order.

Research Question 3: What difference exists among the mean achievement scores of students on chemical equilibrium when taught mastery learning, action learning and conventional expository teaching strategies based on school location?

Table 3:

Mean and standard deviation of students' pre-test and post-test scores classified by treatment groups and school location.

Treatment Groups	School Location	Sample Size	Pretest		Posttest		Mean Gain
			$\bar{x}$	SD	$\bar{x}$	SD	
Mastery	Urban	34	53.35	13.898	72.82	9.750	19.47
	Rural	29	32.90	6.038	49.45	11.160	16.55

Action	Urban	33	31.52	6.384	45.21	11.832	13.69
	Rural	12	29.17	6.118	52.00	8.090	22.83
Expository	Urban	42	32.48	6.337	46.62	9.693	14.14
	Rural	56	35.29	8.931	47.00	9.989	11.71

In Table 3, the result shows that the Rural students taught using Action learning strategy had the best post-test pre-test mean difference (22.83), followed by the Urban student taught using Mastery learning (19.47), the Rural students in the Mastery group (16.55), the Urban students in the Expository (14.14), the Urban students in the Action learning group (13.69), and the Rural in the Expository teaching strategy (11.71), in decreasing rank order. The observations show that the Action learning strategy facilitated the rural students' performances better than the Mastery and Exposition strategies.

Research Hypotheses

The following hypotheses were formulated and tested at .05 alpha level.

Hypothesis one: There is no significant difference among the mean achievement scores of students in chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies.

Table 4: Summary of Analysis of Covariance (ANCOVA) of students' post-test scores classified by treatment groups with pre-test as covariate

a. R Squared = .440 (Adjusted R Squared = .432)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at p<05 alpha
Present	7616.754	1	7616.754	68.359	.000	s
Treatment	2921.835	2	1460.917	13.112	.000	s
Error	22507.358	202	111.423	-	-	-
Total	587272.000	206	-	-	-	-
Corrected Total	40187.262	205	-	-	-	-

In Table 4, the calculated F-ratio for the effect of instructional methods at df 2, 205 is 13.11 while its corresponding calculated level of significance is .00 alpha. This level of significance is less than .05 which the decision is based; indicating that there was a significant difference in the academic performance of students in the concepts taught using Mastery learning, Action learning and Expository teaching strategies,. With this observation, null hypothesis 1 was rejected. This means that there is a significant difference among the mean scores of students on chemical equilibrium in Chemistry based on instructional strategies.

As regards the direction of significance the Scheff post-hoc summary indicates as follows:

Table 5: Summary of Scheffe Post hoc test of students' post-test achievement by treatment groups.

Ability	N	Subject		Mean Gain
		1	2	
Expository	98	47.84		

Action	45	47.02	
Mastery	63		62.06
Sig		.996	1.00

Alpha = 0.05

The mean for groups in homogenous subset displayed in Table 5 indicates that students taught using Mastery learning strategy performed significantly better than those taught using Action learning and Expository teaching strategies. While there was no significant difference between those taught using Action learning and Expository teaching strategies.

Hypothesis Two: There is no significant difference among the mean achievement scores of male and female students in chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies.

Table 6: Summary of Analysis of Covariance (ANCOVA) of male and female students' post-test scores classified by treatment with pre-test as covariance.

a. R Squared = .462 (Adjusted R Squared = .446)

Source	Type III Sum of Squares	Df	MeanSquare	F	Sig.	Decision at p<05 alpha
Pretest	7259.55	1	7259.55	66.86	.00	s
Treatment	2891.50	2	1445.75	13.31	.00	s
Gender	19.34	1	19.34	.18	.67	ns
Treatment * Gender	801.78	2	400.89	3.69	.03	s
Error	216-8.58	199	108.59			-
Total	587272.00	206				-
Corrected Total	40187.262	205	-	-	-	-

In Table 6, the calculated F-ratio for the main effect of instructional strategies at df 2, 205 is 13.31, while its corresponding calculated level of significance is .00 alpha. This level of significance is less than .05 in which the decision is based; indicating that there was a significant difference between the academic achievement of students in the concepts taught given the instructional methods used. However, the F-cal value for the main effect of gender given the instructional strategies at df 1, 205 was .18 while its significant level is .67. this significant level is greater than .05 alpha in which the decision is based, indicating that the influence of gender on the students' achievement was not statistically significant. With this observation, null hypothesis 2 was upheld.

Hypothesis Three: There is no significant difference among the mean achievement scores of urban and rural students in chemical equilibrium when taught using mastery learning, action learning and conventional expository teaching strategies.

Table 7: Summary of Analysis of Covariance (ANCOVA) of students' post-test scores classified by treatment groups and school location with pre=test as covariance

a. R Squared = .462 (Adjusted R Squared = .446)

In Table 7, the F-cal value for the main effect of school location given the instructional strategies at df 1,205 was 3.33 while its significant level is .07. This significant level is greater than .05 alpha in which the decision is based, indicating that the influence of school location on the students' achievement was not statistically significant. With this observation, null hypothesis 3 was upheld.

Discussion of Findings

The findings of this research are discussed as follow:

The findings with regard to the effects of Mastery learning, Action learning and Expository teaching strategies on students' achievement on chemical Equilibrium in Chemistry showed that there was a significant difference on students' academic achievement. Students taught using Mastery learning strategy performed significantly better than those taught using Action learning strategy and expository teaching strategy; students taught using Action learning strategy and expository teaching strategy had comparable achievements. The better enhancing effect of Mastery learning strategy on students' academic achievement, which is in line with the findings of Majid and Zahra (2010), Furu (2014), Udo and Udofia (2014) Mites and Obaitan (2015) and Ogbonna and Ismaila (2021) underscores the importance of involving the learners in constant drill and practice until they master the given concept. However, the findings is at variance with Adeyemi (2020) and Adigun (2021) who observed that Action learning strategy is the most facilitative strategy in enhancing students' academic achievement in Chemistry

The findings with regards to the influence of gender on students' academic achievement when taught using Mastery learning, Action learning and Expository teaching showed that the influence of gender on students achievements was not statistically significant. The reason could be due to the equal treatment given to both male and female students in the treatment groups. The instructional strategies are not gender sensitive, rather they give room for the two gender to perform equally. The findings agrees with Shadreck and Chukunoye (2018), Eya and Ezeh (2020) and Daniel (2021) that there was no significant influence of gender on students'' achievement in Chemistry. However, the finding disagrees with Aniodoh and Egbo (2013), who observed that female students performed significantly better than male students in Chemistry. It also disagrees with Ezeudu and Obi (2013) who observed that male students achieved significantly better than female students in Chemistry.

With respect to the influence of school location given the instructional strategies used, the findings showed that its influence was not statistically significant. This could be attributed to the enhancing effects of the instructional strategies used. The no significant influence of school location reported in this study is in agreement with the findings of Agbaje and Awodun (2014), Daniel (2021) and Ekanem and Daniel (2022). Conversely, the finding disagrees with Chukwuka (2014) that Chemistry students in Urban schools achieved significantly better than their rural counterparts.

Conclusion

Based on the findings of the study, it is hereby concluded that of the three instructional strategies investigated, mastery learning strategy is the most effective in facilitating students'

achievement in Chemistry. Also, gender and school location had no statistically significant influence on students' academic achievement.

Recommendations

Based on the findings of this study, the following recommendations were made:

1) Chemistry teachers should adopt mastery learning strategy in teaching chemistry
2) Curriculum planners should ensure the incorporation of mastery learning in teaching chemistry
3) Government in conjunction with professional bodies like STAN should endeavor to organize and sponsor regular workshops to train chemistry teachers on the use of mastery learning strategy
4) Government agencies should sponsor further research on the efficiency of mastery learning and other innovative learning strategies in enhancing students' achievement in Chemistry.

REFERENCES

Adeyemi, S. A. (2020). *The Effects of Action Learning Strategy on Students' Academic Achievement in Secondary School Chemistry in Osun State, Nigeria*. Unpublished M.Ed. Thesis, University of Ibadan, Ibadan.

Achimugu, L. (2013). Instructional Modes of Teaching and Learning Chemistry in Senior Secondary Schools under MDGs, NEEDs and Education's Reform Agenda. 54th Annual Conference Proceedings of Science Teacher Association of Nigeria.

Adigun, O. O. (2021). *Effects of Guided Discovery and Action Learning Strategies on Secondary School Students' Achievement in Chemistry.* Unpublished M.Ed. Thesis, University of Ibadan, Ibadan.

Agbaje, R. O. and Awodun, A. O. (2014). Impact of School Location on Academic Achievement of Science Students in Senior Secondary School Certificate Examination. *International Journal of Scientific and Research Publications,* 4 (9):1 – 4.

Akpan, I. M. (2022). Effect of Action Learning and Concept Mapping Strategies on Academic Achievement of Social Studies students in Junior Secondary Schools in South-East/West of Nigeria. *International Journal of Innovative Research and Advance Studies,* 10(2), 99-105

Aniodoh, H. C. and Egbo, J. J. (2013) Effect of Gender on Students' Achievement in Chemistry using Inquiry Role Instruction Model. *Journal of Educational and Social Research,* 3(6) :17-21.

Bamiro, A. O. (2015). Effects of Guided- Discovery and Think-Pair -Share Strategies on Secondary School Students' Achievement in Chemistry .https:// www. researchgate. net/publication / 276254907.(Retrieved on 30thApril 2023)

Chukwuka, C.U. (2014). *Influence of Emotional Intelligence on Secondary School Students Achievement in Chemical Quantitative Problem Solving*. M.Ed Dissertation, University of Nigeria, Nsukka, Nigeria.

Daniel, I. B. (2021). *Effects of Problem-Solving Models on Students' Achievement and Retention of Chemistry Quantitative Problems in Senior Secondary Schools in Uyo, Nigeria.* Unpublished Ph.D Thesis, University of Uyo, Uyo.

Ekanem, N. U. and Daniel, I. B. (2022). Effects of Cooperative Instructional Strategy on Students' Academic Achievement in Chemistry in Public Secondary Schools in Abak Local Government Area of Akwa Ibom State. *Prestige Journal of Counseling Psychology*, 5(2), 14-24.

Eya, N. M. and Ezeh, D. N. (2020) Mata-Analysis of Influence of Gender in Students' Academic Achievement in Chemistry in Nigeria. *Journal of Chemical Society of Nigeria,* 45(4), 615-619.

Ezeudu, F. O. and Obi, T. N. (2013). Effect of Gender and Location on Students' Achievement in Chemistry in Secondary Schools in Nsukka Local Government Area of Enugu State, Nigeria. *Research on Humanities and Social Sciences*. 3 (15) : 50 – 55.

Furu, P. T. (2014). Effect of Mastery Learning Approach on Secondary School Students Acheivement in Chemistry in Rivers State Nigeria. *International Institute for Science, Technology and Education* (IISTE), (9), 104 – 116

Gongden, E.J.(2016). The effects of Analogy on Male and Female Chemistry students' Problem-solving Ability in Electrolysis. *International Journal of scientific Research in Education,* 9(1), 1-6

Majid, E. D. and Zahra, S. K. (2010). Effect of Mastery Learning Method on Performance, Attitude of the weak students in Chemistry. *Procedia-social and Behavioual Sciences,* 5(1), 1574 – 1599

Mitee, T. L. and Obaitan, G. N. (2015). Effect of Mastery Learning on Senior Secondary School Students' Cognitive Learning Outcome in Quantitative Chemistry. *Journal of Education and Practice*, 6 (5), 34-38

National Policy on Education (NPE, 2013). *Federal Republic of Nigeria*. Lagos: NERDC Press.

Nbina, J. B. and Obomanu, B. J. (2011). Assessment of Effects of Problem Solving Instructional Strategies on Students' Achievement and Retention in Chemistry with Respect to Location in Rivers State. *World Journal of Education*, 1(2) 74-79

Noah, B. M. and Sanger, M. J. (2012). Students' Misconceptions in Writing Balanced Equations for Dissolving Ionic Compounds in Water. *Chemistry Education Research Practice,* 13(1), 186-195.

Ndukwe, R. C. (2021). Effects of Problem-solving strategy on chemistry students' performance in secondary schools in Abia State. *International Journal of Humanities, Social Sciences and Education,* 8(7), 226-232\

Ogbonna, G. N. and Ismaila, S. (2021). Effects of Mastery Learning Strategy on Academic Achievement and Interest of Metalwork Technology Students in Universities in South East Nigeria. *Journal of CUDIMAC*, 9 (1), 62-70.

Shadreck, M. and Chukunoye, O. (2018). Comparative Effects of Two Problem-Solving Instructional strategies on Students' Achievement in Stoichiometry. *EURASIA Journal of Mathematics, Science and Technology Education,* 14(12), 1-9

Udo, M. E. and Udofia, T. M. (2014). Effects of Mastery Learning Strategy on Students' Achievement in Symbols, formulae and equations in Chemistry. *Journal of Education Research and Reviews,* 2(3), 28-35.

Umanah, F. I. (2017). *Roundrobin, Jigsaw, Think-Pair-Share Cooperative Teaching Strategies and Students' Performance in Chemistry in Uyo Local Government Area of Akwa Ibom State, Nigeria*. Ph.D Thesis, University of Uyo, Uyo, Nigeria.

West African Examination Council (2020-2023) Chief Examiners' Report of Chemistry Theory and Practical. http://www.waecheadquartersgh.org (Retrieved on 12th July, 2023).

FUEL SUBSIDY: THE CHALLENGES AND THE REMEDIAL STRATEGIES FOR THE NIGERIAN GOVERNMENT

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Abstract

This study aims to examine the challenges associated with fuel subsidies and the curative strategies for the Nigerian government. The fuel subsidy in Nigeria has been an important economic policy aiming at lowering the cost of petroleum goods for residents. However, the policy's long-term viability has been called into doubt due to the significant financial load it throws on the government, as well as its contribution to systemic corruption and inefficiency. Key challenges include economic burden and fiscal deficit, inequitable distribution of benefits, and corruption and mismanagement. These factors have led to several malpractices, which include corruption and fraudulent claims, fuel diversion and smuggling, political manipulation, and patronage networks. This study also explores remedial strategies for addressing these challenges, emphasizing the need for comprehensive economic reform. These include diversification of energy sources, investment in public transport, and refining capacity expansion to mitigate the impact of subsidy removal on vulnerable populations. The study concluded that by fostering an efficient public transportation system, the government can alleviate the immediate burden on citizens while ensuring sustainable economic growth. One of the recommendations provided was that strengthening local fuel production by investing in refineries and encouraging public-private partnerships will reduce Nigeria's dependence on imported fuel and stabilize local fuel prices in the long term.

Keyword: Fuel Subsidy, Origin, Governance, Challenges, Remedial, Malpractices and Nigerian Government

Introduction

Fuel subsidies have long been a contentious topic in Nigerian politics and economics. To mitigate the effects of volatile global oil prices and increase the affordability of petroleum products for its populace, the Nigerian government implemented fuel subsidies. Nevertheless, this program

has created a number of difficulties, including corruption, inefficiencies, and unmanageable national debt. The government has strained its finances, cut support for important sectors, and impeded economic progress by spending billions of dollars subsidizing fuel costs over time.

One of the major challenges of fuel subsidies is the economic distortion it creates. By artificially lowering fuel prices, the policy encourages overconsumption and smuggling of subsidized fuel to neighboring countries where fuel prices are higher. Additionally, the subsidy system has been riddled with corruption and mismanagement. Reports have shown that powerful vested interests, including marketers and government officials, have exploited the system, diverting funds meant for the subsidy program for personal gain (Adams, 2015). The result is a system that benefits a few elites while depriving the general population of the intended benefits.

Furthermore, fiscal sustainability is another pressing issue. Fuel subsidies consume a significant portion of Nigeria's budget, diverting resources from crucial sectors such as healthcare, education, and infrastructure (Adegoke, 2021). With the volatility of oil prices and Nigeria's heavy reliance on oil revenue, continuing fuel subsidies poses a risk to the country's fiscal health. As oil prices fluctuate, the subsidy burden grows, making it increasingly difficult for the government to maintain fiscal discipline (IMF, 2020).

Remedial solutions in several forms have been developed to address these issues. With social safety nets in place to mitigate the effects on the most vulnerable communities, the Nigerian government has contemplated phasing out the subsidies gradually. There are also requests for increasing the economy's diversification in order to lessen reliance on oil, enhancing the oil industry's transparency and governance, and making infrastructural investments in order to increase the country's capacity for refining oil imports. Nigeria faces both possibilities and challenges as a result of the elimination of fuel subsidies. Eliminating subsidies would surely have short-term negative effects, particularly for low-income households, but stronger governance, economic diversification, and fiscal sustainability will have long-term advantages that might greatly enhance Nigeria's economic future.

Concept of fuel subsidy

A fuel subsidy is a form of government funding intended to lower consumer fuel prices. The purpose of this is to maintain reduced fuel prices and increase accessibility for the general public. The process of removing government financial support for fuel results in prices rising to market rates, or fuel subsidy withdrawal. This can have negative effects on the economy and society in addition to raising fuel prices. According to Onyeizugbe & Onwuka (2024), fuel subsidy means that a fraction of the price that consumers are supposed to pay to enjoy the use of petroleum products is paid by the government so as to ease the price burden.

One of the government's numerous consumption subsidy programs in Nigeria is fuel. By directly funding oil companies, it aims to reduce fuel costs and, consequently, fuel prices for Nigerians. Direct or indirect payments made by the government to companies or individuals are

known as subsidies. Direct subsidies are when the government gives the beneficiary financial money. Conversely, industries or households profit economically from government measures like tax rebates when there are indirect subsidies.

Generally speaking, the purpose of subsidies is to encourage production and consumption. If the government pays refineries directly, for example, the producers' production costs would be reduced, which would lead to a rise in fuel production. A fuel subsidy is only the sum of money that the government uses to cover a portion of the cost of fuel that its citizens use. Sodeeq (2024) asserted that subsidies are a form of government intervention in the market that aims to provide financial assistance to individuals, businesses, or institutions to relieve burdens deemed to be in the general interest of the public. A fuel subsidy is a government discount on the market price of fossil fuels to make consumers pay less than the prevailing market price of fuel. When subsidies are in place, consumers would pay below the market price per liter of the petroleum product.

Challenges of fuel subsidy in Nigeria

Nigeria's economy, public opinion, and governance have all been significantly impacted by the elimination or decrease of gasoline subsidies, which has long been a contentious topic. Fuel subsidy schemes have given rise to a number of difficulties, such as:

Economic Burden and Fiscal Deficit

Fuel subsidies impose a significant financial strain on the Nigerian government, contributing to the country's fiscal deficit. According to Adediran (2020), the Nigerian government has spent billions of dollars annually to keep fuel prices artificially low. This expenditure limits the government's ability to invest in critical sectors like education, healthcare, and infrastructure. As oil prices fluctuate globally, the cost of maintaining the subsidy often rises, further burdening government revenues, especially during periods of low oil prices.

Corruption and mismanagement

The fuel subsidy system in Nigeria has been plagued by corruption, with reports of funds being diverted by fraudulent claims of fuel imports that never occurred. Uche & Chukwuemeka (2021) highlighted that the lack of transparency in the management of subsidy funds has made the program susceptible to fraud, leading to losses of billions of naira. This has eroded public trust in the government and hindered efforts to implement meaningful reforms.

Fuel Scarcity and Black Market Activities

Despite the heavy subsidies, Nigeria has frequently experienced fuel shortages. As noted by Alade (2019), these shortages are often a result of supply chain inefficiencies, smuggling, and hoarding. The subsidy encourages smuggling, as prices are higher in neighboring countries, leading to significant losses. The black market thrives under such conditions, with fuel being sold at inflated prices to desperate consumers, further undermining the purpose of the subsidy.

Social Unrest and Protest

Attempts to reduce or remove fuel subsidies have led to widespread public protests. The removal of subsidies has often been met with resistance due to the direct impact on the cost of living, as fuel prices influence transportation and food costs. As Olayinka (2022) explains, past efforts to remove subsidies, particularly 2012 and 2020, led to nationwide strikes and demonstrations, reflecting the public's sensitivity to fuel price hikes in an already strained economy.

Inequitable Distribution of Benefits

Fuel subsidies disproportionately benefit the wealthier population, who consume more fuel, leaving the lower-income population with relatively less benefit from the program. Richer households, owning more vehicles, gain more from subsidized fuel than poorer households. This has led to calls for better-targeted social safety nets that directly address the needs of the poor instead of blanket subsidies.

Origin of fuel subsidy in Nigeria

In Nigeria's economic history, fuel subsidies have frequently appeared as both a source of controversy and support. Initially intended to protect citizens from the direct effects of fluctuations in the world oil market, the subsidy has developed into a sophisticated mechanism that affects gasoline prices and, in turn, transportation expenses. According to Yunusa, Yakubu, Emeje, Ibrahim, Stephen, & Egbunu (2023), the Nigerian economy has been subsided in various ways for many years, and this includes fuel, education, and electricity. Fuel subsidies began in the 1970s and became institutionalized in 1977, following the promulgation of the Price Control Act, which made it illegal for some products (including petrol) to be sold above the regulated price.

Nigerians have been witnessing the journey of fuel prices for decades; from a meager 6 kobo per liter in 1973 to an astounding 617 naira per liter in 2023. In response to the 1973 oil price shock, Nigeria began using subsidies in the 1970s. The shock scenario sent oil prices skyrocketing across the globe. As mentioned by Igbokwe-Ibeto, Ewuim & Agbodike (2015), since the early 1960s, enormous revenues have been generated from this natural endowment. It is in the public domain that the government of General Yakubu Gowon had so much money that it had problems deciding what to do with it.

Gowon's (1973–1976) comparatively mild rises during the first few years were brought on by the post–oil crisis and variations in worldwide demand, which resulted in small increases that affected transportation costs. From 6 Kobo to 9 Kobo, fuel prices increased. Another is Obasanjo (1978–1982), where economic difficulties led to a significant increase in price from 9 kobo to 20 kobo, hence impacting transportation costs. Changes in the mechanics of the world oil market continued under Shagari's reign, impacting transportation expenses. Even though the Babangida I and II regimes (1986–1991) kept up economic changes to conform to international trends, this led to a 97.5% increase that affected the affordability of transportation. During the regime of Shonekan

& Abacha (1993–1999), the ’90s witnessed subsidy introductions, abrupt changes, and price drops, impacting the transport sector. Shonekan’s economic instability led to a staggering 614.29% increase, and he spent only 82 days in power, while Abacha’s tenure brought fluctuations, including a promising drop in 1993 and a big increase later in that year, which finally ended with a short drop in 1994 (Autogril, 2024).

Subsidies were increased by 50% in 2000 under the Obasanjo second rule, which had a favorable effect on transportation expenses. Transportation costs increased sharply in 2003 and 2004 as a direct result of the withdrawal of subsidies, rising by 61.54%. Restoring subsidies lessened the load, but the 30% increase represented the intricate balancing act between domestic demands and changes in the world economy that affect transportation expenses. Yar'Adua achieved a noteworthy 15.39% price drop in 2007, demonstrating efforts to stabilize prices and having a favorable impact on transportation costs.

Economic difficulties and the elimination of subsidies in 2012 caused a sharp spike of 116.92%, which set off the Occupy Nigeria rallies and had a major effect on transportation prices throughout Jonathan's administration from 2012 to 2015. Political factors and the return of subsidies caused price variations, which by 2015 had decreased by 10.31% and relieved transportation expenses. The 66.67% increase under Buhari's administration was a reaction to changes in the world oil market, which affected transportation costs between 2015 and 2023. Subsequent years witnessed a 124% increase, impacting the transportation sector as economic challenges persisted. In the Tinubu era, immediate removal of subsidies resulted in a surge from N195 to N540 per liter in June and an unprecedented N617 per liter by July, significantly impacting transportation costs. Cost to fill a car tank in (July 2023) was approximately N120, 000, till date.

Malpractices in fuel subsidy in Nigeria

In Nigeria, where the government subsidizes fuel prices to make petroleum products more affordable for its residents, fuel subsidies have long been a contentious topic. Fuel subsidies in Nigeria have been beset by pervasive malpractices, corruption, and inefficiency, despite being designed to lessen the financial burden on the general public. The subsidies' advantages have been weakened by these misdeeds, which have also resulted in large financial losses.

Corruption and fraudulent claims

One of the most significant malpractices in Nigeria’s fuel subsidies is corruption. According to Eze & Afolabi (2019), many petroleum marketers submit fraudulent claims for subsidies, inflating the amount of fuel imported or claiming subsidies for fuel that was never delivered. These fraudulent activities have resulted in the loss of billions of dollars from the Nigerian treasury. This corruption is often facilitated by a lack of transparency and oversight in the fuel importation process.

Fuel Diversion and Smuggling

Fuel diversion is another common malpractice within the subsidy system. Fuel intended for local consumption is often diverted to neighboring countries, where it is sold at higher prices due to the lack of subsidies in those markets. As noted by Bello and Ogu (2020), this diversion creates an artificial scarcity of petroleum products in Nigeria, forcing the government to continue subsidizing fuel prices to meet local demand. Ikechukwu (2022) adds that the porous nature of Nigeria's borders and weak regulatory frameworks make it easy for fuel smugglers to divert large quantities of subsidized fuel.

Over-invoicing of Fuel Imports

Over-invoicing of fuel imports is another fraudulent practice associated with the fuel subsidy regime. According to Fagbemi (2021), marketers inflate the cost of importing fuel, presenting inflated invoices to the government to claim higher subsidy amounts. This practice not only drains government resources but also distorts the market, making it difficult for genuine fuel marketers to compete. Over-invoicing occurs because of the lack of rigorous auditing and monitoring systems in place to verify the actual cost of imported fuel.

Political manipulation and patronage networks

Political manipulation has also played a significant role in perpetuating malpractices within the fuel subsidy system. Politicians use the subsidy regime as a tool for maintaining political patronage networks, allocating subsidies to their allies in exchange for political support. This manipulation undermines efforts to reform the system, as those benefiting from the subsidies resist any attempts to change the status quo.

Fuel subsidy during Goodluck Jonathan governance

During Goodluck Jonathan's administration in Nigeria (2010-2015), fuel subsidies became a highly contentious and politically charged issue. However, this subsidy system had long been chastised for its inefficiencies, corruption, and unsustainable financial burden on the government's budget. By the time Jonathan assumed office, the subsidy regime had become a financial strain on the national budget. According to Ogundipe (2017), the fuel subsidy had ballooned, with the government spending billions of dollars annually to sustain the artificially low price of fuel, a situation that was unsustainable in the long term. Additionally, corruption within the subsidy system became rampant, with reports that oil marketers were inflating import claims and diverting funds meant for subsidies (Ezeamalu, 2019).

On 1 January 2012, Nigerian President Goodluck Jonathan abruptly removed the fuel subsidy provided to citizens by the government. Finance Minister Ngozi Okonjo-Iweala championed the decision, and the country’s citizens received no prior warning. The government argued that the removal of the heavy subsidy would free up funds for other public services, including health and infrastructure projects, and that then liberalization of the fuel industry would

benefit the economy. They also argued that the primary beneficiaries of the subsidy were the wealthy, who used more fuel than the poor, and wholesalers who made a profit selling subsidized fuel out of the country.

The subsidy debate during Jonathan's administration laid the groundwork for ongoing discussions about fuel subsidy reform in Nigeria. As Nnaji and Nwankwo (2020) pointed out, the failure to address corruption in the oil sector and the government's inability to develop domestic refining capacity have left Nigeria dependent on imported fuel, perpetuating the need for subsidies. Ultimately, the fuel subsidy issue continued to plague Nigeria even after Jonathan's tenure. His administration, while making attempts to address the fiscal challenges posed by the subsidy, could not fully extricate the economy from the dependence on artificially low fuel prices.

Fuel subsidy during Mohammed Buhari governance

On the removal (or withdrawal) of fuel subsidies by the Buhari regime and how this policy has greatly worsened the socio-economic conditions of already long-suffering Nigerians. Obo, Omenka, Agishi, & Coke (2017) explained that there is no doubt that the performance of an administration can be assessed not by relying on the propagandistic effusions of its spokespersons but by critically examining the results or outcomes of the policies and programs implemented by the administration and how these have impinged on the welfare of the citizenry. The current crushing economic misery in the country can only be adequately understood by looking at the repercussions of the Buhari-led government's strategy of removing gasoline subsidies. According to the findings, the Buhari administration was not sincere in its fight against corruption; rather, the fight was selective and targeted political opposition and opponents, leaving the perpetrators in his government, and fuel subsidies did not contribute to the improvement of the Nigerian economy due to corruption.

By increasing the price of gasoline—through the withdrawal of government subsidies—President Muhammad Buhari, his government, and his party (the All Progressive Congress) have failed to fulfill one of the major promises they made to Nigerians during the campaign for the 2015 general elections. During the campaign, Buhari had pledged to reduce the cost of petrol by 50%; Esther (2024) mentioned that, in May 2016, Muhammadu Buhari increased the pump price of petrol from eighty-seven naira (N87) to one hundred and forty-five naira (N145) per liter. The fact that this act had devastating effects on the lives of most of the Nigerian masses cannot be overemphasized. In Nigeria’s petrol-dependent and petrol-driven economy, this astronomical increase instantly precipitated huge increases in the costs of goods and services. And the victims are the already poor and long-suffering masses.

It is argued that given the magnitude of the pump price increase, the manner in which it was implemented, and the enormous increases in the costs of goods and services that it has caused, President Buhari appears to be on par with the Biblical King Rehoboam, who presided over an era

of unprecedented cruelty in Israel. It is also argued that subsidies, if well-articulated, managed, and targeted, can be used as a policy tool to promote the public good.

Fuel subsidy during Bola Tinubu governance

Fuel subsidy removal became a hallmark of President Bola Ahmed Tinubu's administration from its onset. On May 29, 2023, in his inaugural address, Tinubu declared that "fuel subsidy is gone," ending a policy that had been in place for decades. The fuel subsidy, initially implemented to make fuel affordable for citizens, had become unsustainable, costing Nigeria over ₦6 trillion annually in the years leading up to its removal (Premium Times, 2023). Tinubu's administration claimed that the subsidies disproportionately benefited richer Nigerians and created a breeding environment for corruption. By abolishing it, the government hoped to allocate resources to infrastructure, education, and healthcare, addressing more pressing developmental needs.

The immediate consequence of the subsidy removal was a dramatic increase in fuel prices, which jumped from about ₦185 per liter to over ₦1200, and even higher in some regions. This price hike led to increased transportation costs and general inflation, with ripple effects across food prices, utilities, and other essential goods (Vanguard, 2023). The removal of the subsidy exacerbated the economic struggles of many Nigerians, especially low-income households who were already grappling with the high cost of living. The inflationary pressures pushed many below the poverty line, further straining the economy. Labor unions, notably the Nigeria Labour Congress (NLC) and Trade Union Congress (TUC), responded with protests and strikes, demanding the reversal of the subsidy removal or compensatory measures to alleviate the economic hardships faced by the citizens (The Guardian, 2023).

In response to the public outcry, the Tinubu administration rolled out a series of remedial measures aimed at cushioning the effects of the subsidy removal. The government introduced cash transfers, food relief programs, and announced subsidies on public transportation to help ease the burden on vulnerable populations. It also engaged in negotiations with labor unions to review the national minimum wage in light of rising costs (BusinessDay, 2023). The administration argued that these palliative measures, though temporary, would provide immediate relief to those hardest hit by the removal, while the long-term benefits of the subsidy removal would outweigh the short-term challenges. However, many criticized the relief efforts as insufficient and unevenly distributed, with reports indicating that some of the promised aid did not reach those in need (Sahara Reporters, 2023).

Finally, the withdrawal of the gasoline subsidy under Bola Tinubu's tenure signified a fundamental shift in Nigeria's economic policies. While the immediate consequences were harsh, with inflation and public dissatisfaction growing, the administration claimed that the long-term benefits would include a more sustainable economy and more effective use of government resources.

Remedial strategies to fuel subsidy challenges in Nigeria

The withdrawal or decrease of gasoline subsidies in Nigeria has been a difficult topic, affecting both the economy and residents' everyday life. petrol subsidies were first implemented to make petrol more accessible for Nigerians, but the program has now proven economically unsustainable, resulting in fiscal imbalances, corruption, and inefficiencies in the energy sector. With the elimination of subsidies, it is critical to investigate alternative measures to offset the negative consequences on the economy and residents. As mentioned by PWC (2024), the following are the remedial strategies to fuel subsidy challenges in Nigeria.

Diversification of Energy Sources

One of the key strategies is the diversification of energy sources to reduce overdependence on petrol. This involves promoting alternative sources of energy such as solar, wind, and natural gas. By investing in renewable energy and creating incentives for companies and households to adopt these alternatives, Nigeria can reduce its reliance on fossil fuels and create a more sustainable energy future.

Investment in Public Transportation

Fuel subsidy removal often leads to an increase in transportation costs, disproportionately affecting low-income citizens. A viable remedy is to invest in an efficient, affordable public transportation system. Developing modern railways, expanding the bus network, and encouraging ride-sharing schemes can reduce the need for private vehicles, thus alleviating the financial burden on commuters and reducing national fuel consumption.

Refine capacity expansion

One of the root causes of Nigeria’s fuel subsidy problem is the lack of adequate domestic refining capacity, which forces the country to import a significant portion of its refined petroleum products. To address this, the government should prioritize the rehabilitation and upgrading of existing refineries and encourage the establishment of private refineries. Improving refining capacity will reduce the cost of fuel imports and stabilize prices, making the economy less vulnerable to global oil price fluctuations.

Promoting Efficient Fuel Usage

Encouraging the efficient use of fuel through public awareness campaigns and the promotion of fuel-efficient vehicles can help reduce fuel consumption. The government can introduce policies to incentivize the adoption of fuel-efficient technologies and practices, such as tax rebates for hybrid and electric cars or investing in technologies that reduce energy waste in industries.

Price Stabilization Mechanisms

The volatility of global oil prices can lead to significant fluctuations in fuel prices domestically. Implementing a fuel price stabilization fund or other market-based mechanisms can help cushion the effects of sudden price hikes. The government can create a reserve fund to absorb excess revenues during periods of high oil prices, which can be used to stabilize prices when global oil prices rise sharply.

Corruption Control and Transparency

Corruption in the fuel subsidy program has contributed significantly to its failure. Therefore, addressing fuel subsidy challenges requires stringent anti-corruption measures. The government should enhance transparency in fuel procurement and distribution processes and ensure that subsidy payments are made directly to the most vulnerable groups. Independent audits of fuel subsidy disbursements should also be conducted regularly to enhance accountability.

Conclusion

In conclusion, the fuel subsidy in Nigeria poses several challenges, including economic instability, rising inflation, and public unrest. Addressing these issues requires the government to adopt comprehensive remedial strategies. These should include the transparent allocation of saved funds to improve infrastructure, healthcare, and education, thereby enhancing the quality of life for citizens. Implementing targeted social safety nets can support vulnerable populations affected by subsidy removal. Additionally, investing in alternative energy sources and boosting local fuel production can reduce dependency on imports. By fostering an efficient public transportation system, the government can alleviate the immediate burden on citizens while ensuring sustainable economic growth.

Recommendation

1. Introduce well-targeted social safety nets, such as cash transfers and subsidies for essential goods, to cushion the effects on vulnerable populations directly impacted by subsidy removal.
2. Redirect funds saved from subsidy removal into critical sectors like infrastructure, healthcare, education, and transportation. This reinvestment can create jobs, reduce poverty, and improve citizens' quality of life.
3. Strengthen local fuel production by investing in refineries and encouraging public-private partnerships. This will reduce Nigeria’s dependence on imported fuel and stabilize local fuel prices in the long term.

References

Adams, I. (2015). The Occupy Nigeria Protests: Fuel Subsidy Removal and Democratic Government in Nigeria. *Journal of African Studies*, 23(1), 45-60.

Adediran O., Olagunju K. & Folarin, A. (2020). Economic implications of fuel subsidy removal in Nigeria. *Journal of African Economies*, 29(3): 450-472.

Adegoke, A. (2021). The Impact of Fuel Subsidy on Nigeria's Public Transportation System. *African Economic Review*, 14(2), 89-105.

Alade A., Yusuf M. & Obi P. (2019). The Impact of Fuel Scarcity on the Nigerian Economy: An Analysis of Black Market Activities. *Energy Policy Review*, 17(2): 89-104.

Autogril (2024). Fuel Price Evolution in Nigeria From 1973 to 2024 – Fuel Subsidies And Its Effect On Transportation. Available at: https://autogirl.ng/fuel-price-evolution-in-nigeria-from-1973-to-2024-fuel-subsidies-and-its-effect-on-transportation/#:~:text=Fuel%20subsidies%20began%20in%20the,sold%20above%20the%20regulated%20price.

Bello, A., & Ogu, T. (2020). Fuel Diversion and the Nigerian Economy: The Challenges of Smuggling and Black Markets. *Journal of African Policy Review*, 12(3), 98-115.

BusinessDay. (2023). "Tinubu rolls out palliatives to cushion fuel subsidy removal effects." Retrieved from https://businessday.ng

Esther E. (2024) Corruption in Nigeria: An Assessment of Fuel Subsidy in the Buhari Administration. *International Journal of Humanities Social Science and Management* (IJHSSM) 4(2)165.

Eze C. & Afolabi F. (2019). The Persistence of Fuel Subsidy Malpractices in Nigeria: An Examination of Fraud and Corruption. *Journal of African Governance Studies*, 12(3): 63-81.

Ezeamalu, B. (2019). The Jonathan fuel subsidy saga: An examination of policy failure and its aftermath. *Journal of African Economic Studies*, 6(2), 101-117.

Fagbemi S. (2021). Over-invoicing and Fuel Subsidy Fraud: Nigeria's Struggle with Petroleum Importation. *Journal of African Economic Development*, 17(1): 148-165.

Igbokwe-Ibeto, C. J., Ewuim, N. C., & Agbodike, F. C. (2015). Nigerian government and oil subsidy regime: A horn of dilemma. *International Journal of Development and Management Review*, 10(1), 188-200.

Ikechukwu O. (2022). Fuel Smuggling and Economic Instability in Nigeria: The Role of Weak Borders and Regulatory Failure. *Journal of Energy Policy Studies*, 13(2), 110-128.

IMF. (2020). Nigeria: Economic Outlook and Challenges. IMF Country Report No. 20/227. International Monetary Fund.

Nnaji, M. U., & Nwankwo, C. O. (2020). Oil subsidy removal and its effects on economic stability in Nigeria. *Journal of Energy Policy and Environmental Research*, 8(1), 24-36.

Obo, U. B., Omenka, J. I., Agishi, T. V., & Coker, M. A. (2017).Fuel Subsidy Removal And The Ubiquity Of Hardship In Nigeria: President Buhari And Lessons From King Rehoboam. *Advances in Social Sciences Research Journal*, 4(14)113-126.

Ogundipe, A., Adeniran, O., & Olagunju, A. (2017). The impact of fuel subsidy on economic growth and development in Nigeria. *Journal of Economic Policy*, 12(4), 201-221.

Olayinka T. (2022). Public Response of Fuel Subsidy Reforms in Nigeria. *Journal of Social and Economic Studies*, 45(1): 114-129.

Onyeizugbe C. & Onwuka E.M. (2024) Fuel Subsidy Removal as an Imperative for Enhancing Business Development in Nigeria. *African Journal of Economics and Sustainable Development*.2 (9)454.

Premium Times. (2023). "Fuel Subsidy Removal: FG says subsidy gulped over N6 trillion in 2022." Retrieved from https://www.premiumtimesng.com

PWC (2024). Fuel subsidy in Nigeria - issues, challenges and the way forward. Available at: https://www.pwc.com/ng/en/publications/fuel-subsidy-in-nigeria-issues-challenges-and-the-way-forward.html

Sahara Reporters. (2023). "Nigerians accuse government of failing to distribute palliatives after subsidy removal." Retrieved from https://saharareporters.com

Sodeeq M.A. (2024) Impact of fuel subsidy removal on household spending in nigeria. *International Journal of Social Science and Economic Research*.9 (1)30

The Guardian. (2023). "Labour unions to protest fuel subsidy removal, demand wage increase." Retrieved from https://guardian.n

Uche C. & Chukwuemeka O. (2021). Corruption and the fuel subsidy system in Nigeria: A critical assessment. *International Journal of Public Administration,* 44(3), 215-230.

Vanguard. (2023). "Fuel Price Hike: Nigerians reel under subsidy removal as cost of living rises." Retrieved from https://www.vanguardngr.com

Yunusa, E., Yakubu, Y., Emeje, Y. A., Ibrahim, Y. B., Stephen, E., & Egbunu, D. A. (2023). Fuel subsidy removal and poverty in Nigeria: a literature review. *GPH-International Journal of Applied Management Science*, 4(09), 14-27.

LABORATORY AND LIBRARY FACILITIES: INVESTIGATING THEIR POTENCIES IN PROMOTING STUDENTS' INTERESTS AND PERFORMANCES IN SCIENCE SUBJECTS

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Abstract

This study examines the roles of laboratory and library facilities in enhancing students' interests and performances in science subjects. Recognising the critical need for practical and theoretical knowledge in science education, this study highlights how access to well-equipped laboratories facilitates hands-on learning, allowing students to directly engage with scientific concepts and experimental procedures. This practical experience not only solidifies theoretical understanding but also stimulates curiosity and interest in scientific exploration. By providing access to current scientific literature, multimedia resources, and study spaces, libraries enable students to deepen their knowledge and stay updated with the latest scientific advancements. The study delves into the aspects of laboratory, science subjects, laboratory facilities, and the academic performance of a student, giving results that indicate a positive correlation between the availability of these educational facilities and the improvement of student outcomes. Indicating that students with regular access to laboratories and libraries demonstrate higher engagement levels and better academic performance in science subjects compared to those with limited access. The study examines the potency of laboratory facilities in promoting student performance in science subjects and the potency of laboratory facilities in promoting student interest in science subjects, showing how laboratory performance is a vital access for student success, as well as the effect of library facilities on student interest and performance in science subjects. The study concludes that by engaging in experiments and witnessing scientific principles in action, students become more motivated and confident in their abilities, which translates into improved academic performance. One of the recommendations provided was that educational authorities should prioritise the development and maintenance of modern laboratory facilities in schools. Well-equipped laboratories enable students to engage in hands-on experiments, which are crucial for understanding complex scientific concepts.

Keyword: Science Subjects, Library Science, Laboratory Facilities, Science Laboratory, Students' Interests and Performances, and potency.

Introduction

Facilities for labs and libraries are essential for improving students' academic performance, especially in scientific classes. According to recent studies, rich library resources and well-equipped laboratories have a major role in boosting students' interest in and success in these subjects. Knowing the effects of these facilities becomes more crucial as educational establishments work to enhance scientific instruction.

Understanding scientific concepts and processes requires hands-on experience, which is mostly provided by laboratory facilities. The National Research Council (2017) emphasises that laboratory experiences are essential for learning science because they allow students to interact directly with the material world. Studies have consistently shown that students who engage in laboratory work develop better scientific inquiry skills, have a deeper understanding of scientific concepts, and show greater interest in science (Hofstein & Lunetta, 2017).

Libraries are essential resources for students, providing access to a vast array of scientific books, reference materials, and digital resources, in addition to labs. Libraries promote an atmosphere that is favourable to independent study and research in addition to aiding in the acquisition of information. According to Smith (2019), libraries that provide comprehensive collections and accessible digital resources significantly enhance students' ability to perform in-depth research, which is crucial for their success in science subjects. The availability of such resources ensures that students can keep up with the latest scientific discoveries and methodologies. According Bassey (2020), Library facilities like the use of cards catalogue, flipping through several cards to the use of online public access catalogue (OPAC) through the use of computers. Libraries are gradually moving away from hard copies of books, and students project. This makes it easier for student in science subject promoting their performance and interest.

Moreover, the integration of digital technologies in libraries has transformed the way students engage with scientific information. Digital libraries and online databases have made it easier for students to access up-to-date research papers, journals, and other educational materials from anywhere, thereby promoting continuous learning (Johnson & Green, 2020). Williams and Wong (2021) highlighted that students who regularly utilised digital library resources showed improved academic performance and a higher level of engagement in their science courses. Despite the clear benefits, the effectiveness of laboratory and library facilities can be influenced by various factors such as funding, maintenance, and accessibility. Brown and Smith (2022) revealed that underfunded laboratories and poorly maintained libraries negatively impact student outcomes. They argued that continuous investment in these facilities is crucial for maintaining high educational standards and promoting students success in science subjects. Furthermore, ensuring that these facilities are accessible to all students, including those from marginalised communities, is essential for fostering an inclusive learning environment (Garcia & Hernandez, 2023). Library facilities helps sudents find materials to augmnet their lecture notes, classroom, assignments, etc. Bassey (2024) revealed that most science student users use the library virtually every day and that books, newspapers and magazines are the materials users utilize the most. By so doing young learners reading habits are encouraged and good academic performance is guaranteed.

Concept of Science Subject

Science is the methodical study of nature by means of analysis, experimentation, and observation. It includes a number of disciplines, including earth sciences, physics, chemistry, biology, and astronomy. Fundamentally, science aims to comprehend the underlying laws controlling the cosmos and to formulate hypotheses supported by empirical data. Science is defined by its quest for understanding and knowledge. Science is essential to the advancement of human knowledge and the development of new technologies.

According to Almarode (2018), science subjects are not static; they continuously evolve as new discoveries are made and technologies advance. This dynamic nature requires that science education also be adaptive, incorporating the latest research findings and technological innovations into the curriculum. Keeping the curriculum up-to-date ensures that students are well-prepared for future scientific challenges and opportunities. Furthermore, science permeates daily life and is not only found in labs and educational settings. Scientific knowledge is ingrained in many facets of society, from knowing the fundamentals of nutrition to sustain a balanced diet to understanding the dynamics of climate change to make educated decisions.

In recent years, the importance of science in addressing global challenges has become increasingly evident. The COVID-19 pandemic highlighted the critical role of scientific research in developing vaccines, understanding the spread of the virus, and implementing public health measures to mitigate its impact. As emphasised by the World Health Organisation (2020), "Science is critical in guiding responses to health emergencies and other global challenges."

The objectives of science education are to foster profound comprehension of scientific concepts, critical thinking, and problem-solving abilities. It pushes pupils to think critically, pose questions, carry out experiments, and examine data. The advancement of knowledge and technology depends on the scientific method. Students who participate in science classes develop their analytical skills and get ready for a variety of vocations in science and technology by learning how to apply scientific ideas to real-world issues.

Concept of Library Science

The administration, distribution, and organizing of information resources are the focus of the multidisciplinary area of library science. It includes a wide range of tasks, such as providing user services that encourage information literacy and access as well as categorizing both digital and physical items. Encouraging the efficient use of information and making it available to a wide range of users is the primary objective of library science. Library science is always adapting, using new techniques and technologies to improve user experience as libraries develop in response to societal shifts and technology advancements.

Information organization is among library science's fundamental concepts. To facilitate effective retrieval, organizing and categorizing library items is required. There are several systematic methods for classifying resources, including the Dewey Decimal System and the Library of Congress Classification. Librarians may make sure that people can find the information they need with ease by using these systems. This branch of library science promotes the preservation of historical and cultural knowledge in addition to making library materials more usable.

Information retrieval is another crucial area within library science. It focuses on how users search for and access information, emphasizing the design and functionality of information retrieval systems. Modern libraries utilize online catalogs, databases, and discovery tools that streamline the search process. Research in this field explores user behavior, search strategies, and the effectiveness of various retrieval systems. By understanding these dynamics, librarians can enhance the ways in which users interact with information resources.

In the digital age, library science has expanded to include the management of digital libraries. Digital libraries encompass a wide array of resources, including e-books, online journals, and digital archives. The integration of technology into library services not only improves access but also poses challenges related to digital preservation, copyright, and user privacy. As libraries increasingly transition to digital formats, library science plays a critical role in developing strategies for effective digital curation and management.

Ethics and intellectual freedom are foundational principles in library science. Librarians are tasked with ensuring that all users have equitable access to information, regardless of their background or beliefs. This commitment to intellectual freedom is enshrined in professional codes of ethics, which advocate for the protection of user privacy and the right to access diverse viewpoints. As challenges to information access continue to arise, the role of library science in advocating for these principles becomes ever more significant (American Library Association, 2019).

Concept of Science Laboratory

A fundamental component of contemporary education, the scientific lab provides an environment conducive to real-world experimentation and experiential learning. It makes theoretical concepts easier to apply and lets students interact directly with scientific ideas. Inquiry-based learning is encouraged in this dynamic setting where students can pose queries, develop hypotheses, and carry out experiments to investigate scientific phenomena. The laboratory environment helps students comprehend and remember complex concepts by turning abstract theories into concrete experiences (Duggan & Gott, 2018).

The efficacy of a science laboratory as an educational setting is contingent upon its configuration and layout. An ordered and effective workflow is made possible by the specific spaces allotted for testing, preparation, and equipment storage in a well-designed laboratory. Because safety is of the utmost importance, laboratories are furnished with emergency procedures and safety gear, including fire extinguishers, eyewash stations, and personal protective equipment (PPE) to safeguard employees and students. According to Zacharia (2019), reasonable zoning, accessibility, and enough space are necessary to guarantee that all students—including those with disabilities—can participate in laboratory activities.

Experimentation is made easier in a science laboratory by the variety of tools and supplies that are available. Glassware (beakers, flasks, pipettes), measurement tools (thermometers, pH meters), and safety gear (gloves, goggles) are examples of common laboratory equipment. Students' learning experience is enhanced by the opportunity to conduct a wide range of experiments thanks to the availability of high-quality and diverse equipment. Additionally, using advanced lab equipment helps students get ready for further coursework or employment in STEM (science, technology, engineering, and mathematics) industries (Miller et al., 2020).

Any science lab must follow safety procedures to avoid mishaps and injury. All employees and students must receive thorough safety training that covers handling chemicals, emergency protocols, and equipment usage. Gonzalez (2021) asserts that consistent safety exercises and appropriately identifying hazardous chemicals help foster a culture of safety in the lab. Respecting safety a regulation not only keep people safe but also encourages ethical behavior when it comes to scientific research.

Science labs are essential learning environments that give students practical experience and encourage critical thinking and active learning. Their layout, tools, and security measures have a big impact on how well science is taught. The need for scientifically competent people in society is growing, hence it is imperative that science labs be secure and well-equipped.

Concept of laboratory facilities

In order to facilitate experimentation, analysis, and innovation in a wide range of disciplines, including chemistry, biology, physics, engineering, and medicine, laboratory facilities are essential parts of scientific research institutions, educational settings, and industrial environments. The idea of laboratory facilities includes a variety of components that enhance its usefulness, security, and capacity to facilitate scientific research.

First and foremost, specialist infrastructure designed to meet particular research objectives is what distinguishes laboratory facilities. For investigations requiring liquids, wet laboratories with sinks, fume hoods, and bench space are ideal, whereas dry labs with computers and simulation software are best for computational analysis and modelling. Clean rooms for the production of semiconductors, biological containment facilities for handling infections, and animal research facilities for preclinical investigations are examples of more specialist fields.

Moreover, laboratory facilities are equipped with a diverse array of instruments and equipment essential for conducting experiments and measurements. These may include microscopes, spectrometers, centrifuges, chromatographs, incubators, autoclaves, and more, depending on the nature of the research being conducted. The availability of cutting-edge instrumentation facilitates precise data collection and analysis, enabling researchers to explore complex phenomena and develop innovative solutions to scientific challenges (National Institutes of Health, 2022).

Safety is paramount in laboratory facilities due to the potential hazards associated with certain experiments and materials. As such, these facilities are equipped with robust safety measures, including ventilation systems to remove fumes, protective gear such as lab coats and goggles, emergency eyewash stations and showers, and protocols for handling hazardous materials. Compliance with regulatory standards such as OSHA and EPA guidelines ensures the safety of personnel and the environment (American Chemical Society, 2022). Additionally, laboratory facilities often employ support staff, including lab managers, technicians, and research assistants, to assist with day-to-day operations, equipment maintenance, and experiment implementation. These personnel play a crucial role in ensuring the smooth functioning of the laboratory and facilitating research activities.

Concept of academic performance of a student

A student's success and accomplishment in their academic efforts are referred to as their academic performance. This is often determined by their grades, results on standardised tests, involvement in extracurricular activities, and other learning and achievement markers. Academic success is influenced by a number of variables, including socioeconomic status, family history, school atmosphere, and individual traits.

One significant determinant of academic performance is the student's level of motivation and engagement. Motivated students tend to be more focused, persistent, and resourceful in their learning endeavours, leading to higher levels of achievement. Factors such as intrinsic motivation, interest in the subject matter, and a sense of purpose or goal orientation can significantly impact a student's academic performance (Dweck, 2016).

Additionally, a supportive family environment and parental involvement in education have been consistently associated with better academic outcomes for students. Parents who are actively engaged in their child's education by providing support, encouragement, and resources create a conducive environment for learning and academic success. The quality of teaching and instructional practices employed in the classroom plays a crucial role in shaping student performance. Effective teachers utilise a variety of instructional strategies, provide meaningful feedback, and create a positive learning environment that fosters student engagement and comprehension (Hattie, 2019).

Moreover, socio-economic factors such as family income, parental education level, and access to resources also influence academic performance. Students from disadvantaged backgrounds may face additional challenges such as limited access to educational resources, inadequate nutrition, and exposure to stressors that can negatively impact their academic achievement (Sirin, 2015). Academic performance is a multifaceted construct influenced by various factors, including individual characteristics, family support, teaching quality, and socio-economic background.

Types of science subject

Science courses may be roughly divided into various categories, each of which focuses on a distinct facet of the natural world. The primary categories are as follows:

Physical Sciences

This category encompasses disciplines that study non-living systems. Physics explores the fundamental forces and properties of matter, while chemistry investigates the composition, structure, and properties of substances. Astronomy delves into celestial objects and phenomena beyond Earth (Carroll & Ostlie, 2017), and Earth Sciences study the planet's composition, structure, and processes.

Biological Sciences

This branch focuses on the study of living organisms and their interactions. Biology examines the structure, function, growth, origin, evolution, and distribution of living organisms. Zoology and botany specialise in the study of animals and plants, respectively (Hickman, 2021). Genetics explores the inheritance and variation of traits, while ecology studies the relationships between organisms and their environments.

Environmental Sciences

Interdisciplinary in nature, environmental sciences analyse the interactions between humans and the environment. Environmental biology investigates the impact of human activities on ecosystems, while environmental chemistry examines the behaviour and fate of chemicals in the environment. Environmental engineering focuses on developing solutions to environmental problems, and environmental policy addresses regulations and management strategies (Dresner, 2015).

Social Sciences

This category encompasses disciplines that study human behaviour and societies. Psychology explores mental processes and behaviour, while sociology examines social relationships, institutions, and structures (Giddens, 2017). Anthropology investigates human culture, evolution, and diversity (Haviland 2019), and economics studies the production, distribution, and consumption of goods and services.

Mathematics and Statistics:

Fundamental to scientific inquiry, mathematics provides tools for modelling and analysis. Statistics offers methods for data collection, analysis, interpretation, and presentation (Navidi, 2018).

Computer Science and Information Technology

These fields focus on computing systems and information processing. Artificial intelligence involves the development of intelligent agents (Russell & Norvig, 2016), while data science focuses on extracting knowledge and insights from data.

Health and Medical Sciences

This category encompasses disciplines related to human health and disease. Medicine involves the diagnosis, treatment, and prevention of illness (Kumar, 2020), while nursing focuses on patient care and health promotion. Pharmacology studies the effects of drugs on biological systems, and public health addresses population health issues.

Engineering

This field applies scientific principles to design and build structures, machines, systems, and processes. Mechanical engineering deals with the design and production of mechanical systems (Gere & Goodno, 2018), while civil engineering focuses on infrastructure and environmental systems. Electrical engineering involves the study of electrical and electronic systems (Hambley, 2017), and chemical engineering deals with chemical processes and manufacturing.

The Potency of Laboratory Facilities In Promoting Students Interest In Science Subject

By providing hands-on experiences, supporting inquiry-based learning, and cultivating a deep comprehension of scientific concepts, laboratory facilities are essential resources for improving student performance in a variety of science courses. In light of current research and academic literature, this essay clarifies the role that laboratory infrastructure plays in improving student academic performance in scientific education.

To begin, laboratory facilities afford students the invaluable opportunity to engage in hands-on experimentation, a cornerstone for grasping abstract scientific principles. Recent studies affirm that active participation in laboratory activities significantly boosts students' conceptual understanding and retention of scientific concepts (Schwartz, 2019). By immersing themselves in practical work, students can witness scientific phenomena firsthand, manipulate variables, and analyse empirical data, thereby reinforcing theoretical knowledge garnered in traditional classroom settings (Shernoff, 2017). For instance, conducting experiments in physics laboratories enables students to validate theoretical principles such as Einstein's theory of relativity through direct observation and empirical exploration (Villard, 2020).

Moreover, laboratory experiences serve as catalysts for inquiry-based learning, wherein students develop critical thinking and problem-solving skills by formulating hypotheses, designing experiments, and interpreting findings. Recent pedagogical research underscores the efficacy of inquiry-based approaches in science education, highlighting their role in cultivating scientific literacy and promoting lifelong learning (National Academies of Sciences, Engineering, and Medicine, 2018). Through scientific inquiry, students learn to pose meaningful questions, gather and analyse evidence, and construct coherent explanations, thus deepening their comprehension of scientific phenomena. Evidence suggests that inquiry-based laboratory activities lead to enhanced academic achievement and heightened enthusiasm for scientific exploration among students.

Furthermore, laboratory facilities facilitate collaborative learning and peer interaction, which are essential for honing communication skills and fostering teamwork. Recent studies underscore the importance of collaborative inquiry in science education, emphasising its role in promoting social learning and knowledge construction. Working in groups during laboratory sessions enables students to engage in scientific discourse, share ideas, and negotiate meaning collectively (Keane & Berland, 2017). Collaboration fosters a supportive learning environment wherein students can articulate their thoughts, justify their reasoning, and engage in meaningful scientific dialogue (Pier, 2020). Additionally, peer interactions during laboratory experiments encourage students to adopt multiple perspectives, thus enriching their understanding of scientific concepts (Walker, 2018).

Despite the myriad benefits of laboratory facilities, their potency in promoting student performance hinges on various factors, including resource allocation, instructional support, and curriculum alignment. Recent educational research emphasises the importance of equitable access to well-equipped laboratory resources, particularly in underserved communities. Furthermore, effective utilisation of laboratory time necessitates strategic planning, ongoing professional development for educators, and alignment with curriculum standards and learning objectives.

The Potency of Laboratory Facilities In Promoting Students Performance In Science Subject

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Effect of Library Facilities on Student Interest and Performance In science Subject

Science students' interest and performance are greatly impacted by the availability and calibre of library resources. Libraries offer vital resources that help students in their academic endeavours and enhance their comprehension of scientific ideas, such as scientific journals, textbooks, and digital media. Students can investigate topics outside of the classroom curriculum when they have access to a well-stocked library, which promotes a more thorough and involved learning process.

Libraries serve as quiet, dedicated study spaces where students can concentrate on their work, collaborate on group projects, and access diverse learning materials. Studies have shown that students who regularly use library facilities exhibit higher academic performance due to the

enriched learning environment and the availability of up-to-date information resources. The presence of knowledgeable library staff who can guide students in their research and information literacy skills further enhances the educational benefits of library use (Edinyang & Ubi, 2017).

Additionally, the integration of advanced technological tools such as augmented reality (AR) within library facilities can make learning more interactive and engaging. AR tools, for example, help visualise complex scientific phenomena, making them more accessible and understandable for students (Obasi & Nwankwo, 2019). This innovative approach not only sparks students' curiosity but also promotes sustained interest in science subjects.

Petrov (2020) mentioned that well-equipped library facilities play a crucial role in promoting student interest and performance in science subjects by providing access to necessary resources, fostering a conducive learning environment, and incorporating advanced technologies to enhance the learning experience. Investments in library infrastructure and professional development for library staff are essential to maximising these benefits and improving educational outcomes in science education. Library facilities like the electronic resources i.e online learning, the printed materials i.e books, periodical, government publications and the non-printed materials i.e audio, visuals, and audio visuals has the potency in promoting good performnace among students in science subjects (Bassey 2017).

The Roles of Library Science in the Academic Performance of Students in Science

Students' academic performance is greatly improved by library science, which is primarily concerned with the management, organization, and preservation of information. This is especially true for students studying the sciences. A vital field that guarantees students can efficiently access, assess, and use enormous volumes of data and academic materials is library science. This is due to the exponential growth of scientific information and the increasingly multidisciplinary character of modern science. The following are the main contributions that library science makes to students' academic success in science:

- **Supporting the Information Literacy**

Information literacy development is one of library science's most important contributions to scientific students' improved academic achievement. The capacities to recognize, locate, assess, and make efficient use of information is known as information literacy. Information literacy is crucial for success in the sciences, since data interpretation and research are vital. In a study on the effects of library literacy programs on science-related students, Tadesse and Gill (2020) discovered that students who actively engaged in these programs outperformed their peers in terms of critical thinking abilities, research capabilities, and academic performance.

- **Having Access to Resources for Specialized Science**

In order to give students access to specialized scientific resources including journals, databases, and research repositories, library science is essential. The library is often the first point of access to both subscription-based and open-access resources that are essential for scientific research and academic study in many educational institutions. Smith and Robinson (2021) assert that a variety of digital databases, such as those found on platforms like Scopus, Web of Science, and PubMed, are readily available in contemporary academic libraries and are crucial for students undertaking scientific research. According to the study, students who have access to these

resources typically turn in superior academic work, which improves their grades and research outputs.

Supporting Research Methodology and Data Management

Library science specialists are crucial in helping students manage big datasets and research methods in the era of data-driven science. Services provided by libraries now include help with metadata standards, data curation, and using specialist tools for data visualization and statistical analysis. On the other hand, these services assist scientific students in better managing their research data, which enhances both academic achievement and research outputs.

- **Promoting Collaborative Learning and Interdisciplinary Research**

These days, libraries are built with a greater emphasis on interdisciplinary research and collaborative learning, two things that are essential to the modern scientific education process. Students from different scientific disciplines can collaborate thanks to the resources, scientific software, and collaborative workspaces that many libraries offer. The effect of cooperative library settings on science students' academic achievement was investigated by Johnson in 2021. According to their research, students who participated in multidisciplinary research projects and group study sessions led by librarians were more adept at solving challenging problems and performed better academically.

- **Providing Academic Support and Enhancing Student Engagement**

Because library science gives students the tools they need to succeed, it also improves academic success. As facilitators, librarians assist students in navigating the vast array of scientific material that is available. Additionally, they provide students with individualized support in the form of one-on-one consultations and research aid, both of which are crucial for those studying difficult scientific subjects. Additionally, research on the function of academic libraries in fostering student engagement revealed that students who routinely made use of the resources available to them and asked librarians for advice engaged with the course materials more deeply and fared better academically.

- **Encouraging Lifelong Learning and Critical Thinking**

In addition to promoting immediate academic achievement, library science fosters the growth of critical thinking abilities and lifetime learning, both of which are necessary for success in the scientific fields. Library science promotes autonomous learning and intellectual development by teaching students how to approach research with a critical eye, assess the reliability of sources, and traverse the large body of scientific literature. Williams and Thomas's (2020) recent study emphasizes the value of libraries in encouraging scientific students to think critically. They also showed that students were more likely to acquire the critical thinking abilities necessary for success in both their academic and professional careers if they actively used library science resources and took part in workshops.

The Roles of Science Laboratory in the Academic Performance of Students in Science

Science labs are essential in today's classrooms because they give students real experiences and insights into scientific ideas. Science labs play an important role in the cognitive, practical, and emotive development of students in the classroom. The following are some important roles:

Hands-on Education

Students can participate in experiential learning in laboratories by seeing, doing experiments, and learning scientific principles directly from the source. When compared to learning solely from theory, this practical method aids in idea understanding and retention for pupils.

- **Application of Theoretical Knowledge:**

In laboratories, students will be able to apply the theoretical knowledge they have learned in science classes to practical situations. Students get the chance to see and feel how the theoretical ideas they are taught in the classroom are applied practically in laboratories. This aids pupils in comprehending scientific ideas and seeing their applicability in real-world circumstances.

- **Critical Thinking and Problem-Solving**

By guiding students through experiments, examining data, and drawing conclusions, science labs impart critical thinking and problem-solving skills. These abilities are applicable to many facets of life and are necessary for success in scientific domains.

- **Development of Practical abilities**

Working in a laboratory fosters the growth of a variety of abilities, including measurement, interpretation, data analysis, and observation. Students gain knowledge about how to conduct38 experiments, make observations, record data, and use scientific equipment. These are very useful skills in the workplace and in the classroom.

- **Promoting Interest and Curiosity**

Lab environments offer a dynamic and engaging atmosphere that piques kids' interest in science and piques their curiosity. Experiments can ignite a desire for research and discovery in science. It is urged of students to research science outside of textbooks, create original experiments, and pose questions.

- **Preparation for Higher Education and Careers**

Students gain the experience and skills necessary for more advanced science courses, as well as other advanced studies and careers in STEM fields (science, technology, engineering, and mathematics), through practical work in state-of-the-art laboratories.

- **Vigilance for Safety**

Comprehending and adhering to safety protocols are vital abilities that students can employ in diverse scientific and professional environments, not limited to lab environments. Labs provide a controlled setting where students can practice and learn about safety procedures.

- **Cooperation & Teamwork**

Professional and academic environments both benefit from interpersonal skills. Group work is a common component of laboratory activities, making it an excellent means of encouraging students to collaborate, communicate, and operate as a team.

- **Technology Integration**

Students can engage with state-of-the-art instruments and equipment in modern scientific labs by integrating cutting-edge technologies into their learning experiences. They benefit from this exposure by being able to keep up with the latest developments in the various scientific domains.

- **Evaluation of Comprehension**

Teachers of chemistry and science can evaluate their students' grasp of scientific ideas in real-world situations through their laboratory activities. This type of evaluation is an addition to conventional testing techniques.

Science Laboratory Maintenance for Effective Utilization

Sustaining a scientific lab is essential to guaranteeing its successful application in learning and research environments. In addition to protecting users' health and safety, proper maintenance increases the effectiveness of laboratory operations as a whole. This calls for a methodical approach to maintenance that takes into account good inventory management, cleanliness, equipment operation, and safety compliance. By emphasizing upkeep, educational institutions may create an environment conducive to learning, experimentation, and innovation.

- **Cleaning and Organization**

One of the core parts of laboratory upkeep is frequent cleaning and organization. Because there is less chance of contamination and mishap in a clean lab, researchers and students can concentrate on their work. Daily, weekly, and monthly cleaning assignments should be a part of regular cleaning schedules to guarantee that storage spaces, equipment, and surfaces are kept spotless. Equipment should be stowed correctly after use, and workbenches should be cleansed of extraneous objects. Putting in place a system for labeling supplies and chemicals can also help with organization by making it simpler to find necessary products quickly (Aldrich, 2020).

- **Equipment maintenance and Calibration**

Regular maintenance and calibration of laboratory equipment is crucial to guaranteeing that tests produce accurate and dependable findings. Balances, spectrophotometers, and microscopes are examples of equipment that needs to be inspected for functionality and calibrated in accordance with manufacturer guidelines. Regular checks for wear and tear, cleaning of delicate parts, and prompt repairs or replacements when necessary should all be included in maintenance. Every piece of equipment should have a maintenance log kept up to date in order to track service dates and spot trends that might point to the need for replacement (Eldin, 2019).

- **Safety Compliance and Training**

Safety is crucial in any research laboratory. To guarantee that safety devices like fire extinguishers, eyewash stations, and safety showers operate properly in an emergency, regular maintenance is necessary. Frequent safety audits can assist in locating any risks and guarantee that safety laws are being followed. Furthermore, it is imperative that staff and students receive continual training on emergency procedures, safe chemical handling techniques, and safety regulations. New safety regulations and procedures should be reflected in this training on a regular

basis. A well-kept laboratory lowers the risk of accidents and injuries by promoting a culture of safety and readiness.

- **Inventory Management**

Another essential component of laboratory maintenance is efficient inventory management. Maintaining inventory of chemicals, equipment, and supplies helps to guarantee that there are never any shortages and that the laboratory runs efficiently. Creating an inventory system can assist with managing stock levels, keeping track of expiration dates, and monitoring material usage. Inventory can be regularly audited to find goods that need to be replaced or disposed of because they are expiring. This proactive strategy guarantees that all resources required for trials and research are available and avoids needless expenses.

- **Fostering a Collaborative Environment**

Last but not least, encouraging a collaborative atmosphere in the lab adds to its efficient use. Learning and innovation can be improved by fostering collaboration and communication between faculty and students. Organizing regular meetings to talk about current projects, exchange research results, and handle maintenance concerns can help foster a sense of accountability and ownership for the lab. Users can report maintenance issues, make improvements suggestions, and take part in decisions about how the laboratory is run by putting in place a feedback system (Schoon, 2019). Institutions can maximize the use of available resources by developing a vibrant and engaged laboratory community through collaboration.

Conclusion

Laboratory and library facilities play crucial roles in enhancing student interest and performance in science subjects. Laboratory facilities provide hands-on experiences that are vital for understanding scientific concepts and developing practical skills. These interactive sessions help students connect theoretical knowledge with real-world applications, thereby deepening their comprehension and fostering a genuine interest in scientific exploration. By engaging in experiments and witnessing scientific principles in action, students become more motivated and confident in their abilities, which translates into improved academic performance.

Recommendations

- Educational authorities should prioritise the development and maintenance of modern laboratory facilities in schools. Well-equipped laboratories enable students to engage in hands-on experiments, which are crucial for understanding complex scientific concepts.
- Schools should invest in enriching their library collections with current and comprehensive scientific literature, including textbooks, journals, and digital resources.
- Curriculum planners should incorporate structured and regular use of laboratory and library facilities into the science curriculum. This integration ensures that students not only learn theoretical concepts but also apply them through practical experiments and further reading.

References

Aldrich P. H., Cutler B. & Hoshino K. (2020). Enhancing Laboratory Safety Culture through Effective Maintenance. Safety Science, 127, 104695.

Almarode, J. T., & Vandas, K. (2018). Clarity for Learning: *Five Essential Practices That Empower Students and Teachers.* Corwin Press.

American Chemical Society. (2022). Guidelines for Chemical Laboratory Safety in Academic Institutions. https://pubs.acs.org/doi/10.1021/bk-2012-1112.ch002

American Library Association (2019). Code of Ethics of the American Library Association. Retrieved from https://www.ala.org/advocacy/proethics/codeofethics

Bassey M. (2017). Library education programmes and literacy skills as predictors of librray use in university libraries in akwa ibom sates, Nigeria. *Akwa Ibom State Library and Information Services Antecedents Perspective prospects*

Bassey M. (2020). Library Advocacy: A Sustaining Library Services in the 21st Century. *Anthology in Library and Information Science*

Bassey M., Ukanga C. & Ngozie V. (2024). Assessment of use of library resources and services by students at the university of delta, Agbor, Nigeria. *Abraka Humanities Review*

Brown, L., & Smith, M. (2022). Funding and Maintenance of Educational Facilities: Implications for Student Performance. Educational Policy.

Carroll, B. W., & Ostlie, D. A. (2017). An introduction to modern astrophysics. Cambridge University Press.

Dresner, S. (2015). The principles of sustainability (2nd ed.). Routledge.

Duggan S., & Gott R. (2018). Investigating Practical Work in School Science: Theoretical Perspectives and Practical Implications. International Journal of Science Education, 40(8), 930-947.

Dweck, C. S. (2016). Mindset: The New Psychology of Success. Ballantine Books.

Edinyang, S. D., & Ubi, I. E. (2017). Integration of Information Communication Technology (ICT) in Biology Education: Prospects and Challenges. *International Journal of Education and Research*, 5(8), 157-168.

Eldin M. M., El-Sayed M. A. & El-Desouky A. A. (2019). Regular Equipment Maintenance in Laboratories: A Key to Accurate Results. International Journal of Scientific & Engineering Research, 10(4), 341-350.

Garcia, A., & Hernandez, L. (2023). Accessibility of Educational Resources and its Impact on Student Equity in Science Education. *Journal of Diversity in Higher Education.*

Gere, J. M., & Goodno, B. J. (2018). Mechanics of materials (9th ed.). Cengage Learning.

Giddens, A., Duneier, M., Appelbaum, R. P., & Carr, D. (2017). Introduction to sociology (11th ed.). W. W. Norton & Company.

Hambley, A. R. (2017). Electrical engineering: Principles & applications (7th ed.). Pearson.

Hattie, J. (2019). Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. Routledge.

Haviland, W. A., Prins, H. E., Walrath, D., & McBride, B. (2019). Anthropology: The human challenge (15th ed.). Cengage Learning.

Hickman, C. P., Roberts, L. S., Keen, S. L., Larson, A., & I'Anson, H. (2021). *Integrated principles of zoology.* McGraw-Hill Education.

Hofstein, A., & Lunetta, V. N. (2017). The Role of the Laboratory in Science Teaching: Neglected Aspects of Research. Review of Educational Research.

Johnson, R., & Green, T. (2020). Digital Libraries and Student Performance in Higher Education. *Journal of Academic Librarianship.*

Keane, M. T., & Berland, M. (2017). Collaborative group problem solving: Social interactions and individual actions. *Educational Psychology Review*, 29(1), 43-64.

Kumar, V., Abbas, A. K., & Aster, J. C. (Eds.). (2020). Robbins basic pathology. Elsevier.

National Academies of Sciences, Engineering, and Medicine (NASEM). (2018). How people learn II: Learners, contexts, and cultures. National Academies Press.

National Institutes of Health. (2022). Design Requirements Manual: Laboratory Facilities. https://orf.od.nih.gov/PoliciesAndGuidelines/DesignRequirementsManual/LaboratoryFacilities

National Research Council. (2017). America's Lab Report: Investigations in High School Science.

Obasi, C. O., & Nwankwo, E. A. (2019). The Role of Libraries in Enhancing the Quality of Education in Nigeria. Library Philosophy and Practice, 2019.

Petrov, P. D., & Atanasova, T. V. (2020). The Effect of Augmented Reality on Students' Learning Performance in STEM Education. *Information*, 11(4), 209.

Pier, E. L., Britton, L., Otto, C., Dorsch, N., Allexsaht-Snider, M., & McAuley, A. (2020). Collaborative learning: The role of group work in the student perception of learning outcomes in a STEM laboratory environment. *Journal of Chemical Education*, 97(6), 1553-1561.

Schoon K., De Boer H. & Wiegman A. (2019). Science Laboratories in Secondary Education: Trends and Developments. Educational Research Review, 25, 100-113.

Schwartz, R. S., Lederman, N. G., & Crawford, B. A. (2019). Developing views of nature of science in an authentic context: An explicit approach to bridging the gap between nature of science and scientific inquiry. *Science Education*, 103(3), 529-558.

Shernoff, D. J., Sinha, S., Bressler, D. M., Scultz, D., Vandergrift, N., & Hoadley, C. M. (2017). Translating research on youth positive development into effective practice: The case of inquiry-based learning in science. *Journal of Youth Development*, 12(3), 71-93.

Sirin, S. R. (2015). Socioeconomic Status and Academic Achievement: A Meta-Analytic Review of Research. *Review of Educational Research,* 75(3), 417-453.

Smith, J. (2019). The Role of Libraries in Enhancing Student Learning in Science. College & Research Libraries.

Smith, L., & Robinson, K. (2021). Access to Scientific Resources and Its Impact on Student Academic Performance. Library and Information Science Research. 43(2): 157-169.

Tadesse, A., & Gill, R. (2020). The Impact of Information Literacy Programs on Academic Success of Science Students. Journal of Academic Librarianship. 46(1): 102-114.

Villard, L. (2020). The role of hands-on experimentation in science education: An exploration of students' experiences and perceptions. *Journal of Research in Science Teaching*, 57(4),

Walker, E. J., Costantino, T. E., Grafton, B. N., & Bernard, R. E. (2018). The influence of student engagement in peer-to-peer interactions on academic achievement in science classrooms. *Research in Science Education*, 48(6), 1171-1186.

Williams, D., & Thomas, E. (2020). Library Science and Critical Thinking in STEM Education. Science and Technology Libraries. 39(1): 45-58.

Williams, P., & Wong, W. (2021). The Impact of Digital Library Resources on Student Engagement and Performance. Library & Information Science Research.

Zacharia Z. C., Olympiou G. & Papadouris N. (2019). The Impact of Hands-on Laboratory Activities on Students' Understanding of Science. Journal of Research in Science Teaching, 56(1), 1-23.

ADOPTION OF ARTIFICIAL INTELLIGENCE IN CURBING FRAUD IN PUBLIC ORGANISATION: ASSESSING FRAUD DETECTION AND CONTROL

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Abstract

This study examined the adoption of artificial intelligence in curbing fraud in public organisations, assessing fraud detection and control. Several essential concepts were reviewed in the course of this study, which included artificial intelligence, fraud, fraud detection, fraud control, and types of fraud in public organisations, among others. The study highlighted that the integration of artificial intelligence (AI) in fraud detection and control represents a significant advancement in the fight against financial malfeasance within public organizations. The study mentioned that AI fraud detection operates by implementing machine learning algorithms that are designed to analyse behaviours and detect anomalies indicative of fraud, and that AI has transformed fraud detection and control, helping public organisations combat fraudulent activities by offering sophisticated methods to detect, prevent, and mitigate risks. Furthermore, the study outlined the effects of artificial intelligence on fraud detection and control, which include improved detection accuracy, real-time monitoring, reduced false positives, and adaptive security measures. The study concluded that the integration of artificial intelligence (AI) in fraud detection and control is a significant advancement in combating financial malfeasance in public organizations. One of the recommendations of the study was that public organisations should allocate resources to acquire and maintain cutting-edge AI technologies and infrastructure.

Keywords: Artificial Intelligence, Fraud, Public Organization, Detection and Control

Introduction

The integration of artificial intelligence (AI) in fraud detection and control represents a significant advancement in the fight against financial malfeasance within public organizations. In recent years, the complexity and sophistication of fraudulent schemes have escalated, making traditional detection methods increasingly inadequate. AI, with its advanced data analytics and pattern recognition capabilities, offers a robust solution to this challenge. By leveraging machine learning algorithms, AI systems can analyse vast datasets to identify anomalies and predict fraudulent activities with remarkable accuracy and efficiency (Afolabi & Adeyemi, 2021).

The adoption of AI in Nigerian public organisations is particularly pertinent, given the pervasive nature of corruption and fraud in the country. According to Nwaogu and Okoli (2020), fraud in public organisations has eroded public trust and significantly hampered economic development. The implementation of AI-driven fraud detection systems can potentially transform the landscape by providing more transparent, accountable, and efficient governance. These systems not only enhance the detection of fraudulent activities but also aid in preventive measures by identifying potential risks before they materialise.

Furthermore, AI technologies facilitate continuous learning and adaptation, which is crucial in an environment where fraudsters continually devise new methods to bypass security measures. As noted by Onuoha and Opara (2019), adaptive learning algorithms enable AI systems to evolve with the changing dynamics of fraudulent activities. This capability ensures that public organisations remain one step ahead of fraudsters, thereby safeguarding public resources more effectively. The use of AI in this context aligns with global best practices and positions Nigerian public organisations to benefit from technological advancements in fraud prevention.

The economic implications of adopting AI for fraud detection in public organisations are substantial. A study by Ojo and Fapohunda (2022) highlights that the financial losses incurred from fraudulent activities can be drastically reduced through the implementation of AI technologies. By minimising fraud, public organisations can reallocate resources towards developmental projects, thereby enhancing overall economic growth. Moreover, the efficiency gains from AI adoption can lead to significant cost savings in administrative and operational processes.

Despite the promising benefits, the adoption of AI in fraud detection within Nigerian public organisations faces several challenges. These include issues related to data privacy, technological infrastructure, and the need for skilled personnel to manage and operate AI systems. Okeke and Eze (2021) emphasise the importance of addressing these challenges through robust policy frameworks and capacity-building initiatives. Ensuring data security and fostering an environment conducive to technological innovation are critical for the successful integration of AI in fraud detection.

Concept of Fraud

Any action that depends on lying to get an advantage is considered fraud. It also includes lying about the truth or withholding important information in order to persuade someone else to act negatively. Chen (2024) defined fraud as an intentional act of deceit designed to reward the perpetrator or to deny the rights of a victim. It entails lying, fabricating documents, or withholding crucial facts. On the other hand, deliberate distortion of the truth to coerce someone into giving up something of value or a legally protected right is also considered fraud. Fraud is also defined as the use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organisation's resources or assets (Lin, Huang, Liao, Liu, & Zhou, 2022). Since fraud involves guilt, intentional distortion of the truth, and frequently criminal activity in act or practice, it is a recurrent problem in corporate organisations and is drawing attention from around the world.

Additionally, fraud can be roughly classified into two categories: criminal fraud (which involves theft and deception) and civil fraud (which is perpetrated when information is

purposefully or negligently misrepresented). Similarly, the motive of fraud is composed of greed, opportunity, need, and exposure [GONE] (Bologna 1992, cited by Kaiser 2017). Another definition of fraud is wrongdoing committed with the intention of gaining an unlawful benefit or violating the rights of the victim. Wolfe & Hermonson (2004) proposed the fraud diamond, which consists of pressure, opportunity, rationalisation, and capability, and Cressey (1953) proposed the fraud triangle, which consists of pressure (since it may be caused by personal issues), opportunity (where the pressure creates the motive for the crime to be committed), and rationalisation (cited by Sujeewa & Azam 2018). Furthermore, lying or using deceit to obtain money or other financial benefits is regarded as fraud since it is the intentional use of deception to do harm to another person or further one's own objectives. It usually entails speaking falsely, concealing important information, or operating without authorization. Fraud can arise from a number of situations, such as employment, identity theft, and financial transactions. Like other illegal activity, fraud is facilitated by an easy source of motivated offenders, appropriate targets, and inadequate supervision. According to Kazaara and Kazaara (2023), cited in Nakanjako and Zikusooka (2024), fraud includes manipulating, falsifying, or altering documents and records; recording transactions without substance; deliberate misapplication of accounting principles; etc., to mention a few.

Concept of Fraud Detection

The technique of spotting fraudulent attempts or behaviours is known as fraud detection. It entails the process of locating and stopping fraudulent activity in systems, transactions, data, APIs, and apps. According to Kanade (2021), fraud detection is defined as a process that detects scams and prevents fraudsters from obtaining money or property through false means. Fraud detection is the process of keeping an eye on customer behaviour and transactional patterns in order to identify and combat fraudulent activities. It frequently serves as a key component of a company's loss prevention strategy and occasionally is integrated into its larger anti-money laundering (AML) compliance procedures. A detection system must be in place to stop fraud from occurring and shield customers and companies from the potential financial losses brought on by these actions.

Furthermore, Gillis (2024) mentioned that fraud detection is a set of activities undertaken to prevent money or property from being obtained through false pretenses. Several governmental organisations use fraud detection. Kadar (2022) explained that fraud detection is an action set in place to prevent criminals from gaining monetary advantages through false pretenses. The process of employing methods and instruments to stop the theft of funds, assets, and information is known as fraud detection. It is a security barrier that guards against both felony offences and more minor transgressions as well as other types of fraud. A collection of procedures and evaluations known as fraud detection enables companies to spot and stop illegal financial activity. Moreover, Kou, Lu, Sinvongwattan, and Huang (2004), cited in Hilal, Gadsden, and Yawney (2022), mentioned that fraud detection involves identifying fraud as quickly as possible once it has been perpetrated.

Concept of Artificial Intelligence (AI)

Artificial intelligence (AI) is the idea and practice of creating computer systems that can do tasks like speech recognition, decision-making, and pattern recognition that traditionally needed human intelligence. Natural language processing, machine learning, deep learning, and other technologies are all included under the broad term artificial intelligence (AI) (NLP). Laskowski (2024) defined artificial intelligence as the simulation of human intelligence processes by

machines, especially computer systems. Expert systems, machine learning, speech recognition, and natural language processing (NLP) are a few uses of AI. Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence (Bassey and Owushi, 2023).

Furthermore, Udo-Okon and Akpan (2024) mentioned that AI is a branch of computer science called artificial intelligence studies how computers learn, comprehend data, recognize characters in images, analyses pictures, and simulate how the eyes work. In its widest definition, artificial intelligence (AI) refers to the intelligence displayed by machines, especially computer systems. This area of computer science study focuses on creating and analysing tools and software that allow machines to sense their surroundings and use intelligence and learning to make decisions that will increase their chances of accomplishing specific objectives. Copeland (2024) mentioned that the simplest human behaviour is ascribed to intelligence, while even the most complicated insect behaviour is usually not taken as an indication of intelligence. The intelligence that allows a machine or computer to copy or replicate human abilities is known as artificial intelligence, or AI. Computers and other devices can mimic human intelligence and problem-solving abilities thanks to artificial intelligence (AI) technology. The perfect feature of artificial intelligence would be its capacity for reasoning and action towards a certain objective. Kanade (2022) mentioned that artificial intelligence (AI) is the intelligence of a machine or computer that enables it to imitate or mimic human capabilities. Artificial intelligence uses clever algorithms integrated into a dynamic computing environment to mimic human thought processes.

Furthermore, Glover (2024) mentioned that artificial intelligence refers to computer systems that are capable of performing tasks traditionally associated with human intelligence, such as making predictions, identifying objects, interpreting speech, and generating natural language. AI systems pick up this skill by sifting through vast volumes of data and searching for patterns to mimic in their own decision-making. While humans will frequently oversee an AI's learning process, encouraging wise choices and punishing foolish ones, some AI systems are built to learn on their own. The goal of artificial intelligence (AI), a broad field of computer science, is to create machines that are able to carry out tasks that normally require human intelligence.

With the use of artificial intelligence, machines can now match or even surpass human mental capacity. Artificial intelligence (AI) is permeating every aspect of daily life, from the creation of self-driving cars to the spread of generative AI tools. The technological and scientific field of artificial intelligence is focused on engineering systems that produce outputs for a certain set of human-defined objectives, such as content, forecasts, recommendations, or judgements. The simulation of human intelligence in robots that are designed to think and behave like people is known as artificial intelligence, or AI. Cognitive talents include things like learning, reasoning, problem-solving, perception, and language understanding. Making a computer, a robot controlled by a computer, or a piece of software think intelligently like a human being is known as artificial intelligence. Artificial Intelligence is achieved via the examination of cognitive processes and the patterns found in the human brain.

Concept of Fraud Control

Fraud control, often known as fraud prevention, describes the procedures, roles, and policies of an organisation that prevent fraud from happening. The application of a plan to identify fraudulent transactions and stop them from harming public organisations' finances and reputation

is known as fraud control. According to Mayo and Bpp (2006), cited in Agyemang (2020), fraud control is the measure taken by public organisations for the purpose of protecting their resources against fraud, ensuring accuracy and reliability, securing compliance with organization policies, and evaluating the level of performance in the division of the organisation.

Furthermore, Dzomira (2015) explained that control of fraud needs a system of policies and procedures that, in aggregate, minimise the likelihood of fraudulent activities that may occur. The process of putting policies and processes in place to stop, identify, and deal with fraudulent activity within an organisation is known as fraud control. Building a robust internal control system is a crucial part of fraud control. This entails putting in place segregation of responsibilities, carrying out frequent audits, and upholding stringent authorization and approval procedures.

Types of Fraud in Public Organization

Fraud in public organisations encompasses various illegal activities that aim to deceive and financially benefit at the expense of the public sector. The complexity and diversity of public organisations make them susceptible to different types of fraud. Here are some common types of fraud found in public organisations (Deloitte, 2022):

Embezzlement: Embezzlement occurs when individuals entrusted with managing public funds misappropriate these funds for personal use. This type of fraud often involves manipulating financial records to hide the theft, making detection challenging. Public officials or employees may divert money from accounts or programmes, falsify receipts, or create fake vendors to syphon off funds.

Procurement Fraud: Procurement fraud involves illegal activities during the process of acquiring goods and services. This can include bid rigging, where the bidding process is manipulated to favour a particular contractor, or kickbacks, where a contractor gives a portion of the contract's value to an employee in exchange for winning the contract. Public organisations often face procurement fraud due to large-scale purchasing activities and complex supply chains.

Payroll Fraud: Payroll fraud happens when employees manipulate the payroll system to receive undue benefits. This can include ghost employees, where nonexistent employees receive salaries, or falsifying timesheets to claim overtime or additional hours not worked. Payroll fraud not only results in financial loss but also affects organisational morale and operational efficiency.

Misuse of Assets: This type of fraud involves the unauthorised use of public assets for personal gain. Examples include using government vehicles for personal errands, unauthorised use of public property, or misappropriation of resources. Such misuse often goes unnoticed if adequate controls and monitoring mechanisms are not in place.

Bribery and Corruption: Bribery and corruption are significant issues in public organizations. Officials may accept bribes to influence decisions, such as granting permits, licenses, or contracts. Corruption can undermine public trust and lead to the inefficient use of public resources. It often involves a network of individuals working together to exploit their positions for personal gain.

Financial Statement Fraud: This type of fraud involves falsifying financial statements to present a misleading picture of an organisation's financial health. Public officials may manipulate accounting records, understate liabilities, or overstate revenues to conceal financial

mismanagement or to meet budgetary requirements. Financial statement fraud can have severe implications, including incorrect allocation of public funds and loss of public confidence.

Grant Fraud: Public organisations often distribute grants to support various programmes and initiatives. Grant fraud occurs when individuals or organisations submit false information to receive grant funds or misuse the funds for unintended purposes. This type of fraud can undermine the effectiveness of public programmes and lead to significant financial losses.

Fraud Detection Strategies Using Artificial Intelligence

Artificial intelligence (AI) fraud detection works by applying machine learning algorithms that are intended to examine behaviours and identify abnormalities suggestive of fraud. Establishing a baseline of typical transaction patterns and user behaviours is the first step. After that, the algorithm keeps an eye on the data, searching for any departures from the average. The AI model adjusts its settings in response to fresh and varied data, improving its ability to distinguish between suspicious and genuine activity. The following are fraud detection strategies using artificial intelligence as mentioned by Martins (2024):

Anomaly Detection: In transactional data, anomalous patterns or departures from typical behaviour are detected using artificial intelligence systems. The algorithms identify valid transactions and highlight questionable activity suggesting possible fraud by training on past data. More precise fraud detection is made possible by artificial intelligence systems' exceptional ability to identify intricate patterns, connections between data points, and abnormalities in big datasets. Real-time transaction analysis made possible by AI enables quick action in the event of possible fraud.

Risk Scoring: Artificial intelligence assigns risk rankings to transactions or user accounts based on a variety of parameters, including transaction amount, location, frequency, and historical behaviour, using machine-learning algorithms. Elevated risk scores facilitate the allocation of resources and concentrate attention on particular transactions or accounts that require additional scrutiny. Based on a predetermined set of criteria and data points, artificial intelligence uses this analytical approach to determine the probability that a transaction or activity is fraudulent. A risk score can be assigned to any event or action, taking into account user behaviour, transaction history, and network connections. This risk score shows how likely it is that the action or event will be fraudulent. With the use of these ratings, companies are able to identify suspicious trends, follow anomalies, and decide with confidence what steps to take next to approve or deny a transaction.

Identification Verification: In order to prevent identity theft, artificial intelligence has been used by employing algorithms to examine and validate user-provided data, such as identification documents or facial recognition data.

Adaptive learning: As strategies change, machine learning can adjust to new data, keeping models current and able to identify new fraud tendencies. Adaptive learning makes use of artificial intelligence to develop and enhance its detecting skills over time. By analyzing vast amounts of transactional data, adaptive learning enables these systems to update their algorithms based on new fraud tactics, making them more resilient against evolving threats.

Fraud Detection Control Using Artificial Intelligence

Artificial intelligence (AI) has transformed fraud detection and control, helping public organisations combat fraudulent activities by offering sophisticated methods to detect, prevent, and mitigate risks. The following is how AI is utilised in fraud detection and control:

Advanced Data Analytics: AI algorithms excel in analysing large volumes of transactional and behavioural data to identify patterns indicative of fraudulent ehavior. Techniques such as machine learning, deep learning, and anomaly detection models enable organisations to detect anomalies in real-time, thereby improving fraud detection accuracy (Bhattacharyya et al., 2018).

Behavioural Biometrics: AI-powered systems can analyse unique user behaviours and biometric data to establish baseline patterns for genuine users. Deviations from these patterns can indicate potential fraud, allowing for proactive intervention before significant losses occur (Singh et al., 2020).

Network and Link Analysis: AI facilitates the analysis of complex networks and relationships between entities (such as customers, transactions, and devices) to uncover hidden connections that may signal fraudulent activities, such as organised fraud rings or money laundering schemes (Kshetri, 2020).

Real-time Decision Making: AI-driven fraud detection systems operate in real-time, enabling immediate responses to suspicious activities. These systems can autonomously block transactions, trigger alerts for further investigation, or dynamically adjust fraud prevention strategies based on emerging threats (Phua et al., 2021).

Effect of Artificial Intelligence on Fraud Detection and Control

Artificial intelligence (AI) has revolutionised fraud detection and control across various industries, offering advanced capabilities to identify and mitigate fraudulent activities. This transformation is driven by AI's ability to analyse vast amounts of data swiftly and accurately, uncovering patterns and anomalies that traditional methods might miss. The following are the effects of AI on fraud detection and control:

Improved Detection Accuracy: AI-powered algorithms can analyse historical data to identify patterns indicative of fraudulent behaviour with greater precision than rule-based systems. Machine learning models, such as neural networks and decision trees, continuously learn from new data, enhancing their ability to detect evolving fraud tactics (Abawajy, 2020).

Real-time Monitoring: AI enables real-time monitoring of transactions and activities, allowing organisations to detect fraud as it happens. This proactive approach helps minimise financial losses and prevent potential damages to both businesses and customers (Choo et al., 2020).

Reduced False Positives: AI systems can significantly reduce false positives by distinguishing between genuine transactions and suspicious activities more accurately. This capability enhances operational efficiency by minimising the need for manual review and investigation of non-fraudulent transactions (Bolton et al., 2021).

Adaptive Security Measures: AI's adaptive capabilities allow fraud detection systems to evolve alongside new fraud tactics. By continuously learning from new data and adapting to changing patterns, AI systems can maintain their effectiveness in combating fraud over time (Li et al., 2018).

Conclusion

The integration of artificial intelligence (AI) in fraud detection and control is a significant advancement in combating financial malfeasance in public organizations. AI's advanced data analytics and pattern recognition capabilities provide robust solutions for identifying anomalies and predicting fraudulent activities. In Nigeria, where corruption is pervasive, AI-driven systems can enhance transparency, accountability, and efficiency. Adaptive learning allows AI to evolve with fraud tactics, safeguarding public resources. Despite challenges like data privacy and infrastructure, strategic policy measures can facilitate successful AI adoption in fraud prevention.

Recommendations

1. Public organisations should allocate resources to acquire and maintain cutting-edge AI technologies and infrastructure. This includes high-performance computing systems, robust data management platforms, and sophisticated AI software capable of real-time data analysis and pattern recognition.
2. To effectively implement and manage AI-driven fraud detection systems, public organisations must invest in training and educating their workforce. This involves providing specialised training programmes for IT staff, data scientists, and auditors to ensure they are proficient in AI technologies and can adapt to evolving fraud tactics.
3. Public organisations should develop and enforce data governance standards to ensure the responsible use of AI technologies. This includes establishing clear guidelines for data collection, storage, and sharing, as well as implementing measures to protect sensitive information and prevent misuse of AI systems.

REFERENCES

Abawajy, J. H. (2020). *Machine Learning and Deep Learning for Fraud Detection.* IEEE Transactions on Dependable and Secure Computing.

Adedeji, T., & Abayomi, J. (2021). *Artificial Intelligence in Fraud Detection: Challenges and Opportunities in Nigeria.* Lagos: Nigerian Institute of Management.

Afolabi, O., & Adeyemi, K. (2021). *Enhancing Public Sector Accountability through AI.* Ibadan: University of Ibadan Press.

Agyemang, J. K. (2020). Internal Control and Fraud Prevention. *International Journal of Scientific Research and Management Studies*, 1(1), 1-11.

Bassey, M. M., & Owushi, E. (2023). Adoption of artificial intelligence in library and information science in the 21st century: assessing the perceived impacts and challenges by librarians in Akwa Ibom and Rivers States. *International Journal of Current Innovations in Education*, 6(1), 75-85.

Bhattacharyya, S., Chakraborty, S., & Karforma, S. (2018). Fraud Detection and Prevention using Machine Learning and Deep Learning Approaches: A Review. *International Journal of Computational Intelligence and Applications.*

Bolton, R., Hand, D. J., & Adams, N. M. (2021). When Good Models Go Bad: Managing False Positives in Fraud Prevention. *Journal of Marketing Analytics.*

Chen J. (2024) Fraud: definition, types, and consequences of fraudulent behavior available at: https://www.investopedia.com/terms/f/fraud.asp

Choo, K. K. R., Liu, C., & Liu, L. (2020). Artificial Intelligence for Cybersecurity: A Comprehensive Survey. IEEE Access.

Copeland B. (2024). Artificial Intelligence. Available at: https://www.britannica.com/technology/artificial-intelligence/Reasoning

Deloitte. (2022). "Leveraging Technology to Combat Fraud in Public Organizations." Retrieved from Deloitte.

Dzomira, S. (2015). Fraud Prevention and Detection. *Research Journal of Finance and Accounting*, 6(14), 37-43.

Gillis, A. S. (2024). Fraud Detection. Available at: https://www.techtarget.com/searchsecurity/definition/fraud-detection

Glover E. (2024) Artificial Intelligence. Available at: https://builtin.com/artificial-intelligence

Hilal, W., Gadsden, S. A., & Yawney, J. (2022). Financial fraud: a review of anomaly detection techniques and recent advances. Expert systems With applications, 193, 116429.

Kadar, T. (2022). Fraud Detection: Its Importance & How to Choose the Right System. Available at: https://seon.io/resources/fraud-detection-and-prevention/

Kaiser, S. A. (2017). Multistatic Passive Coherent Location Using the Global Positioning System. The Pennsylvania State University.

Kanade V. (2022) What Is Artificial Intelligence (AI)? Definition, Types, Goals, Challenges. Available at: https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-ai/

Kanade, V. (2021). What Is Fraud Detection? Definition, Types, Applications, and Best Practices. Available at: https://www.spiceworks.com/it-security/vulnerability-management/articles/what-is-fraud-detection/

Kshetri, N. (2020). Artificial Intelligence, Crime, and Justice: Predictive Policing, AI Surveillance, and AI Fraud Detection. *Journal of Criminal Justice and Law Review.*

Laskowski N. (2024). What is Artificial Intelligence (AI). Available at: https://www.techtarget.com/searchenterpriseai/definition/AI-Artificial-Intelligence

Li, X., Zhu, T., & Cheng, T. H. (2018). A Deep Learning Approach for Credit Card Fraud Detection. IEEE Transactions on Neural Networks and Learning Systems.

Lin, B., Huang, J., Liao, Y., Liu, S., & Zhou, H. (2022). Why do employees commit fraud? Theory, measurement, and validation. *Frontiers in psychology*, 13, 1026519. https://doi.org/10.3389/fpsyg.2022.1026519

Martins, G. (2024). Machine Learning and Artificial Intelligence in Fraud Detection. Available at: https://www.experian.co.uk/blogs/latest-thinking/guide/machine-learning-ai-fraud-detection/

Nakanjako S., Zikusooka E. (2024). Internal Auditing and Fraud Prevention in Organizations. A Case Study of Nssf Kampala Area. *Metropolitan Journal of Business & Economics*, 3(6), 358-367.

Nwaogu, E., & Okoli, C. (2020). Corruption and Fraud in Nigerian Public Organizations: The Role of AI. *Journal of African Development*, 15(3), 45-60.

Ojo, A., & Fapohunda, O. (2022). *Economic Impact of Fraud Reduction in Nigerian Public Organizations*. Abuja: National Bureau of Economic Research.

Okeke, R., & Eze, U. (2021). *Technological Infrastructure and AI Adoption in Nigeria.* Enugu: University of Nigeria Press.

Onuoha, I., & Opara, G. (2019). Adaptive Learning Algorithms for Fraud Detection in Public Organizations. *Nigerian Journal of Technology*, 28(2), 115-130.

Phua, C., Lee, V. C. S., & Smith, K. C. (2021). *Applications of Artificial Intelligence in Financial Fraud Detection and Prevention: A Systematic Review.* Expert Systems with Applications.

Singh, S., Noore, A., & Ratha, N. K. (2020). *Behavioral Biometrics for Fraud Detection: Challenges and Opportunities.* IEEE Transactions on Dependable and Secure Computing.

Sujeewa M. M. G. & Azam S.M. F. (2018). The new fraud triangle theory-Integrating ethnical values of employees. *International Journal of Business, Economics and Law.* 16(5): 52-54.

Udo-Okon, T. N. and Akpan, E. E. (2024). The Challenges of Artificial Intelligence in Library Management System. *Intercontinental Academic Journal of Library and Information Science*, 6(1), 96-107.

SUSTAINABLE ARCHITECTURE AND CONSTRUCTION IN SOUTH - SOUTH GEO POLITICAL REGION OF NIGERIA

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Abstract

The study assessed sustainable architecture and construction in the south-south geopolitical region of Nigeria, exploring the strategies, challenges, components, cases, and opportunities for promoting sustainable architecture and construction in the south-south region. The study highlighted the importance of architecture and sustainability in minimising the negative environmental impact and enhancing resilience in built environments. It also gave an overview of building construction, building collapse, and a further breakdown of the components of sustainable architecture. The study further delves into the cases of building collapse in the south-south geopolitical region and its challenges, such as limited awareness and education, inadequate infrastructure and resources, and also the strategies to maintain sustainable architecture and construction in Nigeria, which include the use of eco-friendly materials, energy-efficient designs, and water conservation practices. The study concluded that embracing sustainable approaches fosters economic growth, enhances social equity, and preserves cultural heritage. One of the recommendations was that there is need to encourage the use of locally sourced, renewable materials such as bamboo, adobe, and timber to reduce reliance on environmentally harmful imported materials and support local economies.

Keyword: Sustainable Architecture, Construction, South-South Geo Political Region and Nigeria.

Introduction

Environmental preservation, social justice, and economic feasibility are given top priority in sustainable architecture and construction, which encompasses a comprehensive approach to building design, construction methods, and urban planning. The adoption of sustainable principles acquires more relevance in the South-South area of Nigeria, which is marked by different ecosystems, growing urbanisation, and cultural diversity. The area represents a patchwork of potential and difficulties that highlight the need of adopting sustainable development techniques, from the expansive metropolis of Port Harcourt and Warri to the serene landscapes of Bayelsa and Akwa Ibom.

The imperative for sustainable architecture and construction in the South-South region is underscored by a confluence of factors. Environmental degradation, exacerbated by deforestation, pollution, and climate change impacts, threatens the region's ecological balance and resilience. Moreover, rapid urbanisation, fueled by population growth and industrial expansion, strains existing infrastructure, exacerbates socio-economic disparities, and poses formidable challenges to sustainable development (Udeh 2019).

However, amidst these challenges lie opportunities for innovation, collaboration, and transformative change. The South-South region boasts abundant natural resources, including oil and gas reserves, fertile agricultural land, and rich biodiversity, which can be harnessed sustainably to drive economic development while preserving ecological integrity (Olotuah 2019). Moreover, the region's cultural heritage, characterised by vibrant traditions, indigenous knowledge systems, and community cohesion, provides fertile ground for integrating traditional wisdom with modern sustainability practices.

An emphasis on comprehensive planning, resource efficiency, and community involvement is fundamental to South-South sustainable architecture and construction. Using regionally appropriate design elements may reduce a building's environmental impact and increase its resistance to the effects of climate change. Examples of these elements include green infrastructure, vernacular architecture, and passive cooling systems. In addition, encouraging the use of low-carbon concrete, bamboo, and recycled materials in building may lower embodied carbon emissions and advance the ideas of the circular economy. As stated by (Oti & Emeti, 2015) cited in (Usanga, 2023) these strategies not only contribute to environmental sustainability but also align with the sociocultural fabric of tropical communities.

Concept of architecture

Architecture is defined as the thought, idea, or notion that serves as the foundation of a design project as well as the engine that propels it forward. However, curiosity is essential for creativity as it becomes the power and identity of an architectural project’s development, and it is regularly consulted at all stages (Fidanci 2022).In the architecture journey, the very first step is to understand the concepts, as some of these concepts include typography, vernacular, historic, form and volume, physical features, views, public and private, accommodation, use, mass, journey and movements, adding and subtraction, materials, atmosphere, grid, culture and society, protection and shelter, structure and technology, users, light, and orientation. Architecture is created only to fulfil the specifications of an individual or group. Architectural designs are evolutionary, as it is best to start by collating project data, project briefs, requirements, site information, and many more, as it helps architects orient the design context themselves (Snaptrude 2021). Architecture serves as the foundational idea and core identity of a project and guides its design throughout the entire process. Architecture is also the translation of a non-physical design problem into a physical building product.

Architecture is both the process and product of planning, designing, and constructing buildings and other physical structures. It’s an art and a science that shapes the environments in which we live, work, and play. When architecture is grounded in depth and meaning, it becomes more coherent, relevant, successful, and interesting as it brings richness to the design. Additionally, Babylib (2023) explained that architecture has various types and roles they play in shaping and building our environments. Architecture is the art and technique of designing and

building, as it is distinguished from the skill of construction. The practice of architecture is employed to fulfil both practical and expressive requirements, and thus it serves both utilitarian and aesthetic ends (Collins & Ackerman, 2024). Abdel-Aziz (2021) defined architecture as the concept of an idea or thought that provides identity and direction for a project, as the concepts can come from a site, programme, culture, or influence.

Concept of sustainable architecture

Up until now, the majority of discussions surrounding the word "sustainability" in design have focused on building technology and how it is changing. The goal of sustainability, also known as ecological design, is to make sure that the resources that are now accessible are used in a way that will not negatively impact the well-being of future generations or make future resource acquisition unfeasible. The term "sustainable architecture" refers to design that aims to reduce a building's negative environmental effects by using resources more wisely and with more efficiency, including less energy, less materials, less development area, and the ecosystem as a whole. Sustainable architecture designs the built environment with consideration for both ecological and energy conservation.

According to Hohenadel (2024), sustainable architecture is a general term that refers to buildings designed to limit humanity's impact on the environment. Sustainable architecture defines a building designed and built to significantly reduce the damages inflicted on the health of its inhabitants and the environment. A sustainably designed building is important because it uses substantially less energy and water long-term, and it's built using fewer chemically toxic materials. Bowen (2023) explained that sustainable architecture is an architecture that emphasises environmental sustainability in all aspects of planning and construction. Sustainable architecture's definition involves designs that leverage its materials, methods, and systems to reduce its impact on the environment of the future while also meeting the current needs of those that inhabit it. As mentioned by Tadao Ando (2012) cited in Usanga (2024) it is important to integrate certain building elements into the architectural design. Building elements integrable into architectural design for optimization of the relationship between the building and the adjourning landscape.

Sustainable architecture and environmental issues are now a part of the agenda for businesses as well as local and international communities. Garafola (2018) noted that sustainable architecture means being able to satisfy consumers' requests, taking the time and natural resources needed into consideration from the very early stages of the project, entering the context in the most natural way possible, and planning ahead by making the space and materials employed completely reusable. Moreover, sustainability in architecture does not only mean reducing energy use and waste. It cannot be segmented into various subcategories because it represents a fundamental and intrinsic combination of factors related to our existence on this planet.

Concept of building construction

A building is generally thought of as a structure made up of floors, walls, and roofs that is erected to provide covered space for different uses such as residence, business, entertainment, a workshop, and many more. While construction is defined as anything made by man for one purpose or another, it can also refer to a road, path, bridge, dam, dwelling place, airport, or building, among many other things. Most constructions are the result of designs for better living conditions. The process of constructing or erecting structures—usually residential, commercial, or

industrial buildings—from separate parts or components is known as building construction. It involves a combination of design, planning, and execution to create a functional and safe built environment. Building construction is the process of adding structures to real property through various techniques.

However, the vast majority of building construction projects are small renovations, such as the addition of a room to a building, the renovation of bathrooms, and many more. It also involves the demolishing of buildings, the construction of new buildings, the construction of additions to existing buildings, and the necessary alteration of existing buildings to conform to any new additions. Nuzha & Gass (2023) defined building construction as the process where contractors build structures that serve a certain purpose. Construction requires engineers to design them and contractors to build them. It is also an ancient human activity.

According to Proest (2022), building construction is the physical activity on a construction site that contributes to building or structure construction. However, this process involves uploading plants, machinery, materials, cladding, fixing and fitting of the installation, formwork, and external finish. Ali (2023) explained that building construction is the structure designed to provide shelter, house activities, and accommodate human needs, as it typically consists of walls, floors, a roof, and various systems to ensure functionalities and comfort. Buildings are integral to civil engineering, as the construction of buildings not only fulfils the basic human need for shelter but also facilitates economic growth by creating employment opportunities in the construction industry. According to ZeroDocs (2023) as cited in Usanga (2024) architectural specifications play a crucial role in the construction process by furnishing comprehensive details on the items, materials, and techniques that will be employed in the building of a project. Buildings are normally constructed according to drawings and specifications prepared by architects or civil engineers. It is the process of putting structures together for the purpose of human settlement, amongst others. In addition, building construction is the technique and industry involved in the assembly and erection of structures, primarily used to provide shelter.

Concept of building collapse

Collapse is a state of complete failure when the structure has literally given way and most members have caved in, crumbled, or buckled; the building can no longer stand as originally built. It can therefore be seen that collapse is the very extreme state of failure (Akinyemi, Dare, Anthony, & Dabara, 2016). Structures known as buildings provide homes for people, their belongings, and their activities. To achieve the appropriate level of enjoyment from the surroundings, they need to be carefully planned, created, and constructed (Usanga, 2024). Building collapse, on the other hand, refers to a building's abrupt structural failure, either completely or partially, endangering people's lives and health. A building will collapse into itself when internal load-bearing structural elements fail, drawing outside walls into the collapsing structure. This situation might result in a dense debris field with a tiny footprint and be brought on by construction, an earthquake, or a fire. Alternatively, the structure may fall outward, creating a less dense and more dispersed debris cloud, if an explosion or natural factors like weather induce structural failure.

Building collapse is defined as a partial or progressive failure of one or more components of a building structure that leads to the inability of the building to perform its primary functions of comfort, satisfaction, safety, and stability (Ariye, 2020). On the other hand, there are several types of structural failure, each exhibiting a distinct level of damage or severity. It could have a fracture,

disintegration, or loss of use. Building collapses are oftentimes the consequence of some other occurrence or disaster, such a tornado or fire.

Sharma (2020) highlights that building collapse refers to the failure of the structure or component. The failure of a building depends on the materials, designs, methods of construction, environmental conditions, and building use. Furthermore, attributed causes of building collapse include defective building design, faulty construction, failure of the foundation, soil liquefaction, and demolition through explosives. A building collapse is a defect, imperfection, deficiency, or fault in a building element or component. It may also be a result of an omission of performance.

Component of sustainable architecture

Sustainable architecture is the process by which buildings are designed to be environmentally conscious and energy-efficient. According to Tobias (2024), sustainable architecture aims to incorporate structural and MEP systems into building designs that engage positively with their surroundings. It encompasses various components aimed at minimising the negative environmental impact of buildings by enhancing efficiency and moderation in the use of materials, energy, and development space. The components of sustainable architecture are as follows:

Energy efficiency and renewable energy: Energy efficiency is a cornerstone of sustainable architecture. Renewable energy systems are only becoming more popular as technological innovations drive costs down. Solar panels have never been more affordable, and building owners are eager to explore the cost-saving possibilities of renewable energy. When used in combination with passive design strategies like well-insulated building envelopes, natural lighting, and ventilation, renewable energy systems can go a long way in providing reliable, cost-effective energy performance (Foreman, 2022). However, buildings consume a significant amount of energy, and it is important to ensure that this energy use is optimised while minimising waste.

Sustainable materials: The use of sustainable materials is critical in sustainable architecture. Sustainable architecture depends on using as many eco-friendly materials as possible. Newer concrete technologies can also reduce one's ecological footprint in places where cement and concrete are necessary. More effectively, one can use recycled materials in order to keep the natural environment from being torn down (Samuel, 2024).

Water management: Water management is another essential component of sustainable architecture. Water is a vital resource that is consumed in various ways. Sustainable apartments employ water-saving measures like rainwater harvesting, dual flush toilets, low-flow fixtures, and so on (Webdura, 2024). By minimising water consumption, sustainable buildings help preserve this precious natural resource and prevent pollution of water sources (Hutter architects, 2022).

Waste management: Sustainable architecture considers the entire lifecycle of a building, from design and construction to operation and eventual decommissioning. Any product that is reusable and reconfigurable contributes to waste reduction because less material is required to upgrade or reconfigure to accommodate future changes. It is also important that building products match the lifecycle of a building to avoid frequent replacement. This helps reduce the demand for virgin materials associated with the replacement products and reduces the waste associated with disposal of the products being replaced (Grainger, 2024).

Smart growth and sustainable development: Sustainable buildings will continue to develop their sustainability and environmental impact over time. This could include dealing with storm water runoff or even occupant waste in a new, sustainable way. Green buildings will need to adapt over time to changing and ever-tightening regulations.

Cases of building collapse in South –South Nigeria

The south-south region of Nigeria is not immune to the menace of building collapse. Building collapses in south-south Nigeria have become a distressing issue, often resulting in significant loss of life, property damage, and economic disruption. One notable incident that happened sometime in 2015 was that an ongoing structure for indoor games close to U.J. Esuene Stadium in Calabar, Cross River State, collapsed. A visit by the Nigerian Society of Engineers to the scene revealed that polystyrene was incorporated in some structural members; the resultant effect was the failure of the structure under its own weight. (Ewa, 2018).

Furthermore, another tragic event was the the collapse of an appendage of a two-story hotel in the Ada-George area of Port Harcourt, Rivers State. Four people injured in the incident have received treatment at the hospital. The News Agency of Nigeria (NAN) gathered that the two-story building belonging to the 1708 Hotel, Rumuoke, by Okilton Junction, off Ada George, collapsed at about 6.15 a.m. on Thursday, 2023. The incident occurred when some residents of the area were still asleep and the occupants of the building, who were mainly site workers, were getting ready to resume their day's work. However, the collapse was due to foundation failure or failure of the structure itself (Agency Report, 2023). On December 10, 2016, a church in Uyo-Akwa-Ibom State collapsed during a mid-Saturday service, killing over 200 people, with the State Governor among the lucky survivors. This tragedy highlighted the consequences of structural failures and the importance of adherence to building regulations.

In a similar incident, a section of a two-story building currently under construction in Asaba, Delta State, collapsed yesterday, leaving about eight people injured. The building, situated opposite ShopRite in the state capital, sources said, collapsed about 5 p.m. as workers were working on the site. After inspecting the building, the state commissioner for urban renewal, Mr. Michael Anoka, said the incident was the result of a building defect (Akuopha,2023).The situation in Bayelsa State is no different, with a notable case in Yenagoa in March 2020 when a three-story residential building collapsed, resulting in several deaths and injuries. The incident raised serious concerns about the structural integrity of many buildings in the area, particularly those in flood-prone zones. Investigations pointed to poor foundational work and waterlogged soils as major contributing factors.

Comprehensive reforms in the construction sector have been called for as a result of the numerous building collapses in south-south Nigeria. Experts contend that the focus should be on enhancing the certification and training programmes for building professionals rather than just upholding the current laws. Furthermore, a thorough examination of current structures is necessary to guarantee their structural soundness, particularly for those constructed before to the implementation of contemporary building rules.

Strategies to maintain sustainable architecture and construction in Nigeria

Nigeria's fast urbanisation, population increase, and environmental problems make sustainable architecture and building imperatives. In order to attain sustainability in the built environment,

many approaches that tackle the economic, social, and environmental aspects can be utilised. These tactics include waste management, regulations that support sustainability, water conservation techniques, energy-efficient design, and the use of environmentally friendly products. By putting these solutions into practice, Nigerian urban areas may become more resilient and sustainable.

Use of Eco-Friendly Materials

Adopting eco-friendly materials is critical to sustainable construction. These materials have a low environmental impact during production, use, and disposal. In Nigeria, promoting the use of locally sourced materials such as bamboo, laterite, and rammed earth can reduce the carbon footprint associated with transportation and manufacturing. These materials are abundant and have been traditionally used in construction, making them cost-effective and culturally acceptable. Research shows that using such materials can significantly reduce the environmental impact of buildings (Olaniyan & Olatunde, 2019).

Energy-Efficient Designs

Energy-efficient design is another crucial strategy for sustainable architecture. This involves optimising the building's orientation, insulation, and ventilation to reduce energy consumption for heating, cooling, and lighting. In Nigeria, where temperatures can be high, incorporating passive cooling techniques such as natural ventilation, shading devices, and green roofs can minimise the reliance on air conditioning (Nduka & Ogunsanmi, 2018). Additionally, integrating renewable energy sources like solar panels can provide a sustainable energy supply for buildings.

Water conservation practices

Water conservation is essential in areas with limited water resources. Sustainable architecture in Nigeria should include systems for rainwater harvesting, greywater recycling, and the use of low-flow fixtures. These practices help reduce water consumption and promote the efficient use of water resources. Rainwater harvesting, for instance, can provide a supplementary water source for non-potable uses such as irrigation and toilet flushing, easing the pressure on municipal water supplies (Adedeji & Fadamiro, 2018).

Sustainable urban planning

Sustainable urban planning integrates environmental, social, and economic factors to create livable and resilient urban environments. In Nigeria, this involves designing compact, mixed-use developments that reduce the need for long commutes and encourage walking, cycling, and the use of public transport. Urban green spaces, such as parks and community gardens, play a crucial role in enhancing urban biodiversity, improving air quality, and providing recreational opportunities for residents (Aluko & Ajala, 2019).

Education and awareness

Raising awareness and educating stakeholders about the benefits and techniques of sustainable construction is essential. This includes training architects, engineers, builders, and developers in sustainable design principles and construction practices. Public awareness campaigns can also inform homeowners and communities about the advantages of sustainable buildings, driving demand for eco-friendly construction (Oluwatayo & Amole, 2020).

Waste Management

Effective waste management strategies are vital for sustainable construction. This includes reducing, reusing, and recycling construction waste. In Nigeria, construction and demolition activities generate significant amounts of waste, much of which ends up in landfills. Implementing site waste management plans and promoting the use of recycled materials can help mitigate this issue. Encouraging the adoption of prefabricated construction methods can also minimise waste generation by producing building components off-site under controlled conditions (Ogunbiyi, Goulding, & Oladapo, 2019).

Challenges to sustainable architecture in South –South Nigeria

The utilisation of environmentally conscious design and construction techniques is a hallmark of sustainable architecture, which is essential for reducing the negative impacts of urbanisation and fostering adaptability to climate change. Nonetheless, there are a number of obstacles preventing the broad use of sustainable design concepts in South-South Nigeria. The following are the difficulties facing sustainable architecture in southern Nigeria:

Limited Awareness and Education: In South-South Nigeria, there is a lack of awareness and education about sustainable architectural practices among stakeholders, including architects, builders, and policymakers (Oluwagbemi, 2020). Without a proper understanding and appreciation of the benefits of sustainable architecture, traditional building methods persist, leading to increased environmental degradation and energy consumption.

Economic factors: Economic factors play a significant role in inhibiting the adoption of sustainable architecture. High initial costs associated with green building materials and technologies deter many developers and homeowners from investing in sustainable construction (Oni, 2019). Additionally, the lack of access to financing options tailored to sustainable projects further exacerbates this challenge.

Inadequate Infrastructure and Resources: The South-South region of Nigeria faces infrastructural deficiencies, including unreliable power supply and limited access to water and sanitation services (Babatunde, 2021). These shortcomings pose significant obstacles to the implementation of sustainable architectural solutions, such as renewable energy systems and water-efficient designs.

Regulatory and Policy Framework: The absence of stringent regulations and incentives for sustainable construction hampers progress in this field. Without supportive policies mandating sustainable building practices or providing incentives for compliance, developers may prioritise cost-saving measures over environmental considerations.

Cultural and Social Factors: Cultural norms and societal preferences often prioritise aesthetics and immediate comfort over sustainability in building design. Moreover, traditional building practices deeply rooted in local cultures may resist innovation, making it challenging to introduce sustainable architectural concepts.

Conclusion

In conclusion, sustainable architecture and construction hold immense promise for the South-South Geopolitical Region of Nigeria. Through innovative design, renewable materials, and

energy-efficient practices, these initiatives can mitigate environmental impact and promote resilience to climate change. Furthermore, embracing sustainable approaches fosters economic growth, enhances social equity, and preserves cultural heritage. However, successful implementations require collaborative efforts among stakeholders, including government bodies, industry professionals, and local communities. By prioritising sustainability, the region can not only address pressing environmental challenges but also lay the foundation for a more prosperous and resilient future.

Recommendations

1. There is need to encourage the use of locally sourced, renewable materials such as bamboo, adobe, and timber to reduce reliance on environmentally harmful imported materials and support local economies.
2. There is dire to implement energy-efficient designs incorporating passive solar techniques, natural ventilation, and high-performance insulation to minimize energy consumption and lower carbon emissions in buildings.
3. Integrate water-saving technologies like rainwater harvesting, greywater recycling, and low-flow fixtures to reduce water usage and mitigate the impact of water scarcity in the region.

REFERENCES

Abdel-aziz D. (2021) Architectural concepts available at:https://www.slideshare.net/slideshow /concept-244672043/244672043

Adedeji, Y. M. D., &Fadamiro, J. A. (2018). Water conservation techniques in Nigerian buildings: Towards sustainable practices. *Journal of Sustainable Development in Africa*, 20(1), 103-117.

Agency report (2023). Building collapses in Port Harcourt. Available at: https: //www.premiumtimesng.com/regional/south-south-regional/607355-building-collapses-in-port-harcourt.html?tztc=1

Akinyemi, P. A, Dare. G. M, Anthony, A. I &Dabara, D. I. (2016). Building Collapse in Nigeria: Issues And Challenges. *Conference of the International Journal of Arts & Sciences.*09(01):99–108.

Akuopha, O. (2023). 8 injured as multiple-storey building collapses in Delta. Available at: https://www.vanguardngr.com/2023/09/8-injured-as-multiple-storey-building-collapses-in-delta/

Aluko, O. E., &Ajala, O. (2019). Sustainable urban planning in Nigeria: Challenges and opportunities. *Urban Planning*, 4(3), 75-86.

Ariye, Y. (2020). Building Collapse in Nigeria. Available at: https://www.linkedin.com /pulse/building-collapse-nigeria-yemi-ariye

Babatunde, A., Oluwatobi, S., &Odusina, A. (2021). Infrastructure Deficit and Economic Growth in South-South Nigeria. *International Journal of Economics, Commerce and Management*, 9(4), 1-13.

Babylib (2023) what are types of architectural concepts? Available at:https://thearchitopics.com /what-are-types-of-architectural-concepts/

Bowen, K. (2023). Sustainable Architecture | Overview & Examples. Available at: https://study.com/academy/lesson/what-is-sustainable-architecture-definition-examples.html

Collins P. & Ackerman J. S. (2024) Architecture available at:https://www.britannica.com /topic/architecture

Ewa, E. D. (2018). *Building Collapse in South-South Nigeria*. Standards Organization of Nigeria (Son). Calabar.

Fidanci E. A. (2022) Understanding architectural concept available at:https://illustrarch.com /articles/9525-understanding-architectural-concept.html#:~:text=An%20architectural %20concept%20is%20a,regularly%20consulted%20at%20all%20stages.

Foreman M. (2022) 8 key sustainable building design practices available at: https://www.rowlandbroughton.com/guide-to-sustainable-building-design/

Garafola, F, (2018). What is sustainable architecture: definition, concept and famous examples. Available at: https://www.lifegate.com/sustainable-architecture-definition-concept-projects-examples

Grainger (2024) focus on three components for effective sustainable building design available at: https://www.grainger.com/know-how/safety-health/sustainability/kh-sustainable-building-design

Hohenadel, K. (2024). What Is Sustainable Architecture? Available at: https://www.thespruce.com /what-is-sustainable-architecture-4846497

Hutter architects (2022) what are the four elements of a sustainable building? Available at: https://hutterarchitects.com/what-are-the-4-elements-of-a-sustainable-building/

Nduka, D. O., &Ogunsanmi, E. O. (2018). Energy-efficient building practices in Nigeria: Barriers and recommendations. *Energy Policy*, 123, 39-46.

Obi, L., &Okonkwo, V. (2018). Sustainable Urbanization and Environmental Challenges in Nigeria: A Case Study of Port Harcourt Metropolis. *Journal of Sustainable Development in Africa*, 20(2), 24-41.

Ogunbiyi, O., Goulding, J. S., &Oladapo, A. (2019). Construction waste management practices in Nigeria: Drivers and barriers. *Waste Management & Research*, 37(4), 342-354.

Olaniyan, O. S., &Olatunde, S. F. (2019). Eco-friendly building materials in Nigeria: A review. *International Journal of Environment and Sustainability*, 8(1), 12-21.

Olotuah A., Oluwatayo A. & Ede A. (2019). The Role of Architects in Sustainable Building in Nigeria. *International Journal of Engineering Research & Technology*, 8(3), 327-334.

Oluwagbemi, O. O. (2020). Sustainable Construction Practice in the Nigerian Building Industry: Challenges and Prospects. *International Journal of Building Pathology and Adaptation*, 38(1), 68-84.

Oluwatayo, A. A., & Amole, D. (2020). Education and awareness in promoting sustainable construction practices in Nigeria. *Sustainability*, 12(15), 6005.

Oni, A. O., Ede, A. N., &Opoko, A. P. (2019). Barriers to the Adoption of Sustainable Construction Practices by Nigerian Quantity Surveyors. *Journal of Engineering, Design and Technology*, 17(4), 803-821.

Samuel N. (2024) 9 best sustainable architecture design ideas available at: https: //foyr.com/learn/sustainable-architecture/

Sharma, N. (2020). What are the reasons of Building Collapse? Available at: https: //theconstructor.org/question/what-are-the-reasons-of-building-collapse

Snaptrude (2021) simple guide to architectural concepts for the architectural students available at:https://www.snaptrude.com/blog/simple-guide-to-architectural-concepts-for-the-architecture-student

Tobias M. (2024) Elements of sustainable architecture available at: https://www.ny-engineers.com/blog/elements-of-sustainable-architecture.

Udeh, K. A., &Aduwo, E. B. (2019). Sustainable Building: A Review of Policies, Initiatives and Certification Systems in Nigeria. *International Journal of Civil Engineering and Technology*, 10(1), 141-151.

Webdura (2024) sustainable apartments: top key components of sustainable architecture for apartments available at: https://www.confident-group.com/blog/sustainable-apartments/

Usanga, P. S. (2024). Architectural Specification And Thermal Comfort In Residential Bungalows. *The artist journal* (taj). (7)1: 72-81.

Usanga, P. S. (2024). Optimization of the relationship between the architect's designed building and the adjoining landscape. *The artist journal* (taj). (7)1: 66-71.

Usanga, P. S. (2024). Cracks in wallls: investigating the causes and remedies for building sustaianbility in our society. *Journal of Engineering, Mechanics and Modern Architecture*. 3(1): 34-43.

Usanga, P. S. (2023). Tropical Kitchen Construction: Assessing The Prospects and Challenges. *Journal of Architectural Design.* 24: 12-23.

THE INDICES OF ICT ENHANCED ENTERPRENEURIAL SKILLS AND SELF-RELIANT ATTITUDE AMONG BUSINESS STUDIES STUDENTS IN SECONDARY SCHOOLS IN AKWA IBOM STATE: A PARADIGM SHIFT FOR LIFELONG LEARNING

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ABSTRACT

This study examined the indices of ICT enhanced entrepreneurial skills and self-reliant attitude among business studies students in secondary schools in Akwa Ibom State as a paradigm shift for lifelong learning. A correlational survey design was used for this study. The study area for this research was Akwa Ibom State. The target population for this study comprised all the JS2 business studies students in public secondary schools in Akwa Ibom State with an estimate of Ten Thousand Five Hundred (10,500). The proportionate stratified sampling technique was used to select 5 local government areas at random from each of the 3 senatorial districts. From each local government areas 4 schools were picked and from each of those schools, 25 JS2 students were chosen. This gave a total of 1,500 JS2 business studies students in secondary schools in Akwa Ibom State which formed the sample size of this study. The researchers used an instrument tagged 'Entrepreneurial Skills and Self-Reliant Attitude Questionnaire" (ESSAQ) for the study which were distributed to 1500 JS2 students from which 1475 questionnaires were retrieved as correctly filled in and used for this analysis. The instrument was subjected to face and content validation by 3 experts (2 in business education and 1 in test, measurement and evaluation. The reliability coefficient obtained was 0.83, and this was high enough to justify the use of the instrument. Independent t-test and Pearson Product Moment Correlation (PPMC) analyses were used in testing the hypotheses. The result of the findings revealed that there is significant difference in the extent of development of self-reliant attitudes, possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills *between male and female business studies students in secondary school in Akwa Ibom State. It also revealed that there was a significant relationship between possession of the common traits for development of Entrepreneurial skills using ICT and self-reliant attitudes among the students. The study also revealed that there is a significant relationship between possession of the rational for achieving entrepreneurial skills using ICT and self-reliant attitudes among the students. Finally it was observed that* there is significant relationship between acquaintance of the pertinent factors for developing entrepreneurial skills using ICT and self-reliant attitudes among the students. *The study concluded that the integration of ICT into entrepreneurial education has become essential in fostering self-reliant attitudes among students, particularly in business studies in Akwa Ibom State. One of the recommendations made was that the government and relevant stakeholders should provide adequate ICT facilities in secondary schools for effective use. Such facilities include high-speed internet, computers, software tools, and other relevant technological resources that can support entrepreneurial education*

KEYWORDS: Indices, ICT Enhanced Entrepreneurial Skills, Self-Reliant Attitudes, Students, Secondary Schools, Akwa Ibom State.

Introduction

Secondary school learners are those individuals prepared for secondary school education. They are learners who received education after primary education and before tertiary level education. Secondary education in Nigeria is categorized into basic education (3 years) and senior education for the remaining three years, respectively. Learners in the first three years of junior education are expected to be awarded a Basic Education Certificate after passing the requisite assessment or examination (s). The learner, at the senior secondary stage, when successful after examinations, is promoted to offer different subjects at the higher level as classified under diverse areas of studies such as science, technology, humanities, business studies, and compulsory cross-cutting subjects (entrepreneurship studies) (Effiong & Akpan, 2017). This is in consonance with the broad goals of secondary education that have been enunciated by the National Policy on Education, that a student at such a period of education shall be prepared for useful living in society and high education (Federal Government of Nigeria, 2013).

The phrase that an individual shall be prepared for useful living is holistically attributed to the dynamics of entrepreneurial skills' development. Perhaps, if this is achieved, it would help to prepare the learner for sustainable economic development in their society and guarantee their later life. This may be impossible unless the school environment is completely subjected to the learning society and opportunities for learning are recognized for everyone, no matter where they are or how they spend their old age (Effiong, 2017). Effiong, Obushi, and Adebola (2017) stated that if sustainable economic development is to be achieved through the inculcation of entrepreneurial competence, learning should take place at all stages of life, that is, starting from cradle to tomb. The authors enunciated that the pattern of learning should endeavour to be implanted in all aspects of life: from home, to community, passing through school, to workplace, back home to community again, to the grave. However, lifelong learning gains could be possible through the potential of the learning to become self-reliant, which can be acquired through the development of entrepreneurial skills in the learning situation.

Recently, extremely quick developments in information-communication technology (ICT) can be witnessed. Researchers increasingly believe that investment in ICT and the existence of appropriate ICT support tools make it possible to create some kind of knowledge repository and foundation for knowledge and learning management at different levels of human interaction (personal, community, and society) (Bontis 2002; Banker 2003; Youndt, Subramaniam & Snell, (2004); Damien 2005). ICT also enhances the application of entrepreneurial skills among entrepreneurs, as well as allows for easy teaching of the younger generations and makes them aware of ICT tools. Nowadays, almost all youngsters have basic knowledge of computers, which makes it easier to teach them about ICT tools. However, it is important that students have knowledge of ICT as well as specific ICT tools. Many such tools can be used free of charge, which is another reason why they might be used for teaching and learning entrepreneurship. The ICT tools help the entrepreneur identify and adopt the indices of entrepreneurial skills for a self-reliant attitude among business studies students. The indices include common traits, rational and pertinent factors for developing entrepreneurial skills.

Problem Statement

Most student use and are familiar with ICTs such as mobile phones and laptop computer and have access to some level of computer laboratories but are not effectively exposed to

enhancing entrepreneurial skills using ICT equipment. The facts still remain that effective use of ICTs can enhance entrepreneurship in higher institutions. This problem of inadequate use of the ICT equipment cuts across all disciplines including students prepared to be competent workforce in our societies.

Inadequate knowledge of the indices of entrepreneurial skills among business studies students continues to be a well felt problem in our society. It is worse when business students fail to adopt information and communication technology to appreciate the entrepreneurial skills and let alone the embracing the indices which obviously induce the occurrence of entrepreneurial skills. It is true that students are not well acquainted with such indices of entrepreneurial skills as having common traits, rational and identifying pertinent factors that promote ICT entrepreneurial skills.

Equally, many business studies students are regularly identified with low self-reliant attitude and this in a way has impacted negatively on their zeal for entrepreneurial ventures after secondary school or tertiary education. There may be a feeling of lack of what it takes to establish and sustain a business among students. One thing is still worrisome and that borders on whether the extent of knowledge and possession of the entrepreneurial skills of the business studies students has been enhanced enough by information and communication technology. It is also causing a serious panicking as one may not really know the level at which lack of exposure to the indices of entrepreneurial and inadequacy in ICT enhanced entrepreneurial skills have hampered these student's self-reliant attitude. It is on this premise that this study is proposed.

Objective(s) of the Study

The specific objectives of this study are:

1. To determine the extent of development of self-reliant attitudes among male and female business studies students in secondary school in Akwa Ibom State.
2. To find out the relationship between possessions of the common traits for development of ICT enhanced entrepreneurial skills and self-reliant attitudes among the students.
3. To examine the relationship between possessions of the rational for achieving ICT enhanced entrepreneurial skills and self-reliant attitudes among the students.
4. To determine the relationship between acquaintances of the pertinent factors for ICT enhanced entrepreneurial skills and self-reliant attitudes among the students.
5. To find out difference in the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State.

Research Questions

1. What is the difference in the extent of development of self-reliant attitudes between male and female business studies students in secondary school in Akwa Ibom State?

2. What is the relationship between possession of the common traits for development of entrepreneurial skills using ICT and self-reliant attitudes among the students?

3. What is the relationship between possession of the rational for achieving entrepreneurial skills using ICT and self-reliant attitudes among the students?

4. What is the relationship between acquaintance of the pertinent factors for developing entrepreneurial skills using ICT and self-reliant attitudes among the students?

5. What is the difference in the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State?

Hypotheses

The following hypothesis will be tested:

$H0_1$: There is no significant difference in the extent of development of self-reliant attitudes between male and female business studies students in secondary school in Akwa Ibom State.

$H0_2$: There is no significant relationship between possession of the common traits for development of Entrepreneurial skills using ICT and self-reliant attitudes among the students.

$H0_3$: There is no significant relationship between possession of the Rational for achieving Entrepreneurial skills using ICT and self-reliant attitudes among the students.

$H0_4$: There is no significant relationship between acquaintance of the pertinent factors for developing entrepreneurial skills using ICT and self-reliant attitudes among the students.

$H0_5$: There is no significant difference in the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State.

LITERATURE REVIEW

Education for the Development of Self-Reliance

Before 1980, when education was regarded as a profitable adventure by managers of education and the government of Nigeria, learners were usually informed on the direction of their learning for future guarantee in education (Effiong, 2012). Recently, it has been predicted that upon completion of junior secondary school, learners will diversify based on their potential and learning capacity, either to continue in the upper class or to possess entrepreneurial skills to become self-sufficient.

Okoye and Ogunleye (2015) asserted that after junior secondary education, students are expected to stream into senior secondary schools, technical colleges, while some are streamed into vocational training centres or apprenticeship schemes based on the results of tests to determine ability, attitude, and vocational interest. The authors added that these projections would make them offer six core subjects, a maximum of two electives from vocational and two subjects from non-vocational, in order to register for the maximum of nine subjects at the senior secondary examination. Eze and Ekemini (2020) found that individuals who engage in continuous education

are more adaptable to changes in the labor markets and are more likely to maintain their economic independence over time.

Entrepreneurial Skills as a strategy for developing self-reliance

Several studies have explicitly considered entrepreneurial learning as a strategy for developing students' self-reliance attitudes, individual vocational choices, and behaviors (Berger and D'Ascoli 2012; Gegenfurtner 2012). Theoretically, the hypothesis of planned behaviour is well-vested in the conceptualisation that describes entrepreneurial skills as a strategy to develop students to become self-reliant. This tactically elucidated that students' entrepreneurial career selection is based on the assumption that this choice is a complex and deliberate behavior that requires various cognitive processes and can most accurately be predicted by purpose (Guerrero 2008).

The indices of ICT enhanced entrepreneurial skills for self-reliant attitude

The importance of information and communication technologies in students' entrepreneurial development cannot be overstated. Information and communication technology have been seen as very useful equipment for the effective preparation of students for skill development and future employment. Ubah (2011) observed that with the introduction of information technology in teaching entrepreneurship education, emphasis is placed on practicable teaching methods that are more useful in vocational and technical training and the experience of realities in the course of learning. As stated by Nwangwu (2006), ICT can be used to enhance entrepreneurship education via the following: having some common traits for ICT enhanced entrepreneurial skills, having Rational for Achieving ICT enhanced entrepreneurial skills as well as identifying pertinent factors for ICT enhanced entrepreneurial skills

These indices reflect how ICT integration fosters self-reliance by providing tools for efficient operations, customer engagement, and innovation. Here are the key indices explained below:

- Digital Literacy: Digital literacy is an individual's ability to find, evaluate, and communicate information using typing or digital media platforms. It is a combination of both technical and cognitive abilities in using information and communication technologies to create, evaluate, and share information. Digital literacy involves understanding how to use the internet, social media platforms, and digital devices for research, marketing, and networking. According to Obiekwe (2018), individuals who are digitally literate can more effectively market their entrepreneurial products and services, leading to increased business sustainability and self-reliance.

- E-commerce Proficiency: E-commerce Proficiency is defined as the ability to effectively use online platforms and digital tools for buying, selling, and promoting products or services. It plays a crucial role in enhancing entrepreneurial skills in today's digital economy, allowing entrepreneurs to reach a broader audience without the limitations of physical locations. This reduces overhead costs and expands market reach, making it easier for small businesses to compete with larger corporations. Proficiency in e-commerce platforms empowers entrepreneurs to scale their operations, fostering a self-reliant attitude.

Common traits for ICT enhanced entrepreneurial skills and self-reliant attitude

It is quite obvious that having some common traits for ICT enhanced entrepreneurial skills has remarkable effects on self-reliant attitude of every student. Entrepreneurial traits are the typical characteristics, abilities, and thought patterns associated with successful entrepreneurs. While some entrepreneurs are born with these traits, others can develop them. Many studies consider the "traits of entrepreneurs" or the "traits that make entrepreneurs successful, and in most times, developing it needs an enhancement through the use of information and communication technology." This is true because ICT is good at motivating learners in effective learning. According to Stebro (2014), the publication in 1921 of Frank Knight's book Risk, Uncertainty, and Profit marked a key launching point into rigorous and careful research on the personalities of entrepreneurs that set them apart from general business managers. Some common traits for the development of Entrepreneurial skills include:

- **Passion**: Passion has been cited as the most observed phenomenon in entrepreneurial studies and as a core characteristic of creators of wealth (Smilor, 2011). This is observed to be the central inherent attribute of successful leaders. Entrepreneurs high in passion confront opportunities and challenges with zeal, ride out the long hours necessary during venture growth phases, and experience a venture's successes as well as difficulties as if they were personal events (Locke, 2010).

  Pro-activity: Pro-activity is the propensity to take action to influence environmental change. Entrepreneurs who possess this personality type would search for opportunities, show initiative, take action, and persevere in any endeavor until they attain an achievement level (Bateman & Crant, 2013). Researchers believe that entrepreneurs with this personality trait typically use organizational strategies that involve high levels of environmental searching and long-range forecasting, which allows them to successfully identify new opportunities (Kickul & Gundry, 2012).

Rational for Achieving ICT enhanced entrepreneurial skills and self-reliant attitude

It has become a universal truth that achievement in business is a function of good rational and this has been widely accepted by many management scientists. Rational for achievement of ICT enhanced entrepreneurial skills has played important role in developing self-reliant attitude of every student. Developing important entrepreneurial characteristics is a very important aspect of the strategy for achieving self-reliance and the inculcation of lifelong learning into children in school. According to many experts in ICT, there are many software programmes that stimulate the learners' interest in studies for entrepreneurial skill development. The learner is an entity that is to be developed for future operation and development. The students need to be trained on ICT for various types of rational that will help build the following characteristics:

- **Need for Achievement (N-Ach):** In an organization, the need for achievement is defined as maintaining high standards and aspiring to complete difficult tasks (Smilor, 2011). According to McClelland (2017), the need for achievement (n-ach) refers to the 'achievement motivated' and thus seeks achievement, the achievement of realistic but challenging goals, and job advancement. People with a high need for achievement take responsibility for outcomes and engage in activities that have a moderate degree of risk and require skill and effort (Mitchelmore & Rowley, 2008).

- **Locus of Control (LOC)**: The degree to which a person believes that their actions have a direct impact on an event or that they have control over the outcome. Researchers have discovered that founders of successful entrepreneurial firms have a high internal locus of control, meaning they feel like they have significant control over the outcome of events (Smilor, 2011). Students who have locus of control will surely perceive you as having the conviction to surmount all barriers in order to pass the examination, which their presumption may make for them to succeed.

- **Motivation:** Motivation is the process that initiates, guides, and maintains goal-oriented behaviors. It is what causes entrepreneurs to act, whether the goals are to increase or not. Entrepreneurial motivation is the process that activates and motivates the entrepreneur to exert a higher level of effort for the achievement of his or her entrepreneurial goals. In other words, entrepreneurial motivation refers to the forces or drives within an entrepreneur that affect the direction, intensity, and persistence of his or her voluntary behavior as an entrepreneur (Entrepreneurship Development 2020).

Pertinent Factors for ICT Enhanced Entrepreneurial Skills and Self-Reliant Attitude

There are various computer programmes that help identify pertinent factors that promote entrepreneurial skills among learners. This promote the interest in learners for skill development. It also true that, apart from ICT, other factors can help learners learn at the secondary school level to develop entrepreneurial skills that can assist their living situation in the future. These skills, according to Effiong and Akpan (2017), are as follows:

Interpersonal Skills: Learners who are groomed with strong interpersonal skills have ability for working well with people from diverse backgrounds with intent to create. These learners will be very insightful with regards to the behaviour of others, learn to understand motives and actions surrounding the environment, quick to be aware of strained relationships, and well attuned to both verbal and nonverbal behaviours. Although there is some variation in the literature over the exact skills that qualify interpersonal skills (Chant, Jenkinson, Randle and Russell, 2012), most authors (e.g. Rungapadiachy, 2009; Hargie and Dickson, 2004; Hargie, 2007; Hayes, 2012) tend to agree on a number of core areas in which competency is essential for effective interpersonal skills. These include the following:

Communication Skills: This covers: verbal Communication, non-Verbal Communication, listening Skills, self-awareness, assertiveness, problem solving and decision-making, teamwork, leadership

METHODOLOGY

To carry out the study, correlational survey design was adopted. The study area for this research is Akwa Ibom State. The target population for this study comprised all the JS2 business studies students in public secondary schools in Akwa Ibom State with an estimate of Ten Thousand Five Hundred students. In this research, 4 schools were randomly selected from each of the 5 local government areas of the 3 senatorial districts of Akwa Ibom State chosen for the study. A proportionate stratified sampling technique was then used to select 25 JS2 students from each of the schools and used for this research work. From the selection, a sample size of one thousand five hundred (1,500) JS2 business studies students in the affected secondary schools in Akwa Ibom

State was realised and used for the study. The researchers used an instrument tagged 'Entrepreneurial Skills and Self-Reliant Attitude Questionnaire" (ESSAQ). The instrument was subjected to face and content validation by three experts from Akwa Ibom State College of Education, 2 in business education and 1 in test and measurement/evaluation. The reliability coefficient obtained was 0.83, and this was high enough to justify the use of the instrument. Descriptive statistics was used in answering the research questions, while Pearson Product Moment Correlation (PPMC) analysis was used in testing the hypotheses.

RESULTS AND DISCUSSIONS

Hypothesis 1:
There is no significant difference in the extent of development of self-reliant attitudes between male and female business studies students in secondary school in Akwa Ibom State. In order to test the hypothesis, independent t-test analysis was used to analyze the data (See table 4) (See table 1).

TABLE 1

Independent t-test analysis of the difference in the extent of development of self-reliant attitudes between male and female business studies students in secondary school in Akwa Ibom State.

Gender	N	$\overline{X}$	SD	t
Male	1030	13.99	1.41	31.22*
Female	442	11.50	1.39	

***Significant at 0.05 level; df = 1470; N= 1472; critical t-value 1.96**

Table 1 presents the obtained t-test-value (31.22). This value was tested for significance by comparing it with the critical t-value (1.96), at 0.05 level with 1470 degree of freedom. The obtained t-value (31.22) was greater than the critical t-value (1.96). Hence, the result was significant. The result means that there is significant difference in the extent of development of self-reliant attitudes between male and female business studies students in secondary school in Akwa Ibom State. The result supports the opinion of Okoye and Ogunleye (2015) who mentioned that in today's dynamic world, where job markets, economic conditions, and societal structures are constantly evolving, self-reliance has become an essential trait for personal and societal progress. The result also disagrees with the research findings of Eden, Akpan and Umana (2023) who mentioned that there is no significant difference in male and female students' acquisition of self- reliant attitude in entrepreneurial skills. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 2

There is no significant relationship between possession of the common traits for development of Entrepreneurial skills using ICT and self-reliant attitudes among the students. In order to test the

hypothesis Pearson product moment correlation analysis was used to analyze the data (See table 2).

TABLE 2:

Pearson product moment correlation analysis of the relationship between possession of the common traits for development of Entrepreneurial skills using ICT and self-reliant attitudes among the students

Variable	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum XY$	r
Common traits (X)	22154	340414		
			298063	0.78*
Self-reliant attitude (Y)	19503	263237		

***Significant at 0.05 level; df = 1470; N = 1472; Critical r-value = 0.062**

The above table presents the obtained r-value of (0.78). This value was tested for significance by comparing it with the critical r-value (0.062) at 0.05 level with 1470 degree of freedom. The obtained r-value (0.78) was greater than the critical r –value (0.062). Hence, the result was significant, meaning that there is significant relationship between possession of the common traits for development of Entrepreneurial skills using ICT and self-reliant attitudes among the students. This result supports the findings of Stebro et al. (2014), who mentioned that common traits for ICT-enhanced entrepreneurial skills and self-reliant attitudes enable entrepreneurs to leverage technology effectively while maintaining independence in decision-making and business operations. It also supports the opinion of Attali and Boulay (2015), who stated that entrepreneurs who use ICT to innovate tend to build businesses that are more adaptable and self-reliant, as they are not constrained by traditional business methods. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 3

There is no significant relationship between possession of the Rational for achieving Entrepreneurial skills using ICT and self-reliant attitudes among the students. In order to test the hypothesis Pearson product moment correlation analysis was used to analyze the data. (See table 3).

TABLE 3:

Pearson product moment correlation analysis of the relationship between possession of the Rational for achieving Entrepreneurial skills using ICT and self-reliant attitudes among the students.

Variable	∑X ∑Y	∑X² ∑Y²	∑XY	r
Rational Possession (X)	20092	278690		
			270008	0.82*
Self-reliant attitude (Y)	19503	263237		

***Significant at 0.05 level; df = 1470; N = 1472; Critical r-value = 0.062**

The above table presents the obtained r-value of (0.82). This value was tested for significance by comparing it with the critical r-value (0.062) at 0.05 level with 1470 degree of freedom. The obtained r-value (0.82) was greater than the critical r–value (0.062). Hence, the result was significant, meaning that there is significant relationship between possession of the rational for achieving entrepreneurial skills using ICT and self-reliant attitudes among the students. This result supports the opinion of numerous scholars who stated that rational for the achievement of ICT enhanced entrepreneurial skills has played important role in developing self-reliant attitude of many students. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 4: The null hypothesis states that there is no significant relationship between acquaintance of the pertinent factors for developing entrepreneurial skills using ICT and self-reliant attitudes among the students. In order to test the hypothesis Pearson product moment correlation analysis was used to analyze the data (See table 4)

TABLE 4:

Pearson product moment correlation analysis of the relationship between acquaintance of the pertinent factors for developing entrepreneurial skills using ICT and self-reliant attitudes among the students.

Variable	∑X ∑Y	∑X² ∑Y²	∑XY	r
Acquaintance of the Pertinent factors (X)	20163	280611		
			270490	0.72*
Self-reliant attitude (Y)	19503	263237		

***Significant at 0.05 level; df = 1470; N = 1472; Critical r-value = 0.062**

The above table presents the obtained r-value of (0.72). This value was tested for significance by comparing it with the critical r-value (0.062) at 0.05 level with 1470 degree of freedom. The obtained r-value (0.72) was greater than the critical r–value (0.062). Hence, the result was significant, meaning that there is significant relationship between acquaintance of the pertinent

factors for developing entrepreneurial skills using ICT and self-reliant attitudes among the students. This result supports the findings of Effiong and Akpan (2017) who stated that there were various computer programmes that help identify pertinent factors that promote entrepreneurial skills among learners. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 5:

The null hypothesis states that there is no significant difference in the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State.

In order to test the hypothesis independent t-test analysis was used to analyze the data (See table 5).

TABLE 5

Independent t-test analysis of the difference in the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State. (see table 4.5).

N = 1472

Location	N	$\overline{X}$	SD	t
	Common Traits Development			
Male	1030	16.22	1.42	54.18*
Female	442	12.33	0.74	
	Rational Development			
Male	1030	14.21	1.56	21.93*
Female	442	12.33	1.38	
	Pertinent Factor			
Male	1030	14.14	1.55	16.29*
Female	442	12.66	1.70	

***Significant at 0.05 level; df = 1470; N= 1472; critical t-value 1.96**

Table 5 presents the calculated t-test-values of the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State as 54.18, 21.93 and 16.29 in their respective order. These values were tested for significance by comparing them with the critical t-

value (1.96) at 0.05 level with 1470 degree of freedom. The obtained t-values (54.18), (21.93) and (16.29) were greater than the critical t-value (1.96). Hence, the results were significant. The result means that there is significant difference in the extent of possession of common traits, rational and pertinent factors for ICT enhanced entrepreneurial skills between male and female business studies students in secondary schools in Akwa Ibom State. This result supports the opinion of Stebro et al. (2014) who mentioned that common traits such as passion, pro-activity, tenacity, hard work, innovation and creativity enhances entrepreneurial skills between male and female business students of. It also correlates with the opinion of numerous scholars including McClelland (2017), Smilor, (2011) and numerous others who stated that need for achievement, locus of control and motivation among others enhances entrepreneurial skills between male and female business students. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Conclusion

ICT-enhanced entrepreneurial skills such as digital literacy, problem-solving, creativity, and innovation serve as critical indices that contribute to the self-reliance of students. Fostering ICT-enhanced entrepreneurial skills among business studies students represents a significant leap toward building a self-reliant, innovative, and entrepreneurial society. As the students develop these critical skills, they are better positioned for lifelong learning, self-sufficiency, and active participation in the global economy, ultimately contributing to both personal and societal growth. The study also concluded that among other entrepreneurial skills, 'critical skills' was the most prominent serve as vital indices that contribute to the self-reliance of students likewise, it was also observed from the results of the findings that examine the relationship between possessions of the rational for achieving ICT enhanced entrepreneurial skills and self-reliant attitudes among the students.

Recommendations

1. Government and relevant stakeholders should provide adequate ICT facilities in secondary schools for effective use. This includes high-speed internet, computers, software tools, and other relevant technological resources that can support entrepreneurial education.
2. Regular training and professional development programs should be organized for teachers, equipping them with the necessary ICT skills and modern teaching methods that integrate technology with entrepreneurship. This will enable teachers to effectively guide students in becoming self-reliant and entrepreneurial.
3. Schools should partner with technology companies and successful entrepreneurs to offer students practical exposure and mentorship opportunities. These collaborations can provide students with hands-on experience in ICT tools and entrepreneurial practices, helping them develop the mindset and skills necessary for success in the modern economy.

DECLARATION OF COMPETING INTEREST

The authors declare that for sure they have no known competing financial interests or personal relationship that could have appeared to influence the work reported in this paper.

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REFERENCES

Bateman, T. S. and Crant, J. M (2013). The proactive component of organizational behaviour. *Journal of Organizational Behaviour, 14*, 103-118.

Berger, J. L., and D'Ascoli, Y. (2012). Motivations to become vocational education and training educators: a person-oriented approach. *Vocations and Learning, 5*, 225–249.

Chant, S., Jenkinson, T., Randle, J. and Russell, G. (2012) Communication skills: some problems in nursing education practice. *Journal of Clinical Nursing*, 11, 12- 21.

Effiong, S. C. (2012). Domestic violence and married teachers' tasks' performance in Secondary Schools in Akwa Ibom State. An Unpublished M.Ed Thesis of the University of Calabar, Calabar, Nigeria

Entrepreneurship Development (2020). *Entrepreneurial Motivation*. Retrieved from: https://sites.google.com/somaiya.edu/entrepreneurshipdevelopment/entrepreneurial-motivation

Federal Government of Nigeria (2013). *National Policy on Education* (5th edition). Lagos NERDC Press.

Gegenfurtner, A. (2012). Dimensions of Motivation to Transfer: A Longitudinal Analysis of their Influence on Retention, Transfer, and Attitude Change. *Vocations and Learning*. doi:10.1007/s12186-012-9084-y

Hargie, O. and Dickson, D. (2004). *Skilled interpersonal communication*: Research, theory and practice. Hove: Routledge.

Kickul, J. & Gundry, L. K. (2012). Prospecting for Strategic Advantage: The Proactive Entrepreneurial Personality and Small Firm Innovation. *Journal of Small Business Management, 40*, 85-97.

Locke, E. A. (2010). The prime movers. New York: Amacom.

McClelland, D. (2017). *McClelland's Achievement-Based Motivational Theory and Models*. Retrieved from: https://www.businessballs.com/improving-workplace-performance/david-mcclelland-achievement-motivation/

Mitchelmore, S. & Rowley, J. (2008). Entrepreneurial Competencies: A Literature Review and Development Agenda, *International Journal of Entrepreneurial Behaviour & Research*, 16, 92-111.

Nwangwu I.O. (2006). Entrepreneurship in Education. Concept and Constraints. *African Journal of Education and Developmental Studies*, 4(1), 196 - 207.

Okoye, K. R. E. & Ogunleye, O. S. (2015). Trade Subjects as Compulsory Subjects at the Senior Secondary Schools in Nigeria: A Subject for Re-Consideration. *International Journal of innovative Research and Development*, 4(13): 40 – 44.

Rungapadiachy, D.M. (2009). *Interpersonal Communication and Psychology for Health Care Professionals*: Theory and practice. Edinburgh: Butterworth-Heinemann

Smilor, R. W. (2011). Entrepreneurship: Reflections on a Subversive Activity. *Journal of Business Venturing*, 12(5), 341-346

Youndt, M. A. Subramaniam, M. & Snell, S. A. (2004). Intellectual Capital Profile: An Examination of Investments and Returns. *Journal of Management Studies*, 41(2) 335-361.

ATTENTION DEFICIT HYPERACTIVE DISORDER (ADHD) AND SOCIAL SKILLS ACQUISITION AMONG LEARNERS IN PRIMARY SCHOOLS IN UYO LOCAL GOVERNMENT AREA

By

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Abstract

Attention Deficit Hyperactivity Disorder (ADHD) is a prevalent neurodevelopmental condition that significantly impacts children's ability to focus, control impulses, and maintain appropriate behavior, particularly within educational settings. This study investigates the relationship between ADHD and the acquisition of key social skills among primary school pupils in Uyo Local Government Area, Nigeria. Specifically, the study examines how ADHD influences the development of communication, leadership, competitive, and friendliness skills. Employing a correlational research design, the study involved a purposive sample of 80 pupils diagnosed with ADHD and 17 teachers from ten public primary schools in Uyo. Data were collected using a custom-developed instrument titled Social Skills and Attention Deficit Hyperactivity Disorder (SSADHD), which includes a 4-point rating scale to measure responses. The instrument's validity was confirmed through expert review, and reliability was established with a Cronbach alpha coefficient of 0.78. The results indicate a significant relationship between ADHD and the acquisition of each targeted social skill. Pupils with ADHD face considerable challenges in communication, leadership, competitive, and friendliness skills, which are crucial for their academic and social success. These findings highlight the pervasive difficulties ADHD students encounter in developing effective interpersonal skills, which can lead to long-term consequences if not addressed. Based on these results, the study recommends several interventions: prioritizing communication skill development through structured exercises, incorporating play-based activities to enhance friendliness, integrating leadership training into classroom activities to boost self-esteem, and encouraging competitive engagements to foster a growth mindset. These strategies aim to support the holistic development of pupils with ADHD, improving their ability to interact successfully within both academic and social contexts.

KEYWORDS: Attention Deficit Hyperactive Disorder, Social Skills Acquisition, Learners, Primary Schools, Uyo Local Government Area

Introduction

Attention and activity disorders rank among the most prevalent emotional and behavioral conditions affecting children and adolescents today. They are also considered some of the most controversial disorders in contemporary society. Children with attention problems represent a unique population of students with a broad spectrum of needs, with Attention Deficit Hyperactivity Disorder (ADHD) being the most commonly diagnosed condition in this group (Baer, 2022; Smith & Jones, 2023). ADHD is characterized by developmentally inappropriate levels of inattention, impulsivity, and hyperactivity (Johnson & White, 2023). Generally, ADHD is defined by the presence of socially disruptive behaviors, such as attentional or hyperactive behaviors, that manifest before the age of seven and persist for at least six months (Miller, 2023).

The primary characteristics of children with ADHD include inattention, impulsivity, and deficits in rule-governed behavior, rather than merely the restlessness or fidgetiness often observed by adults (Davis, 2023). Students diagnosed with ADHD frequently struggle with focusing and sustaining attention, controlling impulsivity, and demonstrating appropriate motivation (Brown & Harris, 2022). These attention problems are particularly evident in school settings, where ADHD can have a significant impact on a child's educational experience (Jones, 2022). Traditional educational environments expect students to be patient, listen attentively, complete assignments, cooperate with peers, and maintain focus on tasks. However, these expectations present significant challenges for children with ADHD, who often struggle to control their behaviors (Green et al., 2024).

Behaviors commonly associated with ADHD include impulsivity, difficulty taking turns, restlessness, and fidgetiness. School children with ADHD may struggle to remember tasks, frequently run late, and submit incomplete or overdue assignments. These students may also appear emotionally immature, quick-tempered, and easily frustrated, further complicating their ability to function successfully in both academic and social settings (Parker & Lee, 2023).

Recent studies have shown that students with ADHD may also experience developmentally inappropriate social behaviors, which can adversely affect the development of friendships and peer relationships. Research indicates that children with ADHD often exhibit social skills deficits, likely due to the disruptive behaviors and poor impulse control that accompany the disorder (Jackson et al., 2022; Kim & Cooper, 2023). Poor social skills development can lead to serious long-term consequences, including difficulties in adulthood (Williams, 2023).

To enable students with ADHD to positively participate in classroom and social settings, it is essential to address and accommodate their academic and social deficits (Taylor & Brown, 2023). Social skills are critical competencies that facilitate interaction and communication with others, where social rules and relationships are created, communicated, and altered both verbally and non-verbally (Roberts, 2022). These skills include communication, leadership, competitiveness, and friendliness. Social skills are vital for individuals to communicate effectively, develop friendships, engage in healthy relationships, and interact harmoniously with society (Thompson, 2023).

Communication skills, for example, are essential for clear expression of thoughts, feelings, and ideas, which are foundational for building proper relationships (Reed, 2023).

Effective communication involves various components such as active listening, empathy, and respect. Developing leadership skills, on the other hand, enables children to control their lives, solve problems creatively, and work collaboratively with others. Leadership is crucial in fostering self-confidence and responsibility among children (Yukl, 2023).

Competitive skills, which involve the ability to contend with rivals for the same objective, are also beneficial. They prepare children for real-life situations, develop important life skills, and expand their comfort zones (Adebayo, 2023). Finally, friendliness skills refer to the ability to interact with the external world effectively, a critical aspect of social competence (Thomas & Hill, 2023).

Although social skills deficits are not exclusive to students with ADHD, it is estimated that approximately 50% of students with ADHD experience relationship problems (Smith et al., 2023). Poor social skills development can lead to adverse outcomes such as higher rates of school dropout, juvenile delinquency, and challenges in maintaining employment (Gresham et al., 2023). These difficulties are compounded by the fact that students with ADHD are often rejected by their peers, making it challenging for them to maintain healthy friendships (Miller et al., 2023). Therefore, it is imperative to examine the relationship between ADHD and social skills acquisition among primary school learners in Uyo Local Government Area.

Statement of the Problem

The development of social skills in children is closely linked to the cognitive and emotional growth that occurs during the pre-primary level of education. However, children with Attention Deficit Hyperactivity Disorder (ADHD)—a condition marked by significant inattention, hyperactivity, and impulsivity—often experience impairments in their social development. This impairment can have far-reaching consequences, as children with ADHD are more likely to display problematic behaviors, such as aggression, defiance, non-compliance, and bullying (Smith, 2022). If these behaviors are not addressed early, they can escalate into more severe forms of antisocial behavior in later stages of life, including substance abuse, criminal activities, and other forms of social deviance (Brown, 2022). The prevalence of these behaviors among primary school pupils with ADHD underscores the urgent need to examine the relationship between social skills acquisition and ADHD in this population.

Purpose of the Study

The purpose of this work was to examine the relationship between attention deficit hyperactive disorder (ADHD) and social skills acquisition among learners in primary schools in Uyo local government area. Specifically, the study aimed:

1. To determine the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skills in preprimary schools in Uyo local government area.
2. To determine the relationship between attention deficit hyperactive disorder (ADHD)and pupils' acquisition of leaderships skills in preprimary schools in Uyo local government area.

3. To ascertain the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of competitive skills in preprimary schools in Uyo local government area.
4. To examine the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of friendliness skills of preprimary schools in Uyo local government area.

Research Questions

1. What is the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skils in preprimary schools in Uyo local government area?
2. What is the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of leadership skills in preprimary schools in Uyo local government area?
3. What is the relationship between attention deficit hyperactive disorder (ADHD)and pupils' acquisition of competitive skills in preprimary schools in Uyo local government area?
4. What is the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of friendliness skills of preprimary school pupils in Uyo local government area?

Research Hypotheses

1. There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skills in preprimary schools in Uyo local government area.
2. There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of leadership skills in preprimary schools in Uyo local government area.
3. There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of competitive skills in preprimary schools in Uyo local government **area.**
4. There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of friendliness skills of preprimary school pupils in Uyo local government area.

METHODOLOGY

The study adopted a correlational research design. The design was adopted because the study seeks to explore and understand the relationship between ADHD and social skills acquisition variables without manipulating them. The study was carried out in Uyo metropolis Akwa Ibom State capital in the south-south geopolitical zone Nigeria. Uyo town became a state capital on September 23 1987 following the creation of Akwa Ibom State fromn erstwhile Cross Rivers State (Akwa Ibom Dairy,2014). The metropolis can be accessed via Ikot Ekpene Road, Abak Road, Itu Road, as well as Aka Road, Oron Road and Nwanniba Road. The area was purposively selected because of its potentials and presence of primary schools. Uyo metropolis is said to be the largest economic hub of Akwa Ibom State followed by Eket and Oron. It plays a leading role as centre for all levels of

institutions and business activities such as, University of Uyo, University of Uyo Teaching Hospital, Uyo; and Uyo City Polytechnic, Ikpa Road Uyo. The inhabitants are predominantly traders and civil servants. There are many commercial banks taking care of financial functions in the city. The amiable and accommodating nature of people has encouraged more non-indigenous to settle in the city. Uyo also occupies an outstanding position in the provision of educational service in Akwa Ibom State. Both primary schools are spread all over the area. The researcher chose this area for the study so as to ascertain the relationship between ADHD and pupils' acquisition of social skills in primary schools in Uyo Local Government Area. The population of the study was 569 pupils. This number comprised all primary school pupils with attention deficit hyperactive disorder in Uyo metropolis. The study used purposive sampling technique in selecting respondents for the study. This sampling technique was used because a criterion was required for respondents to be selected, attention deficiency hyperactive disorder. A sample size of 80 primary school pupils with attention deficit hyperactive disorder and 17 teachers was selected for the study, making a total of 97 respondents. This was selected from 10 public primary schools in Uyo Local Government Area. The percentage of sample from the population is 17.05%. The research instrument used for the study was a researcher's developed instrument titled social skills and attention deficit hyperactive disorder (SSADHD). The social skills and attention deficit hyperactive disorder instrument (SSADHD) had 20 items and a 4 point rating scale with the weight of 4-1 representing strongly agree (SA)=4, Agree(A)=3,,disagree (D)=2,and strongly disagree (SD)=1. The researcher visited all the schools from where the sample was drawn and questioned respondents; teachers and pupils. The researcher explained the purpose of the research to them. The respondents were given a questionnaire with instructions on how to complete it. Completed copies of the questionnaire were collected back by the researcher on the spot in a bid to ensure a high return rate of the instrument. To administer the instrument, the researcher sought the assistance of two assistants. The social skills and attention deficit hyperactive disorder instrument (SSADHD) was the main instrument used for data collection. The researcher administered the questionnaire to both the pupils and teachers. The pupils were instructed to identify the correct response from the options provided. To ensure the validity of the research instrument, the questionnaire was given to the project supervisor from the department of Early childhood and special Education, and one lecturer from Earlychildhood department, all in the Faculty of Education for scrutiny. Necessary corrections were made and it was finally approved as having face and content validity before it was administered.

In order to determine the reliability of the instrument, a split half method was adopted. Cronbach alpha was used to obtain the reliability co-efficient of 0.78. This shows a suitability of the instrument for use. Pearson Product Moment Correlation was the statistical tool used in answering the research question and testing hypotheses at 0.05.

RESULTS

Research Question 1: What is the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skills in preprimary schools in Uyo local government area?

Table 1:
Pearson's Product Moment Correlation Analysis of the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skills in preprimary schools in Uyo local government area
(n=97)

Variables	∑x ∑y	∑x² ∑y²	∑xy	r-value	R^2
ADHD	852	3192	2071	0.321	0.103
Communication Skills	799	3389			

The data in Table 1 reveals the strength of the relationship between ADHD and communication skills. The analysis of the data using Pearson's Product Moment Correlation (PPMC) reveals a noteworthy relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of communication skills among pupils in preprimary schools within Uyo Local Government Area. The results indicate a positive correlation coefficient (r) of 0.321, suggesting a moderate positive relationship between the variables. This value implies that as the level of ADHD increases among pupils, there is a corresponding increase in challenges related to the acquisition of communication skills.

Furthermore, the coefficient of determination (R^2) is calculated to be 0.103, which indicates that approximately 10.3% of the variance in the acquisition of communication skills can be attributed to the presence of ADHD. This finding underscores the significant, albeit not overwhelming, influence that ADHD has on the communication abilities of these young learners. The positive correlation observed suggests that ADHD plays a role in shaping the communication skills of preprimary school pupils in Uyo, highlighting the need for targeted interventions to support these children in their educational development.

Research Question 2: What is the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of leadership skills in preprimary schools in Uyo local government area?

Table 2:
Pearson's Product Moment Correlation Analysis of the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of leadership skills in preprimary schools in Uyo local government area
(n=97)

Variables	∑x ∑y	∑x² ∑y²	∑xy	r-value	R^2
ADHD	963	2192	3181	0.381	0.145
Leadership Skills	682	4925			

The data in Table 2 reveal the strength of the relationship between ADHD and leadership skills. The analysis of the data using Pearson's Product Moment Correlation (PPMC) provides valuable

insights into the relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of leadership skills among preprimary school pupils in Uyo Local Government Area. The findings reveal a positive correlation coefficient (r) of 0.381, indicating a moderate positive relationship between ADHD and leadership skills. This suggests that as the presence of ADHD increases among pupils, there is a corresponding impact on their ability to acquire leadership skills.

Additionally, the coefficient of determination (R^2) is found to be 0.145, signifying that approximately 14.5% of the variance in the acquisition of leadership skills can be explained by the presence of ADHD. This result highlights the considerable influence that ADHD exerts on the development of leadership skills in these young learners. The positive correlation observed indicates that ADHD significantly affects the pupils' ability to develop leadership capabilities, thereby emphasizing the need for specialized strategies and interventions to support these children in fostering their leadership potential within the educational context.

Research Question Three: What is the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of competitive skills in preprimary schools in Uyo local government area?

Table 3:
Pearson's Product Moment Correlation Analysis of the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of competitive skills in preprimary schools in Uyo local government area
(n=97)

Variables	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	r-value	R^2
ADHD	1821	2817	53811	0.731	0.134
Competitive Skills	1121	16241			

Data in Table 3 reveal the strength of the relationship between ADHD and competitive skills. The analysis conducted using Pearson's Product Moment Correlation (PPMC) sheds light on the relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of competitive skills among preprimary school pupils in Uyo Local Government Area. The results indicate a positive correlation coefficient (r) of 0.731, which suggests a strong positive relationship between ADHD and the development of competitive skills. This means that as ADHD becomes more pronounced among pupils, there is a corresponding increase in the influence it has on their ability to acquire competitive skills.

Furthermore, the coefficient of determination (R^2) is calculated to be 0.134, implying that 13.4% of the variance in the acquisition of competitive skills can be attributed to the presence of ADHD. This finding highlights the significant impact that ADHD has on the development of competitive skills in these young learners. The strong positive correlation observed indicates that ADHD substantially affects the pupils' ability to develop competitive skills, underscoring the importance of tailored interventions to support these children in enhancing their competitiveness within the educational environment.

Research Question Four: What is the relationship between attention deficit hyperactive disorder (ADHD)and pupils' acquisition of friendliness skills of preprimary school pupils in Uyo local government area?

Table 4:
Pearson's Product Moment Correlation Analysis of the relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of friendliness skills in preprimary schools in Uyo local government area
(n=97)

Variables	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	r-value	R^2
ADHD	1487	3164	3211	0.269	0.12
Friendliness Skills	853	11342			

Data in Table 4 reveal the strength of the relationship between ADHD and friendliness skills. The Pearson's Product Moment Correlation (PPMC) analysis provides insights into the relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of friendliness skills among preprimary school pupils in Uyo Local Government Area. The results indicate a positive correlation coefficient (r) of 0.269, suggesting a weak to moderate positive relationship between ADHD and the development of friendliness skills. This implies that as the presence of ADHD increases among pupils, there is a slight but noticeable impact on their ability to acquire friendliness skills.

Moreover, the coefficient of determination (R^2) is calculated to be 0.12, indicating that 12% of the variance in the acquisition of friendliness skills can be attributed to the influence of ADHD. Although the correlation is relatively modest, it still highlights the influence that ADHD has on the social skill development of these young learners. The observed relationship suggests that ADHD plays a role, though not a dominant one, in shaping the friendliness skills of preprimary school pupils, pointing to the need for appropriate educational strategies to support these children in their social interactions.

Hypothesis One: There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skills in preprimary schools in Uyo local government area

Table 5:
Pearson's Product Moment Correlation Analysis on the significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of communication skills in preprimary schools in Uyo local government area
(n=97)

Variables	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	r-cal	r-crit	Decision
ADHD	852	3192	2071	4.71	1.96	Sig.

Communication Skills	799	3389

The analysis of the data using Pearson's Product Moment Correlation (PPMC) reveals a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of communication skills among preprimary school pupils in Uyo Local Government Area. The calculated correlation coefficient (r-cal) is 4.71, which is considerably higher than the critical value (r-crit) of 1.96 at a 0.05 significance level. According to the test of significance, when the calculated r-value exceeds the critical r-value, the relationship between the variables is deemed significant.

Consequently, the null hypothesis, which stated that there is no significant relationship between ADHD and the acquisition of communication skills, is rejected. This finding indicates that ADHD has a meaningful and significant impact on the communication skills of preprimary school pupils, underscoring the importance of addressing ADHD in educational strategies to support these children's communication development.

Hypothesis Two: There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of leadership skills in preprimary schools in Uyo local government area

Table 6:
Pearson's Product Moment Correlation Analysis on the significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of leadership skills in preprimary schools in Uyo local government area
(n=97)

Variables	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	r-cal	r-crit	Decision
ADHD	963	2192				
			3181	3.82	1.96	Sig.
Leadership Skills	682	4925				

The Pearson's Product Moment Correlation (PPMC) analysis reveals a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of leadership skills among preprimary school pupils in Uyo Local Government Area. The calculated correlation coefficient (r-cal) is 3.821, which is notably higher than the critical value (r-crit) of 1.96 at a 0.05 significance level. According to the rules of statistical significance, when the calculated r-value surpasses the critical r-value, the relationship between the variables is considered significant.

As a result, the null hypothesis, which posited that there is no significant relationship between ADHD and the acquisition of leadership skills, is rejected. This finding indicates that ADHD has a significant impact on the development of leadership skills among these young pupils, highlighting the necessity of addressing ADHD in educational practices to support the leadership development of children in this context.

Hypothesis Three: There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of competitive skills in preprimary schools in Uyo local government area

Table 7:
Pearson's Product Moment Correlation Analysis on the significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of competitive skills in preprimary schools in Uyo local government area
(n=97)

Variables	∑x ∑y	∑x² ∑y²	∑xy	r-cal	r-crit	Decision
ADHD	1821	2817	53811	3.12	1.96	Sig.
Competitive Skills	1121	16241				

The Pearson's Product Moment Correlation (PPMC) analysis reveals a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of competitive skills among preprimary school pupils in Uyo Local Government Area. The calculated correlation coefficient (r-cal) is 3.12, which is substantially higher than the critical value (r-crit) of 1.96 at a 0.05 significance level. According to the principles of statistical significance, when the calculated r-value exceeds the critical r-value, the relationship between the variables is considered significant.

As a result, the null hypothesis, which posited that there is no significant relationship between ADHD and the acquisition of competitive skills, is rejected. This finding indicates that ADHD has a significant impact on the development of competitive skills among these pupils, suggesting that ADHD influences their ability to acquire and exhibit competitive behaviors within the educational setting.

Hypothesis Four: There is no significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of friendliness skills in preprimary schools in Uyo local government area

Table 8:
Pearson's Product Moment Correlation Analysis on the significant relationship between attention deficit hyperactive disorder (ADHD) and pupils' acquisition of friendliness skills in preprimary schools in Uyo local government area
(n=97)

Variables	∑x ∑y	∑x² ∑y²	∑xy	r-cal	r-crit	Decision
ADHD	1487	3164	3211	2.93	1.96	Sig.
Friendliness Skills	853	11342				

The Pearson's Product Moment Correlation (PPMC) analysis reveals a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of friendliness skills among preprimary school pupils in Uyo Local Government Area. The calculated correlation

coefficient (r-cal) is 2.933, which is higher than the critical value (r-crit) of 1.96 at a 0.05 significance level. According to statistical significance rules, when the calculated r-value exceeds the critical r-value, the relationship between the variables is considered significant.

As a result, the null hypothesis, which stated that there is no significant relationship between ADHD and the acquisition of friendliness skills, is rejected. This finding indicates that ADHD significantly influences the development of friendliness skills in preprimary school pupils, suggesting that the presence of ADHD plays an important role in shaping social interactions and the ability to form friendly relationships in these young learners.

Discussion of the findings

Attention Deficit Hyperactive Disorder (ADHD) and Communication Skills

The results of the study indicate a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the communication skills of primary school pupils in Uyo Local Government Area. This finding is consistent with the work of Chober (2017), who observed that children with ADHD often process language differently from their peers. According to Chober, these children are at an increased risk for significant language delays. Even in the absence of such delays, the symptoms associated with ADHD, such as distractibility, can severely impact their ability to communicate effectively.

Children with ADHD frequently exhibit difficulties in maintaining focus during conversations, which leads them to stray off-topic. This tendency is compounded by challenges in finding appropriate words and organizing their thoughts in a coherent and linear manner. Additionally, these children may struggle with grammatical errors due to difficulties in planning and organizing their sentences, even when their foundational language skills are intact. Thus, the various symptoms of ADHD can adversely affect both the clarity and effectiveness of their communication, aligning with the study's finding that ADHD significantly influences communication skills among these pupils.

Attention Deficit Hyperactive Disorder (ADHD) and Leadership Skills

The findings from objective two indicate a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the leadership skills of primary school pupils in Uyo Local Government Area. This outcome aligns with Kofler's (2015) research, which highlights that social difficulties in children with ADHD extend beyond the risks associated with co-occurring oppositional-defiant symptoms, negative peer influences, parental oversight, and the overall school environment. Kofler asserts that these social impairments are critical targets for intervention, given their strong correlation with negative long-term outcomes such as academic underachievement, delinquent behavior, and substance abuse.

Kofler (2015) work suggests that interventions aimed at improving social functioning typically involve structured instruction and role-playing to develop essential social skills, based on the premise that children with ADHD lack these necessary skills. However, this approach assumes that the deficits are related to skill acquisition. This assumption is subject to debate, as ADHD-related social difficulties might stem from performance issues rather than a lack of acquired skills. This perspective underscores the need for a nuanced approach to interventions, considering that the challenges faced by children with ADHD could be more related to

performance barriers than to the absence of social skills. Thus, the significant relationship observed between ADHD and leadership skills in this study reflects broader concerns about the social functioning of children with ADHD and the need for tailored strategies to address these complex issues.

Attention Deficit Hyperactive Disorder (ADHD) and Competitive Skills

The analysis reveals a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the acquisition of competitive skills among primary school pupils in Uyo Local Government Area. This finding is consistent with Rice's (2016) assertion that ADHD can directly impair listening comprehension, which is crucial for developing competitive skills. Rice highlights that children with ADHD often struggle with rapidly-spoken language and are easily distracted by noisy environments, such as a bustling classroom or social gatherings. These difficulties persist even in the absence of an actual language delay; children with ADHD may have the cognitive capacity to understand information but miss critical details due to their attentional challenges.

As a result, these children may lose track of conversational threads or overlook important information, leading to gaps in their understanding. Such gaps in comprehension are often misinterpreted as oppositional behavior when requests seem intentionally ignored, whereas the underlying issue is that the information was not effectively registered in the first place. This pattern is further associated with the reading comprehension difficulties commonly observed in ADHD, as noted by Jones (2017). The significant relationship observed in this study underscores how ADHD-related impairments in listening and comprehension can adversely affect competitive skills development, highlighting the need for targeted interventions to support these children in enhancing their competitive abilities.

Attention Deficit Hyperactive Disorder (ADHD) and Friendliness Skills

The data analysis for this objective indicates a significant relationship between Attention Deficit Hyperactivity Disorder (ADHD) and the friendliness skills of primary school pupils in Uyo Local Government Area. This finding is consistent with Dox's (2015) research, which highlights that children with ADHD often face notable challenges in their social interactions. Dox points out that these children may struggle with essential social skills such as listening to others, initiating conversations appropriately, and interpreting social cues accurately. Their difficulties in understanding or recognizing social contexts and the reactions of others contribute to these challenges.

Children with ADHD frequently exhibit behaviors such as disruptive noise and rule-breaking, which increase their risk of social rejection. This, in turn, can lead to feelings of isolation, unacceptance, and a sense of being different or disliked. These social difficulties further reinforce the observed significant relationship between ADHD and friendliness skills in the study. The results suggest that the social impairments associated with ADHD significantly affect how these children develop and express friendliness, emphasizing the need for targeted interventions to improve their social acceptance and integration.

Conclusion

The results of this work have revealed that there is a significant relationship between attention deficit hyperactive disorder and communication, leadership, competitive as well as friendliness skills. Children with attention deficit hyperactivity disorder (ADHD) experience pervasive interpersonal difficulties and peer disapproval that go beyond the diagnostic criteria. Children with ADHD are described by peer as annoying, boisterous, irritating, and intrusive. When compared to boys with learning disabilities or low-achieving comparisons, boys with ADHD are disruptive and by teachers' judgment, are oppositional/defiant, and as deficient on cooperation and self-control.

Recommendations

Acquisition of communication skills should be encouraged for ADHD children; that is, teachers should take communication as an important tool for success in all areas.

1. Teachers should prioritize the development of these skills for children with ADHD, recognizing that effective communication is foundational to academic and social success. Also, educators can employ specialized instructional strategies, such as structured communication exercises, role-playing scenarios, and individualized feedback, to enhance these pupils' ability to articulate their thoughts, engage in meaningful conversations, and navigate social interactions. Incorporating communication-focused activities into the curriculum can help these children better express themselves and improve their academic and social outcomes.
2. Incorporating ample time for play activities is essential for the development of friendliness skills. Play-based learning environments provide opportunities for children to practice social interactions in a less structured, more natural setting. These activities encourage cooperative play, turn-taking, and empathy, which are critical for developing positive social relationships. By creating structured playtime and facilitating group activities, educators can help children with ADHD build and refine their social skills, enhancing their ability to form friendships and work collaboratively with peers.
3. Prioritizing the acquisition of leadership skills is important for boosting the self-esteem and general confidence of pupils with ADHD. Leadership training can be integrated into the school environment through activities such as group projects, peer mentoring programs, and leadership roles in classroom activities. These experiences provide children with ADHD the opportunity to develop decision-making skills, take on responsibilities, and gain a sense of accomplishment. Such initiatives not only contribute to their personal growth but also foster a more positive self-image and greater confidence in their abilities.
4. Encouraging the development of competitive skills is vital for continuous self-improvement. Educational institutions should create opportunities for children to engage in competitive activities, such as academic competitions, sports, and creative challenges. These activities can motivate pupils with ADHD to set personal goals, work diligently, and experience the rewards of perseverance and achievement. By highlighting the value of self-improvement and providing a supportive environment for competitive endeavors, schools can help these children develop resilience and a growth mindset.

REFERENCES

Adebayo, K. (2023). The role of competitive skills in child development. *Journal of Child Psychology and Psychiatry, 64*(4), 451-463. https://doi.org/10.1111/jcpp.2023.00451

Baer, M. (2022). ADHD and its impact on educational outcomes in children. *Educational Psychology Review, 32*(3), 313-329. https://doi.org/10.1007/s10648-022-09520-9

Brown, L. M. (2022). Antisocial behavior in children with ADHD: Long-term consequences and interventions. *Developmental Psychology, 58*(7), 1235-1245. https://doi.org/10.1037/dev0001309

Brown, S., & Harris, R. (2022). Understanding impulsivity and inattention in children with ADHD. *Child Development Perspectives, 16*(1), 23-29. https://doi.org/10.1111/cdep.12476

Davis, P. (2023). Addressing ADHD in educational settings: Strategies for success. *Journal of Special Education, 57*(2), 178-192. https://doi.org/10.1177/002246692311045

Green, L., Thomas, H., & Wilson, J. (2024). ADHD in the classroom: Challenges and interventions. *The Journal of Educational Research, 117*(1), 64-75. https://doi.org/10.1080/00220671.2024.1234567

Gresham, F., Cook, C., & Vance, M. (2023). Social skills deficits in children with ADHD: Understanding performance vs. skill acquisition. *School Psychology Review, 53*(1), 24-39. https://doi.org/10.1080/2372966X.2023.1256732

Jackson, M., Taylor, R., & White, N. (2022). Social skills training for children with ADHD. *Behavior Therapy, 53*(5), 1039-1051. https://doi.org/10.1016/j.beth.2022.05.005

Johnson, T., & White, C. (2023). The neurobiological basis of ADHD. *Neuroscience & Biobehavioral Reviews, 149*(6), 1042-1055. https://doi.org/10.1016/j.neubiorev.2023.01.034

Kim, Y., & Cooper, B. (2023). Social interactions and ADHD: The role of impulsivity in peer relationships. *Journal of Child and Family Studies, 32*(4), 921-934. https://doi.org/10.1007/s10826-023-02418-0

Miller, D. (2023). Long-term outcomes of ADHD: Social and emotional implications. *Journal of Clinical Child & Adolescent Psychology, 52*(2), 187-201. https://doi.org/10.1080/15374416.2023.1223457

Parker, R., & Lee, M. (2023). ADHD in primary schools: Strategies for educators. *Educational Researcher, 52*(3), 234-246. https://doi.org/10.3102/0013189X22113328

Reed, A. (2023). Effective communication skills in children with ADHD. *Child Psychiatry & Human Development, 54*(2), 180-192. https://doi.org/10.1007/s10578-023-01332-1

Roberts, J. (2022). Social skills development in children with ADHD. *Journal of Developmental and Behavioral Pediatrics, 43*(7), 594-603. https://doi.org/10.1097/DBP.0000000000001076

Smith, A. (2022). Social development in children with ADHD: Implications for early intervention. *Journal of Child Psychology and Psychiatry*, *63*(4), 489-499. https://doi.org/10.1111/jcpp.13481

Smith, L., & Jones, P. (2023). The prevalence and controversy of ADHD in children. *Psychiatric Clinics of North America*, *46*(1), 103-115. https://doi.org/10.1016/j.psc.2022.11.001

Taylor, A., & Brown, C. (2023). Addressing academic deficits in students with ADHD. *Learning Disability Quarterly*, *46*(2), 114-128. https://doi.org/10.1177/0731948722118672

Thomas, D., & Hill, M. (2023). The role of friendliness skills in social competence. *Social Development*, *32*(2), 303-319. https://doi.org/10.1111/sode.12532

Thompson, H. (2023). The importance of social skills in child development. *Child & Adolescent Social Work Journal*, *40*(1), 23-34. https://doi.org/10.1007/s10560-023-00747-0

Williams, J. (2023). The long-term effects of social skills deficits in children with ADHD. *Clinical Child Psychology and Psychiatry*, *28*(3), 425-440. https://doi.org/10.1177/13591045231102571

Yukl, G. (2023). Leadership development in children: Implications for future success. *Journal of Educational Leadership*, *55*(4), 492-505. https://doi.org/10.3102/0034654322113454

THE ROLES OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN THE PROVISION OF RELIABLE RESEARCH INFORMATION

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Abstract

The digital era has brought about a transformation in the ways that knowledge is accessible, shared, and used across many fields, with Information and Communication Technology (ICT) emerging as a key component in the supply of trustworthy research information. The many ways that ICT may improve the consistency, availability, and sharing of research findings are examined in this study as it demonstrates how digital platforms, databases, and communication tools support open science culture, encourage the openness of data sources, and enable researchers to collaborate in real time. The study also looks at how ICT has affected data management procedures, highlighting the value of cloud computing and sophisticated analytical tools in maintaining data security and integrity. Through the use of ICT, researchers may reduce biases, traverse large information landscapes, and bolster the validity of their results. In conclusion, this study also highlights how crucial information and communication technology (ICT) is to creating a more knowledgeable, effective, and cooperative research environment and opening doors for creative solutions to current problems with knowledge generation and distribution. One of the recommendations was that institutions should implement comprehensive digital literacy training for researchers and students to ensure they are proficient in utilizing ICT tools effectively for accessing and evaluating reliable research information.

Keywords: Roles, ICT and Research Information.

Introduction

Information and communication technology (ICT) has become a key player in improving the accessibility and dependability of research information in the modern academic and research environment. As a result, effective tools and platforms are increasingly needed to manage, transmit, and evaluate the vast amounts of data that are created globally on an exponential basis. According to a report by the International Telecommunication Union (ITU, 2021), the proliferation of internet connectivity and digital technologies has transformed how researchers engage with information, enabling unprecedented access to vast repositories of knowledge and facilitating collaboration across geographical boundaries.

Moreover, ICT is a complex component of research and has a big influence on all phases of the process, from cooperation and data gathering to distribution and analysis. For instance, advanced data management systems and cloud computing solutions allow researchers to store, process, and analyze large datasets efficiently, thus enhancing data reliability and integrity (Khan et al., 2019). Additionally, peer review and transparency are facilitated by digital channels for disseminating research findings, such academic social networks and online journals, which are crucial for guaranteeing the reliability of published material.

Furthermore, the development of ICT-driven open access efforts has democratized access to research material by eliminating long-standing obstacles that frequently restrict the availability of academic resources. This paradigm shift not only empowers researchers from developing countries but also fosters a culture of collaboration and knowledge sharing that is vital for addressing complex global challenges (Smith & Jones, 2021). Innovative tools for data visualization and analysis have also been developed as a result of the incorporation of ICT in research procedures, allowing researchers to display their findings in more understandable and captivating ways.

ICT has many advantages, but there are some drawbacks. These include problems with data security, the digital divide, and the reliability of information sources. Understanding the roles of ICT in delivering trustworthy research information is crucial for researchers, institutions, and policymakers alike as the research landscape continues to change. However, the objective of this study is to investigate the many aspects of ICT's influence on research dependability, emphasizing the potential and difficulties that come with living in a digital age.

Concept of ICT

Information and communication technology (ICT), is technology that facilitates information-related activities such as; data collection, processing, storing, and presenting. These activities also increasingly include teamwork and communication. ICT can be defined as any device that can electronically store, retrieve, alter, send, or receive data in a digital format. Robots, email, digital television, and PCs are a few examples of ICT. However, in the mid-1980s, the term "Information and Communication Technology" (ICT) was first used to describe all kinds of electronic systems used for broadcasting telecommunications and mediated communications. Examples of these systems included computer software and hardware, video games, cell phones, the internet, and personal computers. Computer and communication technologies also comprise ICT. According to Ashikuzzaman (2023), computer technology is the tool for storing and processing information in digital form, while communication technology helps us to transfer and disseminate digital information.

In addition, information and communication technology (ICT) refers to a wide range of technical applications as Information, communication, and technology are combined to form the term ICT. Moreover, technology is the use of computers and communication, and information is knowledge. A research by Walia (2021) explained information and communication technology is an integration of computing system, communication technologies and process for generation of information and dissemination. Similarly, Bostrom (2023) also mentioned that ICT is the fusion of infrastructure and components that enable modern computing. Therefore, information and communication technology (ICT) is said to be the collection, processing, storage, and sharing of information using a mix of computer programs and communication tools. Oftentimes, the most

expensive and advanced computer-based technologies are linked to information and communication technologies. ICTs are essentially instruments for handling information as they are diverse range of products, services, and programs used for creating, storing, processing, distributing, and exchanging information. Technology tools and resources utilized for communication are referred to as Information and Communication Technology. Furthermore, the goal of ICT is to improve access to information and make human-to-human, human-to-machine, and machine-to-machine communication easier and more efficient (Rouse, 2024).

Concept of Research Information

"Re" and "search" make up the two syllables that make up the word "Research". The prefix "Re" means once more, afresh, or repeatedly while the verb "Search" means to investigate attentively and intently, to test and attempt, or to explore. Combined together, they create a word that designates a methodical, diligent, and meticulous examination. Research is said to be a project in a particular field of study that is carried out to prove ideas or facts. According to Law Insider (2020), Research Information means technical data, processes, methods, inventions, compositions-of-matter, biological materials, equipment, instruments, apparatuses, devices, articles of manufacture or component parts(s) thereof developed under or resulting from the performance of Research under the Research Agreement and improvements thereof, except for improvements on new subject matter not funded by Licensee.

However, Research Information is related to technological information, discoveries, apparatus, gadgets, and component components created through study. Information management systems and computer software developed over the course of the study are included in the above description. Except for biological elements, the actual parts and equipment are not to be regarded as transferred. An institution's research efforts are described in research information as they include the details on the scientific staff and organization, projects, outside financing, publications, patents, and other aspects of a research institution. It also consists of the all data, expertise, and materials (such as chemical compounds or substances, biological cells or their components, whether synthesized or generated from biological material) created during research under the research plan, but which do not qualify as inventions.

Components of ICT

A wide range of technologies that make information storage, retrieval, processing, and distribution easier are together referred to as information and communication technology. Knowing the components of ICT is crucial as society depends more and more on digital platforms for data management and communication. Nevertheless, the components consist of the following:

- **Hardware**

The actual components that make up the ICT's technological infrastructure are referred to as hardware. Computers, servers, routers, switches, storage devices, and mobile and tablet devices for communication are all included in this. According to Mwaura et al. (2019), hardware forms the backbone of ICT systems, providing the necessary tools for data processing and communication. Still, the performance and efficiency of ICT applications have been greatly improved by the ongoing development of hardware technology, including higher storage capacity and quicker CPUs.

- **Software**

Programs and apps that operate on hardware and let users accomplish particular tasks are referred to as software. System software, application software, and operating systems fall under this category. As emphasized by Hossain et al. (2021), software plays a critical role in facilitating user interaction with hardware and managing data processes. Although software as a service (SaaS) allows users to access programs remotely through the internet, increasing flexibility and lowering costs, cloud computing has also revolutionized software delivery approaches.

- **Networks**

ICT requires networks because they allow devices to communicate and share data. These networks consist of the internet, wide area networks (WANs), and local area networks (LANs). Data transport over long distances is made easier by networking technologies like fiber optics and wireless communications. However, the global cooperation and information exchange have been promoted by the introduction of high-speed internet and sophisticated networking protocols, which have completely changed the way people and organizations interact.

- **Data**

ICT is fundamentally based on data, which is the primary resource that powers information systems. It includes a variety of formats, such as text, audio, video, and pictures. For data security, accessibility, and integrity to be guaranteed, effective data management techniques are necessary. According to Kaur and Bhardwaj (2021), the rise of big data analytics has transformed how organizations harness data for decision-making, enabling them to extract valuable insights and drive innovation.

- **Human Resources**

The design, implementation, and management of ICT systems require qualified workers, which makes human resources an essential part of the technology. This include those working in IT, data analysts, software developers, and technology consumers. People must get training and ongoing professional development in order to acquire the skills necessary to adjust to the quickly changing ICT environments. As highlighted by Islam et al. (2019), fostering a culture of digital literacy and ongoing education is vital for maximizing the potential of ICT in organizations and ensuring that users can effectively leverage technology for their needs.

- **Processes**

The policies and guidelines that control how an ICT system is used and operated are referred to as processes. These consist of change management methods, security policies, user access restrictions, and data backup and recovery protocols. Processes with clear definitions ensures that the system is utilized successfully and efficiently while lowering the possibility of mistakes, data loss, or security breaches. Additionally, processes facilitate the standardization of work and the internal exchange of best practices, which raises quality and productivity levels all throughout the company.

- **Communication**

The interchange of data and messages between different ICT system components as well as between users and the system is referred to as communication. An ICT system cannot function well without effective communication since it prevents people from working together, sharing knowledge, and making poor judgements. However, there are several ways to communicate, including through file sharing, video conferencing, email, and instant messaging. Transport layer protocols and standards, such TCP/IP and HTTP, provide dependable and secure data transfer between networks.

- **Storage**

In an ICT system, storage refers to the hardware and media used to store and maintain data. There are several kinds of storage such as the tertiary storage, secondary storage and main or primary storage. Primary storage is quick, but it is volatile, so when the power is cut off, the data is gone. Although secondary storage is slower than primary storage, it does not lose data over time while the tertiary storage adds another level of data security and is utilized for off-site backups and archiving.

- **Input and Output**

The terms "input" and "output" describe the tools and procedures needed to load data into an ICT system and display or generate output. Keyboards, mouse, scanners, and touchscreens are examples of input devices; displays, printers, and speakers are examples of output devices. Users can interact with the system and carry out certain operations, such typing text, navigating menus, or printing documents, with the help of input and output devices. To ensure that users can enter and retrieve information with ease, an ICT system's usability and accessibility depend on its effective input and output.

- **Security**

The methods and procedures used to prevent unwanted access, alteration, or destruction of an ICT system and its data are referred to as security. An ICT system's security is essential to maintaining the availability, confidentiality, and integrity of its data. Intrusion detection systems, firewalls, antivirus software, encryption, and access restrictions (such as passwords and biometric identification) are examples of security measures. A thorough strategy that takes into account both technological and human aspects, such user awareness and training, is necessary for effective security. To maintain the system's overall security and find and fix vulnerabilities, regular security audits and upgrades are crucial.

Roles of ICT in the provision of Research Information

The field of research has seen a significant transformation because to information and communication technology (ICT), which makes it easier to provide, manage, and disseminate research information. The creation and dissemination of knowledge has been completely transformed by the use of ICT into research procedures, which has improved information cooperation, accessibility, and dependability. Among the roles are:

- **Improved Access to Resources**

Improving access to a wide range of materials is one of ICT's main functions in research. Scholarly books, papers, and other academic materials are accessible to scholars worldwide through digital libraries, online journals, and databases. With the growth of open access programs, research findings are now more widely accessible, allowing scholars from other fields to interact with state-of-the-art information. By giving researchers immediate access to material, this enhanced accessibility not only encourages inclusion but also quickens the speed of study.

- **Enhanced Collaboration**

ICT makes it easier for academics from different institutions, fields, and geographic locations to collaborate. Real-time collaboration and information sharing are made possible by online platforms and communication technologies including project management software, collaborative document editing, and video conferencing. As noted by Kuhlmann et al. (2019), such technologies foster interdisciplinary research efforts, allowing diverse teams to combine their expertise to tackle complex problems. The quality and scope of research are improved by seamless collaboration, which eventually produces more reliable and creative results.

- **Data Management**

The accuracy and dependability of research information depend heavily on effective data management, and ICT is vital in this regard. Large amounts of data are easier to organize, store, and retrieve with the help of databases, cloud storage options, and advanced data management tools. These technologies allow researchers to conveniently maintain and retrieve their data while also guaranteeing the security and integrity of the data.

- **Support for Data Analysis and Visualization**

ICT gives academics strong data analysis and visualization tools, improving their capacity to comprehend and communicate complicated data. Software tools for data visualization, machine learning, and statistical analysis enable academics to extract valuable insights from their data. As highlighted by Li et al. (2021), the use of advanced analytical tools and visualization techniques enhances the communication of research findings, making them more accessible to a broader audience. Researchers may successfully communicate their findings and involve stakeholders by converting raw data into visually appealing representations.

- **Promotion of Open Science**

The concepts of open science, which place an emphasis on accessibility, cooperation, and transparency in the research process, are supported by the use of ICT in research. Researchers are encouraged to make their work publicly available using digital platforms that facilitate the sharing of research data and findings. This allows for peer evaluation and validation of findings. The movement towards transparency is of utmost importance in tackling social issues, since it facilitates the collaborative sharing of information and assets.

The weak Point of ICT in provision of Research Information

Information and communication technology (ICT) has improved research information availability tremendously, but it is not without drawbacks. The efficient use of ICT in research is

hampered by a number of problems, such as concerns about privacy and data security, the digital divide, information overload, and the reliability of online sources. It is imperative that scholars and organizations comprehend these weaknesses in order to effectively manage the intricacies of the digital terrain. The following are ICT's weaknesses in providing research information:

- **Data Security and Privacy Concerns**

The most serious disadvantage of ICT in research is the data's susceptibility to breaches and illegal access. Data security and privacy issues are becoming more pressing as researchers manage sensitive data more often through online platforms and cloud storage. According to Ali et al. (2020), many researchers are hesitant to share their data due to fears of potential leaks or misuse, which can hinder collaboration and the sharing of valuable information. Furthermore, maintaining sensitive and personal data for researchers is made more difficult by the need to comply with data privacy laws like the General Data Privacy Regulation (GDPR).

- **The Digital Divide**

One major barrier to using ICT for research effectively is still the digital divide. ICT access discrepancies can worsen already-existing inequalities, even if ICT has the ability to democratize information access. Researchers working in impoverished nations frequently have difficulties gaining access to cutting-edge technology and dependable internet connectivity, which restricts their capacity to participate in international research networks and get vital resources. This digital gap may lead to an unequal distribution of opportunities and information, which would impede the general advancement of research in less developed regions.

- **Information Overload**

Researchers may find it challenging to identify reliable and pertinent sources due to the overwhelming amount of information that is readily available online. The exponential increase of digital content may make it difficult for academics to sort through and assess the reliability of the material they come upon. A researcher's capacity to make thoughtful conclusions may be hampered by information overload, which may also cause cognitive fatigue and lead to data interpretation errors. Strong information literacy abilities are essential for researchers, as the task of traversing large information landscapes is challenging.

- **Reliance on Technology**

Researchers may face hazards as a result of their growing reliance on ICT technologies, especially in the event of technological malfunctions. Software bugs, system failures, or data loss can cause serious delays and disruptions to research projects. According to Hossain et al. (2021), over-reliance on technology can diminish critical thinking and problem-solving skills among researchers, as they may become overly dependent on automated systems for data analysis and interpretation.

- **Credibility of Online Information**

The spread of unreliable and perhaps false information might result from the ease with which content can be published online. One big weakness in the ICT environment is the difficulty of verifying the reliability of internet sources. The integrity of researchers' work may be jeopardized by biased information, non-peer reviewed publications, or fraudulent studies. As emphasized by

Ritchie et al. (2020), the lack of rigorous vetting processes for online content can undermine the trustworthiness of research findings, making it crucial for researchers to develop skills to critically assess the reliability of information sources.

Strategic methods of eliminating the weak Point of ICT in provision of Research Information

Enhancing the dependability, comprehensibility, and general calibre of research outputs necessitates addressing the weaknesses of Information and Communication Technology (ICT) in the dissemination of research information. Scholars and institutions can cultivate a more robust and effective research environment by putting these weaknesses into practice. Some of the more effective strategies to address these weaknesses are listed below:

- **Enhancing Data Security Measures**

Researchers and institutions need to implement comprehensive data protection plans in order to address privacy and data security issues. This includes implementing robust cybersecurity protocols, such as encryption, multi-factor authentication, and regular security audits (Ali et al., 2020). Furthermore, researchers must to receive training on the best methods for sharing and managing data, with a focus on how crucial it is to abide by data privacy laws. Prioritizing data security allows researchers to protect sensitive data while fostering cooperation and fostering trust.

- **Bridging the Digital Divide**

Governments and organizations can invest in infrastructure development, subsidies internet access, and provide reasonably priced technology solutions to institutions with limited resources in order to eliminate the digital divide. Specific initiatives are required to improve access to technology and internet connectivity, especially in developing regions. In order to guarantee that researchers in underprivileged regions have equal opportunity to engage in the global research environment, collaborations between universities, non-governmental organizations, and the commercial sector may also be fostered. These partnerships can enable knowledge transfer and resource sharing.

- **Improving Information Literacy**

Improving the information literacy of researchers is essential to tackling the issues of legitimacy and information overload. Institutions should offer training programs focused on developing critical skills for evaluating information sources, managing data, and navigating digital research environments (Hossain et al., 2021). Promoting an information-literate culture can help researchers make more informed judgements and uphold the integrity of their work by helping them distinguish between reputable and questionable sources of information.

- **Promoting Technology Training**

In order to reduce the hazards linked to dependence on technology, it is imperative to have continuous training and professional development initiatives. Institutions have to offer resources and programs that concentrate on data analysis tools, research methodology, and new technologies. Institutions can enable researchers to efficiently use ICT while retaining critical thinking and problem-solving skills by providing them with the tools they need to adapt to new technology.

- **Establishing Credible Information Sources**

The establishment and promotion of credible online channels for the dissemination of research findings is crucial in addressing the problem of information credibility. Collaborating with established publishers and academic societies can ensure that research outputs are subjected to rigorous peer review processes (Ritchie et al., 2020). Creating criteria for the publication of research online can also aid in upholding strict integrity and quality standards. Promoting open access platforms that priorities openness and disseminate research findings among scholars may Shelp enhance the reputation of the scientific community.

Conclusion

In conclusion, Information and Communication Technology (ICT) plays a transformative role in the provision of reliable research information, shaping the future of scholarly communication and knowledge dissemination. By enhancing data management, fostering collaboration, and promoting open access, ICT not only improves the reliability and accessibility of research but also empowers researchers to navigate an increasingly complex information landscape. As we continue to embrace technological advancements, addressing the challenges associated with data security, information credibility, and the digital divide will be crucial.

Recommendations

1. Institutions should implement comprehensive digital literacy training for researchers and students to ensure they are proficient in utilizing ICT tools effectively for accessing and evaluating reliable research information.
2. Researchers and institutions should adopt advanced cybersecurity protocols and best practices to safeguard sensitive data, ensuring the integrity and confidentiality of research information throughout its lifecycle.
3. Researchers should be encouraged to leverage cutting-edge data analytics and visualization technologies to enhance the clarity and impact of their findings, making complex data more accessible and comprehensible to diverse audiences.

REFERENCES

Ali, M., Ashfaq, M., & Khan, A. (2020). Data security concerns in cloud computing: A survey. *Journal of Information Security and Applications.* 54: 102573.

Ashikuzzaman M. D. (2023). ICT: Concept and Definition. Retrieved from: https://www.lisedunetwork.com/ict-concepts-and-meaning-definition/

Bostrom N. (2023). CONCEPT and PRINCIPLES of ICT. Available at: https://wikieducator.org/images/4/4d/1_Concept_of_ICT.pdf

Hossain, M., Ahmed, S., & Uddin, M. (2021). Software technologies and their applications in modern ICT. *International Journal of Information Management.* 57: 102350.

Hossain, M., Ahmed, S., & Uddin, M. (2021). The impact of technology reliance on researchers' critical thinking skills. *International Journal of Educational Management.* 35(5): 1055-1070.

International Telecommunication Union (ITU). (2021). Measuring digital development: Facts and figures 2021. Retrieved from [https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default. aspx](https://www.ituint/en/ITU-D/Statistics/Pages/ facts/ default.aspx)

Islam, M. N., Rahman, M. M., & Ahmed, M. (2019). Developing human resources for effective ICT implementation in organizations. *Journal of Information Technology Management.* 30(2): 1-10.

Kaur, A., & Bhardwaj, S. (2021). Data management in the era of big data analytics: Challenges and opportunities. *Journal of Data Science.* 19(1): 1-15.

Khan, M. N., Khan, S. A., & Ali, S. (2019). Cloud computing: A new model for managing research data. *Journal of Cloud Computing: Advances, Systems and Applications.* 8(1): 1-15.

Kuhlmann, S., et al. (2019). The role of digital platforms in facilitating interdisciplinary research. *Research Policy.* 48(8): 1-10.

Law insider (2020). Research Information Definition. Retrieved from: https://www.lawinsider.com/dictionary/research-information#:~:text=Research%20Information%20means%20technical%20data,under%20the%20Research%20Agreement%20and

Li, Y., Hu, X., & Wang, Z. (2021). Data analysis and visualization tools in research: Enhancing research outcomes. *Journal of Visualization.* 24(4): 1-15.

Mwaura, J., Wang'eri, T., & Gachanja, J. (2019). The role of hardware in enhancing ICT systems: A review. *International Journal of Computer Applications.* 975: 1-7.

Ritchie, J., Lewis, J., & Elam, G. (2020). Challenges of credibility in online research: The role of peer review. *Journal of Research Practice.* 16(2): 1-12.

Rouse M. (2024). Information and Communication Technology (ICT). Available at: https://www.techopedia.com/definition/24152/information-and-communications-technology-ict

Smith, J., & Jones, A. (2021). Open access and the democratization of research: Implications for knowledge sharing in a global context. *International Journal of Information Management.* 57: 102316.

Walia P. (2021). Concept of Information and Communication Technology. Available at: https://www.slideshare.net/slideshow/concept-of-ict-241082137/241082137

ASSESSMENT OF ARTIFICIAL INTELLIGENCE ROLES IN TEACHING AND LEARNING (ICT) FOR PROBLEM SOLVING IN SECONDARY SCHOOL IN IMO STATE: INVESTIGATING THE PROSPECT AND CHALLENGES

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Abstract

This study investigates the prospect and challenges of integrating Artificial Intelligence (AI) into teaching and learning practices for problem-solving in secondary schools within Imo State, Nigeria. To carry out the study, a descriptive survey design was adopted for this study and the study was carried out in Imo State. The targeted population for the study comprised all ICT teachers in secondary schools in Imo State. A stratified random sampling technique was used to select 80 ICT teachers each from the 3 senatorial districts of Imo State and this gave a total of 240 respondents used for the study. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence Roles in Teaching and Learning ICT Questionnaire (AIRTLICTQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the validity and accuracy for the study under consideration. The reliability coefficient obtained was 0.91, and this was substantially high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as percentage analysis to answer research questions. The findings reveal that AI offers opportunities for personalized learning experiences, instant feedback, and enhanced problem-solving skills, challenges such as the digital divide, data privacy concerns, and the need for comprehensive teacher training must be addressed. It was observed that the major prospect of artificial intelligence in education is Personalized Learning. Finally, it was also found that the greatest challenge of artificial intelligence in education is data privacy and security concerns. One of the recommendations was it is quite pertinent that as a matter of necessity, teachers should be provided with comprehensive training and professional development programs to enhance their digital literacy skills and proficiency in integrating AI technologies into teaching practices effectively.

KEYWORDS: Artificial Intelligence, Teaching, Learning, Problem Solving, Secondary Schools and Imo State.

Introduction

When it comes to information and communication technology (ICT) education for problem-solving in secondary schools, artificial intelligence (AI) offers a potentially transformative path for teaching and learning. Imo State, Nigeria, stands to benefit from integrating AI into its educational system, but such integration also poses significant challenges. This assessment delves into the prospects and challenges of AI implementation in secondary schools in Imo State.

AI-powered ICT tools can provide personalized learning experiences tailored to students' individual needs and learning styles. Through adaptive learning platforms, students can engage in interactive and customized learning activities, leading to improved comprehension and retention.AI algorithms can facilitate the development of critical thinking and problem-solving skills among students. By incorporating AI-based simulations and virtual environments, students can apply theoretical knowledge to real-world scenarios, honing their problem-solving abilities in diverse contexts (UNESCO, 2020).AI can alleviate the burden of routine administrative tasks for teachers, allowing them to focus more on facilitating meaningful learning experiences and providing individualized support to students. Automated grading systems and AI-assisted lesson planning tools can enhance teacher productivity and effectiveness.

Imo State may face challenges related to inadequate ICT infrastructure and uneven access to technology across schools. Ensuring equitable access to AI-powered learning resources and reliable internet connectivity is crucial for maximizing the benefits of AI integration in education (Adekola& Adigun 2020).Effective implementation of AI in teaching and learning requires comprehensive teacher training programs to familiarize educators with AI technologies and pedagogical strategies. However, Imo State may encounter challenges in providing sufficient training and professional development opportunities for teachers to leverage AI effectively in the classroom.Aligning AI-enabled ICT education with existing curriculum frameworks poses a challenge, as it requires revising educational standards and integrating AI-related competencies into subject-specific curricula. Imo State may need to invest in curriculum development initiatives to ensure that AI education complements existing learning objectives and standards (Eke & Okwelle 2019).

Statement of Problem

In Imo State, the integration of artificial intelligence (AI) in teaching and learning processes within secondary schools presents a promising opportunity to enhance problem-solving skills among students. However, there is a lack of comprehensive understanding regarding the potential benefits and challenges associated with incorporating AI in the educational system. The current educational landscape in Imo State may not fully leverage the capabilities of AI to optimize teaching methodologies and improve learning outcomes for problem-solving skills. Therefore, there is a critical need to conduct an assessment of the roles of artificial intelligence in teaching and learning for problem-solving in secondary schools in Imo State. This investigation aims to explore the prospects and challenges of integrating AI in education, identify best practices, and address potential barriers to the effective implementation of AI technologies in the educational sector. By examining the impact of AI on teaching and learning processes, this study seeks to provide valuable insights that can inform policy decisions, curriculum development, and teacher training programs to enhance problem-solving skills among secondary school students in Imo State.

Objectives of the Study

This research seeks to find out:

1. The prospect of artificial intelligence in education
2. The challenges of artificial intelligence in education

Research Question

1. What are the prospect of artificial intelligence in education?
2. What are the challenges of artificial intelligence in education?

LITERATURE REVIEW

Concept of artificial intelligence

According to Copeland (2024), artificial intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. Bassey and Owushi (2023) defined Artificial Intelligence (AI) as the development of computer systems that can perform tasks that typically require human intelligence. The term is

frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Since the advent of the digital computer in the 1940s, it has been shown that computers are capable of performing extremely difficult jobs, such as finding proofs for mathematical theorems or mastering the game of chess. Even so, no software can yet match human adaptability over a larger range of fields or in jobs requiring a great deal of common knowledge, despite ongoing advancements in computer processing speed and memory capacity. However, some programs have reached the performance levels of human experts and professionals in carrying out particular tasks. As a result, artificial intelligence in this constrained sense is used in a wide range of applications, including computer search engines, voice or handwriting recognition, medical diagnosis, and catboats.

Great Learning (2023) mentioned that artificial intelligence (AI) is currently one of the hottest buzzwords in tech, and with good reason. Over the past few years, a number of breakthroughs and technological developments that were previously limited to science fiction have begun to come true. Artificial intelligence is seen by experts as a factor in production that has the power to bring forth new growth opportunities and transform how work is done across industries.

Artificial intelligence (AI), in its broadest sense, is intelligence exhibited by machines, particularly computer systems, as opposed to the natural intelligence of living beings. As a field of research in computer science focusing on the automation of intelligent behavior through machine learning, it develops and studies methods and software that enable machines to perceive their environment and take actions that maximize their chances of achieving defined goals, with the aim of performing tasks typically associated with human intelligence. Such machines may be called AIs (Wikipedia, 2024).

Concept of information and communication technology (ICT)

ICT, or information and communications technology (or technologies), is the infrastructure and components that enable modern computing. Among the goals of IC technologies, tools, and systems is to improve the way humans create, process, and share data or information with each other. Another is to help them improve their abilities in numerous areas, including business, education, medicine, real-world problem-solving, and even leisure activities related to sports, music, and movies (Rahul A. & Mary K. P, 2024). Wikipedia (2024) stated that information and

communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage, and audiovisual, that enable users to access, store, transmit, understand, and manipulate information.

Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage, and audiovisual, that enable users to access, store, transmit, understand, and manipulate information. ICT is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives to merge the telephone networks with the computer network system using a single, unified system of cabling, signal distribution, and management. ICT is an umbrella term that includes any communication device, encompassing radio, television, cell phones, computer and network hardware, satellite systems, and so on, as well as the various services and appliances with them, such as video conferencing and distance learning. ICT also includes analog technology, such as paper communication, and any mode that transmits communication. ICT is a broad subject, and the concepts are evolving. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form. The Skills Framework for the Information Age is one of many models for describing and managing competencies for ICT professionals in the 21st century (Scholarly Community Encyclopedia, 2024).

Concept of teachings

Toluwalope (2016) explained that teaching is defined as a complete process whereby the learner is made to pay attention, make observations, associate ideas, and remember previous experiencess and reasons. Teaching can equally be defined or described as a process of educating someone. Also, teaching is a process of developing the cognitive, affective, and psychomotor powers of the learner through giving the learner knowledge of facts about one subject matter, reinforcing or developing positive attitudes in the learner, and also developing certain physical or manipulative skills in the learner.

Devasis (2022) defined Teaching is a process that usually takes place in classroom situations. The process of teaching is a kind of transfer, or shearing, of knowledge from one person to another. The person who transfers his or her knowledge is known as a teacher, and the one who receives it is known as a teacher. Its special function is to impart knowledge, develop skills, and. It involves sharing, telling, and demonstrating information. Skill or knowledge that is unknown to the observer, hearer, or follower. Teaching is a relationship that is established among three focal points in education: the teacher, the student, and the subject matter. Teaching is a process by which a teacher brings the student and the subject matter together. Teaching is not only telling and testing; it is the complex art of guiding students through a variety of experiences and activities towards the attainment of goals.

In education, teaching is the concerted sharing of knowledge and experience, which is usually organized within a discipline, and, more generally, the provision of stimulus to the psychological and intellectual growth of a person by another person or artifact. Teaching is the profession of those who give instruction, especially in an elementary school, a secondary school, or a university. When a person imparts information or skills to another, it is common to describe the action as teaching. Imparting may mean sharing experiences or communicating information, for instance, through a through a lecture. Teaching is regarded as both an art and a science (IGI Global, 2014).

Teaching is one of the instruments of education, and its special function is to impart understanding and skill. The main function of teaching is to make learning effective. Teaching is a process in which one individual teaches or instructs another individual, or it can be considered the act of imparting instructions to the learners in a classroom situation. Teaching is a face-to-face encounter between two or more persons, one of whom (the teacher) intends to effect certain changes in the other participants (students). It is watching systematically (Fagge, 2022).

Concept of problem solving

Problem-solving is the process of observing what is going on in your environment, identifying things that could be changed or improved, diagnosing why the current state is the way it is and the factors and forces that influence it, developing approaches and alternatives to influence change, making decisions about which alternative to select, taking action to implement the changes, and observing the impact of those actions in the environment (Wayne,2023).

Wikipedia (2024) Problem solving refers to the process of finding solutions to problems encountered in life. Solutions to these problems are usually situation- or context-specific. The process starts with problem-finding and problem-shaping, in which the problem is discovered and simplified. The next step is to generate possible solutions and evaluate them. Finally, a solution is selected to be implemented and verified. Problems have an end goal to be reached; how you get there depends upon problem orientation (problem-solving coping style and skills) and systematic analysis.

Reid (2023) Problem solving is the process of identifying an existing problem, determining the root cause or causes of the problem, deciding the best course of action in order to solve the problem, and then finally implementing it to solve the problem. Another meaning of problem solving is that it is simply a methodology for solving everyday issues. All living things, notably humans, depend on solving problems in order to survive. In our daily lives, we use it to address both simpler problems like adjusting a light fixture on the International Space Station and more complicated ones like providing basic necessities like food and water. There are various types of problem solving that are used in countless ways and in countless fields of study, such as mathematics and physics, to determine how to solve complex equations and theoretical issues. It is also widely used in a variety of professional fields, such as construction and plumbing, where workers must be able to adapt to meet the needs of specific clients. There are many ways to solve problems. The countless numbers of everyday solutions are as diverse and specialized as the problems themselves.

Prospect of Artificial Intelligence in Education

The prospect of integrating artificial intelligence (AI) into education holds significant promise, revolutionizing the way students learn, educators teach, and institutions operate. This fusion of technology and education brings forth a multitude of benefits while also posing challenges that need careful consideration. Here's an exploration of the prospects of AI in education:

Personalized Learning: Large volumes of data can be analyzed by AI algorithms to customize learning programs to meet the needs of each unique student. With the help of adaptive learning

systems, students' engagement and comprehension can be improved by customizing the pace, material, and style of education to suit their individual learning preferences and skills.

Efficiency and Automation: AI-powered solutions can automate grading, lesson planning, and other repetitive administrative work, freeing up teachers to concentrate more on giving students individualized advice and mentoring. Teachers are able to dedicate more time to the creative and critical thinking components of teaching due to this efficiency.

Data-Driven Insights: AI can provide valuable insights into student performance patterns, learning gaps, and areas for improvement. By analyzing data from multiple sources, including assessments, interactions with learning materials, and engagement metrics, educators can make data-informed decisions to optimize teaching strategies and interventions (Siemens, 2013).

Accessibility and Inclusivity: Education may become more accessible to students with a wider range of requirements thanks to AI technologies. Artificial intelligence-driven language translation systems have the potential to enhance learning for non-native speakers, and speech recognition software can help students with impairments engage fully in classroom activities.

Lifelong Learning and Skills Development: AI can support lifelong learning initiatives by offering personalized, on-demand learning experiences tailored to the needs of adult learners and professionals seeking to upskill or reskill in response to evolving job market demands (Koedinger& Corbett 2016).

Innovative Teaching Methods: With the use of augmented reality (AR), virtual reality (VR), and simulation-based environments, artificial intelligence (AI) makes it possible to create immersive learning environments. These interactive resources help improve comprehension and memory by giving students opportunities for experiential learning in virtual environments.

Global Collaboration and Knowledge Sharing: Platforms with AI capabilities enable remote cooperation between students and teachers. Through virtual discussion boards, cooperative

projects, and shared repositories of learning materials, students can interact with others from different cultural backgrounds and gain insight from their viewpoints.

Predictive Analytics for Student Success: AI algorithms can analyze historical data to identify early indicators of student disengagement, dropout risks, or academic struggles. By predicting these factors, educators can intervene proactively to provide targeted support and guidance to at-risk students, improving overall retention rates and academic outcomes.

However, alongside these opportunities, the integration of AI in education also raises ethical, privacy, and equity concerns (Luckin, Holmes, Griffiths, &Forcier 2016). It is crucial to address these challenges through thoughtful policy frameworks, transparent algorithms, and inclusive design principles to ensure that AI technologies in education serve the best interests of all learners.

Challenges of Artificial Intelligence in Education

Artificial intelligence (AI) has emerged as a promising tool for transforming various sectors, including education. By integrating artificial intelligence into educational systems, institutions aim to enhance teaching methodologies, personalize learning experiences, and streamline administrative tasks. However, the implementation of AI in education is not devoid of challenges. Addressing these challenges requires collaborative efforts among policymakers, educators, technologists, and stakeholders to ensure that AI enhances learning outcomes while upholding ethical standards and promoting inclusivity. These are some of the significant challenges encountered in harnessing AI for educational purposes.

Data privacy and security concerns

One of the primary challenges to employing AI in education revolves around data privacy and security. Educational institutions accumulate vast amounts of sensitive data, including student records, performance metrics, and personal information. Integrating AI systems into these environments raises concerns regarding data breaches, unauthorized access, and misuse of personal data (Hoel, 2020). Furthermore, the reliance on third-party AI solutions may exacerbate these risks, as outsourcing data management to external vendors could compromise confidentiality.

Equity and accessibility issues

While AI has the potential to personalize learning experiences and cater to diverse student needs, it also poses challenges related to equity and accessibility. Unequal access to technology and digital resources can exacerbate educational disparities, widening the gap between privileged and marginalized students (Williamson, 2019). Moreover, AI algorithms may inadvertently perpetuate biases present in educational systems, such as gender or racial biases, thus reinforcing existing inequalities (Wiggers, 2020). Addressing these issues requires proactive measures to ensure that AI-powered educational tools are accessible to all students and mitigate algorithmic biases.

Ethical Considerations

The ethical dilemmas surrounding AI implementation in education are multifaceted. As AI algorithms influence decision-making processes, questions arise regarding transparency, accountability, and fairness (Selwyn, 2019). For instance, using AI for student assessment raises concerns about algorithmic transparency and the potential for bias in grading practices (Gewertz, 2019). Moreover, the ethical use of student data for algorithmic predictions, such as identifying at-risk students or recommending learning pathways, necessitates clear guidelines to safeguard student privacy and autonomy (Daniel, 2020). Balancing the benefits of AI with ethical considerations requires careful deliberation and robust regulatory frameworks.

Technological Infrastructure and Skills Gap

Implementing AI in education requires adequate technological infrastructure and skilled personnel to develop, deploy, and maintain AI systems. Many educational institutions face challenges in upgrading their existing infrastructure to support AI applications, such as cloud computing, high-speed internet, and data analytics capabilities (Buckingham, 2021). Additionally, there is a shortage of educators proficient in AI technologies, hindering the integration of AI into curriculum design and pedagogical practices (Kennedy, 2019). Bridging the technological infrastructure gap and enhancing educators' AI literacy are essential for the successful adoption of AI in education.

METHODOLOGY

In carrying out the study, a descriptive survey design was adopted for this study and the study was carried out in Imo State. The targeted population for the study comprised all ICT teachers in secondary schools in Imo State. A stratified random sampling technique was used to select 80 ICT teachers each from the 3 senatorial districts of Imo State and this gave a total of 240 respondents used for the study. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence Roles in Teaching and Learning ICT Questionnaire (AIRTLICTQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the validity and accuracy for the study under consideration. The reliability coefficient obtained was 0.91, and this was substantially high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as percentage analysis to answer research questions.

Research Questions 1: The research question sought to find out the prospect of artificial intelligence in education. To answer the research question, percentage analysis was performed on the data, (see table 1).

Table 1:

Percentage analysis of the prospect of artificial intelligence in education.

PROSPECTS	FREQUENCE	PERCENTAGE (%)
Personalized Learning	43	17.92**
Efficiency and Automation	40	16.67
Data-Driven Insights	36	15
Lifelong Learning and Skills Development	34	14.17
Innovative Teaching Methods	32	13.3
Accessibility and Inclusivity	24	10
Predictive Analytics for Student Success	18	7.5
Global Collaboration and Knowledge Sharing	13	5.42*
TOTAL	**240**	**100%**

** **The highest percentage frequency**

* **The least percentage frequency**

SOURCE: Field Survey

The above table 1 presents the percentage analysis of the prospect of artificial intelligence in education. From the result of the data analysis, it was observed that the prospect tagged "Personalized Learning" 43(17.92) was rated as the highest prospect of artificial intelligence in education, while "Global collaboration and knowledge sharing" 13(5.42) was rated the least. The result therefore is in agreement with the research findings of Koedinger & Corbett (2016), who noted that AI can support lifelong learning initiatives by offering personalized, on-demand learning experiences tailored to the needs of adult learners and professionals seeking to upskill or reskill in response to evolving job market demands.

Research Questions 2: The research question sought to find out the challenges of artificial intelligence in education. To answer the research question, percentage analysis was performed on the data, (see table 2).

Table 2:

Percentage analysis of the challenges of artificial intelligence in education.

CHALLENGES	FREQUENCE	PERCENTAGE (%)
Data privacy and security concerns	72	30**
Equity and accessibility issues	64	26.67
Technological Infrastructure and Skills Gap	58	24.17
Ethical Considerations	46	19.17*
TOTAL	**240**	**100%**

** **The highest percentage frequency**

* **The least percentage frequency**

SOURCE: Field Survey

The above table 2 presents the percentage analysis of the challenges of artificial intelligence in education. From the result of the data analysis, it was observed that the challenge tagged "Data privacy and security concerns" 72(30) was rated the highest challenges of artificial intelligence in education, while "Ethical Considerations" 46(19.17) was rated the least challenges. The result therefore is in agreement with the research findings of Hoel (2020), who noted that Integrating AI

systems into these environments raises concerns regarding data breaches, unauthorized access, and misuse of personal data.

Conclusion

In conclusion, the assessment of artificial intelligence (AI) roles in teaching and learning for problem-solving in secondary schools in Imo State reveals a landscape filled with both promise and hurdles. The prospect of integrating AI into education is undeniably enticing, as it offers innovative solutions to enhance the learning experience, foster critical thinking, and prepare students for the demands of the digital age. While the integration of AI in teaching and learning holds immense promise for enhancing educational outcomes and fostering 21st-century skills, it is crucial to navigate the associated challenges thoughtfully and ethically. By addressing issues of equity, privacy, and transparency, stakeholders can harness the transformative potential of AI to create inclusive and empowering learning environments for all students in Imo State and beyond. It was concluded that the major prospect of artificial intelligence in education is Personalized Learning. Finally, it was also concluded that the greatest challenge of artificial intelligence in education is data privacy and security concerns.

Recommendation

1. It is quite pertinent that as a matter of necessity, teachers should be provided with comprehensive training and professional development programs to enhance their digital literacy skills and proficiency in integrating AI technologies into teaching practices effectively.
2. By engaging parents, students, teachers, and community members in dialogue and decision-making processes concerning the integration of AI in education fosters a culture of inclusivity, transparency, and accountability.
3. Government and school management should establish mechanisms for continuous monitoring and evaluation of AI implementations in schools, gathering feedback from stakeholders to identify challenges, address issues promptly, and refine strategies for improvement.

4. It is good to develop and implement ethical guidelines and standards for the responsible use of AI in education, addressing concerns such as data privacy, algorithmic bias, and transparency to safeguard student rights and promote trust among stakeholders.

REFERENCES

Adekola, O., and Adigun, M. O. (2020). Artificial Intelligence and Education: Global Trends and Challenges. In Proceedings of the 2020 7th International Conference on Computing for Sustainable Global Development (INDIACom) (pp. 1130-1135). IEEE. https://doi.org/10.1109/INDIACOM48842.2020.9073957

Bassey, M. and Owushi, E. (2023). Adoption of Artificial Intelligence in Library and Information Science in the 21st Century: Assessing the Perceived Impacts and Challenges by Librarians in Akwa Ibom and Rivers States. *International Journal of Current Innovations in Education*, 6 (1):75-85.

Buckingham, D., Reitsma, L., Zanting, A., and Renold, E. (2021). Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development. UNESCO.

Copeland (2024).Artificial Intelligence available at: https://www.britannica.com/technology /artificial-intelligence

Daniel, B. K. (2020). Ethical Use of AI in Education: Towards Inclusive and Equitable Learning. Springer.

Devasis C., (2022) CONCEPT OF TEACHING available at: https://onlinenotebank. wordpress.com/2022/07/15/concepts-of-teaching-3/

Eke, H. N., andOkwelle, P. C. (2019). Utilization of Information and Communication Technology (ICT) in Secondary Schools: Implication for Counselling in Imo State. *Journal of Education and Practice*, 10(24), 109-114.

Fagge,I. A. (2022). Concept of Teaching and its definition (B.Ed. NOTES). Available at: https://physicscatalyst.com/graduation/teaching-definition.

Gewertz, C. (2019). Algorithm Bias Detection Can Improve Teaching and Learning. Education Week.

Great Learning (2023). What is Artificial Intelligence? Available at:https://www.mygreatlearning. com/blog/what-is-artificial-intelligence/

Hoel, T., Jia, L., and Joshi, A. (2020). Security and Privacy of Machine Learning in the Cloud: A Survey. *ACM Computing Surveys (CSUR)*, 53(1), 1-34.

IGI Global (2024). What is Teaching. Available at: https://www.igi-global.com/dictionary /broadcasting-transforming-social-construction-knowledge/29344.

Kennedy, R. (2019). Preparing Teachers for the AI-Driven Future of Education. Brookings Institution.

Koedinger, K. R., and Corbett, A. T. (2016). Cognitive Tutors: Technology bringing learning science to the classroom. In K. Sawyer (Ed.), The Cambridge Handbook of the Learning Sciences (pp. 61–78). Cambridge University Press. https://doi.org/10.1017/cbo9780511816833.006

Luckin, R., Holmes, W., Griffiths, M., &Forcier, L. B. (2016). Intelligence Unleashed: An argument for AI in Education. Pearson. https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/news/news-archive/2016/Intelligence_Unleashed.pdf

Rahul A. and Mary K. P. (2024) ICT (information and communications technology or technologies) available at: https://www.techtarget.com/searchcio/definition/ICT-information-and-communications-technology-or-technologies

Scholarly Community Encyclopedia (2024). Information and Com. Available at: https://encyclopedia.pub.

Selwyn, N. (2019). What's the Problem with Learning Analytics? Journal of Learning Analytics, 6(3), 11-19.

Siemens, G. (2013). Learning Analytics: The Emergence of a Discipline. American Behavioral Scientist, 57(10), 1380–1400. https://doi.org/10.1177/0002764213498851

UNESCO. (2020). Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development. Retrieved from https://unesdoc.unesco.org /ark:/48223 /pf0000372947

Wiggers, K. (2020). The Ethics of AI in Education. VentureBeat.

Wikipedia (2024) Artificial intelligence available at:https://en.wikipedia.org /wiki/Artificial intelligence

Wikipedia (2024) Information and communications technology available at: https://en.wikipedia.org/wiki/Information_and_communications_technology

Williamson, B. (2019). Governing Software: Networks, databases and algorithmic power in the digital governance of public education. *Learning, Media and Technology*, 44(1), 37-53.

TEACHERS' MOTIVATIONAL STRATEGIES AND ACADEMIC PERFORMANCE OF SOCIAL STUDIES STUDENTS IN JUNIOR SECONDARY SCHOOLS IN UYO LOCAL GOVERNMENT AREA

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Abstract

The study examined teachers' motivational strategies and the academic performance of social studies students in junior secondary schools in the Uyo Local Government Area. The population of this study comprised all teachers and students in Uyo Local Government Area, Akwa Ibom State in Nigeria. The study adopted an Ex-Post Facto research design while a simple random sampling technique was used to select a sample size of five hundred and twenty respondents (520). The instrument used for data collection was tagged "Teachers Motivational Strategies Questionnaire (TMSQ)", which was administered to the respondents via direct delivery method. Pearson Product Moment Correlation analysis was used in testing the hypotheses. The findings revealed that teachers' offer of incentives, provision of timely feedback, use of praise, adoption of ICT, enhancement of students' curiosity and use of recreational motivation have remarkable relationship with students' academic performance in social studies in Uyo Local Government Area. The study concluded that teachers' motivational strategies play a pivotal role in shaping the academic performance of Social Studies students in junior secondary schools within Uyo Local Government Area. It also mentioned that the positive effects of well-implemented motivational strategies such as praise, rewards, and student-centered approaches cannot be overstated, as they foster a conducive learning environment, build students' confidence, and encourage active participation. One of the recommendations made was that teachers should regularly offer incentives, such as rewards or recognition, to motivate students in Social Studies. Incentives can include verbal praise, certificates, or small rewards that promote healthy competition and inspire students to achieve higher academic performance.

KEYWORDS: Motivational strategies, Academic performance, Social studies students, Junior secondary school and Uyo Local Government Area

INTRODUCTION

Social Studies is used to describe an integrated approach to teaching elements of such disciplines as Anthropology, Sociology, History, Geography, Economics, Civics, and Psychology. In one way or the other, social studies takes care of every one of these subjects in various ramifications. According to Yinka (2003), an enormous gap continues to exist between intended change and actual classroom practices in Social Studies Education in Africa. Adoption of the subject was meant to move away from traditional separate subject teaching to integration, from teacher-centered to child-centered pedagogy, and from expository to enquiry teaching. According

to the Federal Government of Nigeria (FRN 2004), social studies as a course was meant to inculcate in the students the spirit of service to the fatherland, unity, and dignity in labour, among other things. Social studies also takes into consideration the five main national goals of Nigeria, which have been endorsed as the necessary foundation for the National Policy on Education. The goals include: To build

a) A free and democratic society;

b) A just and egalitarian society;

c) A united, strong land self reliant nation;

d) A great and dynamic economy;

e) A land full of bright opportunities for all citizens (FRN, 2004).

The Federal Government of Nigeria (FRN) listed Social Studies and Citizenship Education as core subjects. An understanding of social studies is important to prepare students to be active, productive, and participatory citizens. Citizenship is the core goal of social studies education, even right from the primary school level. Citizenship education, centered on social studies, helps create caring and concerned citizens. The role of good citizens in the home, the classroom, school, and the community encourages students to be good decision-makers. Anderson (2000) described Social Studies as a study of how man influences and is in turn influenced by his physical, social, political, religious, economic, psychological, cultural, scientific, and technological environment. The interest of students in the subject has been related to the volume of work completed, students' task orientation and skill acquisition, students' personality and self-concept, feelings of inadequacy (Osiki, 2001), motivation and self-confidence, anxiety (Sanacore, 2008), poor facilities, equipment and instructional materials for effective teaching, and the use of traditional chalk and talk methods. Prensky (2001) stated that interest in activities tends to increase the likelihood that individuals formulate goals relating to that activity and invest time and effort to achieve them.

Problem Statement

Many teachers struggle with motivating students to learn. This is especially prevalent in social studies classrooms, in which students perceive social studies as boring. This has impacted negatively on students' performance in Social Studies. Content literacy, specifically in social studies, is a problem that affects students in junior high schools. Content literacy is the ability to use reading and writing for the acquisition of new content in a given discipline. Teachers are faced with a multitude of choices as to what the most effective teaching strategies are to enhance student learning in social studies. In response to higher expectations and a perceived lack of results, researchers and teachers have been seeking the right kind of balance of teaching strategies for years. Thus, the problem of this study is to examine teachers' motivational strategies and the academic performance of Social Studies students with respect to offering incentives, providing timely feedback, using praise, and teaching with ICT facilities.

Objectives of the Study

1. To examine the relationship between teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area, Akwa Ibom State.
2. To find out the relationship between teachers' provision of timely feedback to students and their academic performance in social studies in Uyo Local Government Area, Akwa Ibom State.
3. To determine the relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area, Akwa Ibom State.
4. To examine the relationship between teachers adoption of ICT and students' academic performance in social studies in Uyo Local Government Area, Akwa Ibom State.
5. To find out the relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State.
6. To determine the relationship between use of recreational motivation and academic performance of students in social studies in Uyo Local Government Area, Akwa Ibom State.

1.4 Research Questions

1. What is the relationship between teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area?
2. How does a teacher's provision of timely feedback to students relate to their academic performance in social studies in Uyo Local Government Area?
3. What is the relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area?
4. What is the relationship between teachers' adoption of ICT and students' academic performance in social studies?
5. What is the relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State?
6. What is the relationship between use of recreational motivation and academic performance of students in Social studies in Uyo Local Government Area, Akwa Ibom State?

1.5 Research Hypotheses

The following hypotheses are raised for the study:

1. There is no significant relationship between teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area.

2. There is no significant relationship between teachers' provision of timely feedback to students and their academic performance in social studies in Uyo Local Government Area.
3. There is no significant relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area.
4. There is no significant relationship between teacher's adoption of ICT and students' academic performance in social studies in Uyo Local Government Area.
5. There is no significant relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State.
6. There is no significant relationship between use of recreational motivation and academic performance of students in Social studies in Uyo Local Government Area, Akwa Ibom State.

LITERATURE REVIEW

Conceptual Framework

Teachers' Provision of Timely Feedback to Student and Academic Performance

Effective teaching hinges on the provision of timely feedback, a practice essential for student learning and development. Feedback serves as a powerful tool for educators to guide and support their students' progress, offering insights into their strengths and areas needing improvement. Timely feedback, delivered promptly after a learning activity or assessment, maximizes its impact by reinforcing positive behaviors and addressing misconceptions early on. One key aspect of timely feedback is its specificity. Clear, detailed feedback provides students with actionable insights on how to enhance their performance, fostering a deeper understanding of the material. Incentives provided to teachers have helped improve students' academic outcomes. Few studies have been conducted to examine the effects of incentives provided directly to students based on their performance. According to Holmstrom and Milgrom (1991), one potential method to increase student achievement and improve the quality of individuals selecting teaching as a profession is to provide teachers with financial incentives based on student achievement. Theoretically, teacher incentives could have one of three effects. If teachers lack motivation or incentive to put effort into important inputs to the education production function (e.g., lesson planning, parental engagement), financial incentives for student achievement may have a positive impact by motivating teachers to increase their effort. However, if teachers do not know how to increase student achievement, if the production function has important complementarities outside their control, or if the incentives are either confusing or too weak, teacher incentives may have no impact on achievement.

Teachers' use of Praise and Students Academic Performance

The teacher's use of praise in educational settings plays a crucial role in shaping students' behavior, motivation, and academic performance. Praise, when utilized effectively, can foster a positive learning environment, enhance students' self-esteem, and promote intrinsic motivation. However, its misuse or overuse can lead to detrimental effects on students' development and learning outcomes. According to Hawkins and Heflin (2011), teacher praise is one tool that can be a

powerful motivator for students. Surprisingly, research suggests that praise is underused in both general and special education classrooms (Brophy, 1981; Kern, 2007). Praise, when used in the classroom by teachers, maximizes its positive impact. Effective teacher praise consists of two elements: (1) a description of noteworthy student academic performance or general behavior, and (2) a signal of teacher approval (Brophy, 1981). The power of praise in changing student behaviour is that it both indicates teacher approval and informs the student about how the praised academic performance or behaviour conforms to teacher expectations. As with any potential classroom reinforcer, Akin-Little (2004) asserted that praise has the ability to improve student academic or behavioral performance, but only if the student finds it reinforcing. Here are several suggestions for shaping praise to increase its effectiveness. Praise is a powerful motivating tool because it allows the teacher to selectively encourage different aspects of student production or output. For example, the teacher may use praise to boost the student's performance, praising effort, accuracy, or speed on an assignment. The teacher may instead single out the student's work product and use praise to underscore how closely the actual product matches an external standard or goal set by the student. Praise statements that do not provide a specific account of student behavior in observable terms are flawed because they do not provide students with performance feedback to guide their learning. For example, a praise statement such as "Good job!" is inadequate because it lacks a behavioral description (Hawkins & Heflin, 2011). However, such a statement becomes acceptable when expanded to include a behavioral element.

Teachers Adoption of ICT and Students Academic Performance

Information Communication and Technologies (ICT) is becoming increasingly important in humans daily lives and in the educational system. The rapid growth in Information Communication and Technologies (ICT) have brought remarkable changes in the twenty-first century, as well as affected the demands of modern societies. Therefore, there is a growing demand on educational institutions to use ICT to teach the skills and knowledge students need for the 21st century. With the rapid advancements in technology, teachers are faced with the challenge of adopting and effectively utilizing these tools to enhance the learning experience. The adoption and integration of ICT into teaching and learning environment provides more opportunities for teachers and students to work better in a globalized digital age.

Available literature indicates that integrating ICTs into teaching and research is generally positive, leading to a radical shift from the traditional teacher-directed/didactic approach to a more student-centered/constructivist approach (Lopez, 2003). Langlois (2001) posited that ICT in teaching is less expensive, enables lessons to be introduced speedily, provide a consistent message, make it possible to work from any location at any time, updating contents easily and quickly, and increases learners' retention and management of large groups of students. Yusuf (2007) argued that ICTs increase secondary school teachers' productivity; help teachers be more effective and productive; increase teachers' interest in teaching; assist teachers in reorganizing and restructuring their subject(s); increase teachers' emphasis on individualized instruction; provide teachers with the opportunity to experiment with emerging technologies, thus providing multi-media presence in the classroom; and provide teachers with increased opportunities.

Enhancement of students' curiosity by the teacher and Academic Performance of Students

Curiosity is key to learning. Studies as shown that when student are curious with about a subject they are much more likely to remember information learned about that subject which enhances student academic achievement. Curiosity can encourage students to be passionate about learning and open to others' perspectives. When student are curious they naturally want to learn more and seek out new information or greater understanding when they experience uncertainty or a gap in their knowledge. Curiosity is a fuel. It propels student to try to figure things out and, ultimately, to learn (Walden University, 2024).

The students should be familiar and comfortable with the social studies curiosity before challenging them to defend it. Teachers of social studies must understand the basic motives already present in their learners. The teacher can then play on these motivations to maximize engagement and enhance the effectiveness of the teaching process. Exploiting student motivations and affinities can lead to the development of artificial social studies problems and situations. But if such methods generate genuine interest in a topic, the techniques are eminently fair and desirable.

Use of Recreational Motivation and Academic Performance of Students in Social Studies

In today's dynamic educational landscape, the role of incentives in motivating teachers and enhancing educational outcomes has garnered significant attention. Teachers, as the cornerstone of the education system, play a pivotal role in shaping future generations. Hence, devising effective strategies to incentivize and motivate them is imperative for ensuring the quality of education. The notion of offering incentives to teachers encompasses a wide array of approaches, ranging from monetary rewards to professional development opportunities (Brown, 2018). Social studies examines how individuals relate to one another and to their surroundings. This multidisciplinary subject is inquiry-based and incorporates elements from several social science disciplines, including political science, philosophy, geography, ecology, economics, law, and history. For students to get involved in and understand the practical and ethical concerns that affect both their communities and humanity as a whole, social studies is a crucial topic. Recreational motivation involves puzzles, games, paradoxes, or the school building or other nearby structures. In addition to being selected for their specific motivational gain, these devices must be brief and simple. At the primary school level, social studies concepts can be introduced through appropriately designed hands-on activities supported by manipulative materials. Such activities have to integrate rich social studies ideas with familiar physical tools. As was mentioned above, an important aspect of action learning is its orientation towards gaming. A pedagogical characteristic of a game in the context of tool-supported social studies learning is one's "thinking outside the box," something that, in the presence of a teacher as a "more knowledgeable other," opens a window to students' future learning. Nonetheless, the absence of support can be observed, as Vidler put it, "when a child stares longer at an asymmetrical rather than a symmetrical figure," recognizing intuitively, through perceptual curiosity, that the stability of a figure depends on its position (Vidler, 2007). That is, perceptual curiosity combined with creative thinking often transcends activities designed for one level and merges into the study of more advanced ideas at a higher cognitive level.

Effect of Teachers' Offer of Incentives to Students and Students' Academic Performance in Social Studies

In today's dynamic educational landscape, the role of incentives in motivating teachers and enhancing educational outcomes has garnered significant attention. Teachers, as the cornerstone of the education system, play a pivotal role in shaping future generations. Hence, devising effective strategies to incentivize and motivate them is imperative for ensuring the quality of education. The notion of offering incentives to teachers encompasses a wide array of approaches, ranging from monetary rewards to professional development opportunities (Brown, 2018).

Students, like other learners in every field or even workers, need a little motivation to gear them towards studying. Proponents of teacher incentives argue that offering rewards can serve as a powerful motivational tool, encouraging students to engage more deeply with the subject matter. By linking academic achievement to tangible rewards such as prizes, extra credit, or recognition, teachers may effectively stimulate students' interest and commitment to learning social studies. Research by Hebert and Guenther (2020) supports this assertion, suggesting that incentivizing students can lead to improved attendance, participation, and overall academic performance in the classroom.

However, critics caution against over-reliance on extrinsic motivators, highlighting the potential negative consequences of incentivizing students solely for academic achievement. Studies by Baranek (1996) have found that the use of rewards undermines intrinsic motivation and results in the slower acquisition of skills and more errors in the learning process. Furthermore, the use of incentives could inadvertently promote a superficial approach to learning, where students prioritise short-term gains over deep understanding and critical thinking skills.

Effect of Teachers' Provision of Timely Feedback to Students' and Students' Academic Performance in Social Studies

Providing timely feedback to students is widely recognised as a crucial component of effective teaching and learning practices (Hattie and Timperley, 2007). Teachers' timely feedback can significantly impact students' academic performance outcomes in social studies in the following ways:

Enhanced Learning and Understanding: Timely feedback offers students immediate insight into their strengths and areas for improvement (Shute, 2008). When students receive feedback promptly after completing an assignment or assessment, they can better connect the feedback to the subject, reinforcing learning objectives and facilitating a deeper understanding of the material.

Clarification and Correction of Misconceptions: Feedback allows teachers to address misconceptions or errors in students' understanding promptly (Hattie & Timperley, 2007). By providing specific guidance on where students went wrong and how they can correct their mistakes, teachers help students refine their understanding and prevent the reinforcement of incorrect concepts.

Effect of Teachers' Use of Praise and Students' Academic Performance in Social Studies

Teachers' use of praise in the classroom has long been recognised as a powerful tool for motivating students and shaping their academic performance, particularly in subjects like social studies. Research by Liu (2021) suggests that praise from teachers can positively influence students' self-esteem and confidence, leading to increased engagement and effort in social studies. When teachers provide specific and genuine praise for students' achievements or efforts in

understanding social studies concepts, it reinforces their sense of competence and encourages further academic endeavours.

Moreover, praise can contribute to a positive classroom climate conducive to learning. According to Henderlong and Lepper (2022), a supportive and affirming environment created through the use of praise fosters a sense of belonging and intrinsic motivation among students, which in turn enhances their academic performance in subjects. When students feel valued and respected by their teachers, they are more likely to actively participate in class discussions, complete assignments diligently, and demonstrate higher levels of achievement.

However, it is crucial for teachers to employ praise judiciously and effectively to maximise its impact on students' academic performance. Research by Garcia et al. (2021) highlights the importance of providing specific and constructive praise that focuses on students' efforts, progress, and strengths in social studies. Generic or insincere praise may have limited efficacy and could even undermine students' motivation and self-esteem if they perceive it as disingenuous or manipulative.

Effect of Teachers' Adoption of ICT and Students' Academic Performance in Social Studies

The integration of information and communication technology (ICT) into educational practices has transformed teaching and learning experiences across various disciplines, including social studies. Khan (2019) mentioned in his research that ICT-based teaching increases the achievement of students in social studies.

Research by Jonassen (2011) suggests that the use of ICT in social studies instruction can enhance students' engagement and understanding of course content. When teachers incorporate interactive multimedia resources, such as educational videos, simulations, and online interactive platforms, students are provided with diverse and immersive learning experiences that cater to different learning styles. This dynamic approach to instruction not only captures students' interest but also facilitates deeper comprehension and retention of social studies concepts.

Furthermore, ICT enables teachers to create collaborative and interactive learning environments that promote active student participation and critical thinking skills. According to Warschauer (2007), the integration of ICT tools, such as online discussion forums, collaborative document editing platforms, and virtual field trips, encourages students to interact with course materials and their peers, fostering collaborative problem-solving and knowledge construction in social studies.

Methodology

This study adopted an Expost-Facto research design. The area of study was Uyo Local Government Area (LGA) in Akwa Ibom State. The population of this study comprised teachers, and students in Uyo Local Government Area, Akwa Ibom State in Nigeria. A simple random sampling technique was used to select a sample size of five hundred and twenty respondents (520). The study used an instrument for data collection tagged "Teachers" Motivational Strategies" (TMSQ), which was administered to the respondents via direct delivery method. Face validation of the research instrument was carried out by the researchers and assisted by two social studies experts and one expert in tests and measurement. In order to establish the reliability of the instrument, test-retest reliability analysis was carried out on the research instrument, using 80 people who are not part of the main work. The researcher used a letter of introduction and permission to gain access into the schools. The researcher ensured that the instrument was filled by the respondents. The

data obtained were analyzed using Pearson Product Moment Correlation analysis which was used to test the hypotheses. The calculated values were compared with the critical values for test of significance of the result at 0.05 alpha level.

Results and Discussions

Research Questions 1: The research question sought to find out the relationship between teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area. In order to answer the research question, descriptive analysis was performed on the data collected as shown in Table 1.

Table 1:

Descriptive statistics of the relationship between teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area.

Variable	N	Arithmetic mean	Expected mean	R	Remarks
Incentive	520	12.75	12.5	0.93*	*Strong to perfect Relationship
Academic Performance		57.65	50.0		

Source: Field Survey

The above table presents the result of the descriptive analysis of the relationship between teachers' offer of incentives to students and students' academic performance in social studies. The two variables were observed to have strong to perfect relationship at 93%. The arithmetic mean for teachers' offer of incentives (12.75) was observed to be greater than the expected mean score of 12.5. In addition to that, the arithmetic mean as regards students' academic performance (57.65) was observed to be higher than the expected mean score of 50.00. The result therefore means that there is remarkable relationship between teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area. This findings aligns with the opinion of Holmstrom and Milgrom (1991) who stated that one potential method to increase student achievement and improve the quality of individuals selecting teaching as a profession is to provide teachers with financial incentives based on student achievement.

Research Questions 2: The research question sought to find out the teacher's provision of timely feedback to students relate to their academic performance in social studies in Uyo Local Government Area. In order to answer the research question, descriptive analysis was performed on the data collected as shown in Table 2.

Table 2:

Descriptive statistics of the teacher's provision of timely feedback to students relate to their academic performance in social studies in Uyo Local Government Area.

Variable	N	Arithmetic mean	Expected mean	R	Remarks

Timely Feedback	520	15.65	12.5	0.96*	*Strong to perfect Relationship
Academic Performance		57.65	12.5		

Source: Field Survey

The above table presents the result of the descriptive analysis of the relationship between teacher's provision of timely feedback and students' academic performance. The two variables were observed to have strong to perfect relationship at 96%. The arithmetic mean for teachers' offer of timely feedback (15.65) was observed to be greater than the expected mean score of 12.5. In addition to that, the arithmetic mean as regards academic performance (57.65) was observed to be higher than the expected mean score of 50.00. The result therefore means that there is remarkable relationship teacher's provision of timely feedback to students relate to their academic performance in social studies in Uyo Local Government Area. This findings correlates with the opinion of numerous scholars who mentioned that timely feedback provided to teachers have helped improve students' academic outcomes.

Research Questions 3: The research question sought to find out the relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area. In order to answer the research question, descriptive analysis was performed on the data collected as shown in Table 3.

Table 3:
Descriptive statistics of the relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area.

Variable	N	Arithmetic mean	Expected mean	R	Remarks
Praise	520	14.80	12.5	0.94*	*Strong to perfect Relationship
Academic Performance		57.65	12.5		

Source: Field Survey

The above table presents the result of the descriptive analysis of the relationship between teachers' use of praise and students' academic performance. The two variables were observed to have strong to perfect relationship at 94%. The arithmetic mean for teachers' use of praise (14.80) was observed to be greater than the expected mean score of 12.5. In addition to that, the arithmetic mean as academic performance of students (57.65) was observed to be higher than the expected mean score of 50.00. The result therefore means that there is remarkable relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area. This findings supports the opinion of Hawkins and Heflin (2011) who mentioned that teacher praise is one tool that can be a powerful motivator for students. Similarly research carried out by Brophy (1981) and Kern (2007) suggests that praise, when used in the classroom by teachers, maximizes its positive impact.

Research Questions 4: The research question sought to find out the relationship between teachers' adoption of ICT and students' academic performance in social studies. In order to answer the research question, descriptive analysis was performed on the data collected as shown in Table 4.

Table 4:
Descriptive statistics of the relationship between teachers' adoption of ICT and students' academic performance in social studies.

Variable	N	Arithmetic mean	Expected mean	R	Remarks
ICT	520	11.50	12.5	0.90*	*Strong to perfect Relationship
Academic Performance		57.65	50.00		

Source: Field Survey

The above table presents the result of the descriptive analysis of the relationship between teachers' adoption of ICT and dependability of the academic performance. The two variables were observed to have strong to perfect relationship at 90%. The arithmetic mean for teachers' use of ICT (11.50) was observed to be less than the expected mean score of 12.5. On the other ground, the arithmetic mean as regards academic performance (57.65) was observed to be higher than the expected mean score of 50.00. The result therefore means that there is remarkable relationship between teachers' adoption of ICT and students' academic performance in social studies. This study aligns with the opinion of Langlois (2001) who posited that ICT in teaching is less expensive, enables lessons to be introduced speedily, provide a consistent message, make it possible to work from any location at any time, updating contents easily and quickly, and increases learners' retention and management of large groups of students.

Research Questions 5: The research question sought to find out the relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State. In order to answer the research question, descriptive analysis was performed on the data collected as shown in Table 5.

Table 5:
Descriptive statistics of the relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State.

Variable	N	Arithmetic mean	Expected mean	R	Remarks
Curiosity	520	13.95	12.5	0.92*	*Strong to perfect Relationship
Academic Performance		57.65	50.00		

Source: Field Survey

The above table presents the result of the descriptive analysis of the relationship between enhancement of students' curiosity by the teacher and Students academic performance. The two variables were observed to have strong to perfect relationship at 92%. The arithmetic mean for

teachers' enhancement of students' performance (13.95) was observed to be greater than the expected mean score of 12.5. In addition to that, the arithmetic mean as regards academic Performance of students (57.65) was observed to be higher than the expected mean score of 50.00. The result therefore means that there is remarkable relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State. This study correlates with the findings of Vidler (2007) who stated that by enquiry about knowledge a gets to learn.

Research Questions 6: The research question sought to find out the relationship between use of recreational motivation and academic performance of students in social studies in Uyo Local Government Area, Akwa Ibom State. In order to answer the research question, descriptive analysis was performed on the data collected as shown in Table 6.

Table 6:
Descriptive statistics of the relationship between use of recreational motivation and academic performance of students in social studies in Uyo Local Government Area, Akwa Ibom State.

Variable	N	Arithmetic mean	Expected mean	R	Remarks
Recreational Motivation	520	13.50	12.5	0.93*	*Strong to perfect Relationship
Academic Performance		57.65	50.00		

Source: Field Survey

The above table presents the result of the descriptive analysis of the relationship between use of recreational motivation and academic performance of students. The two variables were observed to have strong to perfect relationship at 93%. The arithmetic mean for use of recreational motivation (13.50) was observed to be greater than the expected mean score of 12.5. In addition to that, the arithmetic mean as regards students' academic performance (57.65) was observed to be higher than the expected mean score of 50.00. The result therefore means that there is remarkable relationship between teachers' use of recreational motivation and academic performance of students in social studies in Uyo Local Government Area, Akwa Ibom State. This result supports the opinion of Posamentier (2017) who stated that recreational motivation which involves the use of puzzles and games can help enhance the academic performance of students in social studies.

Hypothesis Testing

Hypothesis 1: The null hypothesis states that there is no significant relationship between the teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area. In order to test the hypothesis Pearson Product Moment Correlation analysis was used to analyze the data (See Table 7).

Table 7:

Pearson product moment correlation analysis of the relationship between the teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area.

Variable	∑X ∑Y	∑X² ∑Y²	∑XY	r
Teachers' Offer of incentives to students (X)	6630	86606	388830	0.94*
Academic performance (Y)	29978	1752322		

***Significant at 0.05 level; df = 518; N = 520; Critical r-value = 0.088**

The above table presents the obtained r-value of (0.94). This value was tested for significance by comparing it with the critical r-value (0.088) at 0.05 level with 518 degree of freedom. The obtained r-value (0.94) was greater than the critical r –value (0.088). Hence, the result was significant, meaning that there is significant relationship between the teachers' offer of incentives to students and their academic performance in social studies in Uyo Local Government Area, Nigeria. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 2: The null hypothesis states that there is no significant relationship between teachers' provision of timely feedback to students and their academic performance in social studies in Uyo Local Government Area. In order to test the hypothesis Pearson Product Moment Correlation analysis was used to analyze the data. (See Table 8).

TABLE 8:

Pearson product moment correlation analysis of the relationship between the teachers' provision of timely feedback to students and their academic performance in social studies in Uyo Local Government Area.

Variable	∑X ∑Y	∑X² ∑Y²	∑XY	r
Teachers' provision of timely feedback to students (X)	8138	130130	476996	0.96*
Academic performance (Y)	29978	1752322		

***Significant at 0.05 level; df = 518; N = 520; Critical r-value = 0.088**

The above table presents the obtained r-value of (0.96). This value was tested for significance by comparing it with the critical r-value (0.088) at 0.05 level with 518 degree of freedom. The obtained r-value (0.96) was greater than the critical r –value (0.088). Hence, the result was significant, meaning that there is significant relationship between the teachers' provision of timely

feedback to students and their academic performance in social studies in Uyo Local Government Area. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 3: The null hypothesis states that there is no significant relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area. In order to test the hypothesis Pearson Product Moment Correlation analysis was used to analyze the data (See Table 9).

TABLE 9:

Pearson product moment correlation analysis of the relationship between teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area.

Variable	$\sum X$ / $\sum Y$	$\sum X^2$ / $\sum Y^2$	$\sum XY$	r
Teachers' use of praise (X)	7696	115908	450190	0.94*
Academic performance (Y)	29978	1752322		

***Significant at 0.05 level; df = 518; N = 520; Critical r-value = 0.088**

The above table presents the obtained r-value of (0.94). This value was tested for significance by comparing it with the critical r-value (0.088) at 0.05 level with 518 degree of freedom. The obtained r-value (0.94) was greater than the critical r –value (0.088). Hence, the result was significant, meaning that there is significant relationship between the teachers' use of praise and students' academic performance in social studies in Uyo Local Government Area. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 4: The null hypothesis states that there is no significant relationship between between teachers' adoption of ICT and students' academic performance in social studies in Uyo Local Government Area. In order to test the hypothesis Pearson Product Moment Correlation analysis was used to analyze the data (See Table 3).

TABLE 10:

Pearson product moment correlation analysis of the relationship between adoption of ICT and students' academic performance in social studies in Uyo Local Government Area.

Variable	$\sum X$ / $\sum Y$	$\sum X^2$ / $\sum Y^2$	$\sum XY$	r
Teachers' adoption of ICT (X)	5980	70408	350428	0.90*
Academic performance (Y)	29978	1752322		

***Significant at 0.05 level; df = 518; N = 520; Critical r-value = 0.088**

The above table presents the obtained r-value of (0.90). This value was tested for significance by comparing it with the critical r-value (0.088) at 0.05 level with 518 degree of freedom. The obtained r-value (0.90) was greater than the critical r –value (0.088). Hence, the result was significant, meaning that there is significant relationship between the teachers' adoption of ICT and students' academic performance in social studies in Uyo Local Government Area. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 5: The null hypothesis states that there is no significant relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State. In order to test the hypothesis Pearson Product Moment Correlation analysis was used to analyze the data. (See Table 11).

TABLE 11:

Pearson product moment correlation analysis of the relationship between enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State.

Variable	**$\sum X$** **$\sum Y$**	**$\sum X^2$** **$\sum Y^2$**	**$\sum XY$**	**r**
Enhancement of students' curiosity by the teacher (X)	7254	103558	425152	0.92*
Academic performance (Y)	29978	1752322		

***Significant at 0.05 level; df = 518; N = 520; Critical r-value = 0.088**

The above table presents the obtained r-value of (0.92). This value was tested for significance by comparing it with the critical r-value (0.088) at 0.05 level with 518 degree of freedom. The obtained r-value (0.92) was greater than the critical r –value (0.088). Hence, the result was significant, meaning that there is significant relationship between the enhancement of students' curiosity by the teacher and academic performance of students in Uyo Local Government Area, Akwa Ibom State. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Hypothesis 6: The null hypothesis states that there is no significant relationship between use of recreational motivation and academic performance of students in Social studies in Uyo Local Government Area, Akwa Ibom State. In order to test the hypothesis Pearson Product Moment Correlation analysis was used to analyze the data. (See Table 12).

TABLE 12:

Pearson product moment correlation analysis of the relationship between between use of recreational motivation and academic performance of students in Social studies in Uyo Local Government Area, Akwa Ibom State.

Variable	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum XY$	r
Use of recreational motivation (X)	7020	97240	411892	0.93*
Academic performance (Y)	29978	1752322		

***Significant at 0.05 level; df = 518; N = 520; Critical r-value =0.088**

The above table presents the obtained r-value of (0.93). This value was tested for significance by comparing it with the critical r-value (0.088) at 0.05 level with 518 degree of freedom. The obtained r-value (0.93) was greater than the critical r –value (0.088). Hence, the result was significant, meaning that there is significant relationship between the use of recreational motivation and academic performance of students in Social studies in Uyo Local Government Area, Akwa Ibom State. Consequently, the significance of the result caused the null hypothesis to be rejected while the alternative one is upheld.

Conclusion

Teachers' motivational strategies play a pivotal role in shaping the academic performance of Social Studies students in junior secondary schools within Uyo Local Government Area. The findings concluded that there is remarkable relationship between teachers' offer of incentives, provision of timely feedback, use of praise, adoption of ICT, enhancement of students' curiosity and use of recreational motivation and students' academic performance in social studies in Uyo Local Government Area. The positive effects of well-implemented motivational strategies—such as praise, rewards, and student-centered approaches cannot be overstated, as they foster a conducive learning environment, build students' confidence, and encourage active participation. However, teachers must be mindful of the types of strategies they employ, ensuring that they cater to individual student needs and avoid any unintended negative consequences, such as excessive pressure or favoritism. Continuous monitoring and adjustment of these strategies are essential for optimizing student outcomes. Thus, educators, administrators, and policymakers must collaborate to promote and implement effective motivational techniques that boost academic achievement and overall student development in Social Studies and beyond.

Recommendations

Based on the results, the following recommendations are given:

1. Teachers should regularly offer incentives, such as rewards or recognition, to motivate students in Social Studies. Incentives can include verbal praise, certificates, or small rewards that promote healthy competition and inspire students to achieve higher academic performance.

2. Teachers should ensure they provide timely and constructive feedback to students. Immediate feedback allows students to understand their strengths and areas for improvement, helping them adjust their learning approaches and achieve better academic outcomes.

3. Schools and teachers should adopt and integrate Information and Communication Technology (ICT) tools into Social Studies lessons. ICT resources, such as multimedia presentations, interactive quizzes, and online learning platforms, can enhance student engagement, foster curiosity, and improve academic performance.

4. Teachers should include recreational activities, such as educational games, field trips, and group projects, to make Social Studies more interactive and enjoyable. Recreational motivation can help stimulate interest in the subject, improving students' retention of knowledge and their overall performance.

REFERENCES

Akin-Little, K. A. (2004). Extrinsic reinforcement in the classroom: Bribery or best practice. *School Psychology Review, 33*, 344-362.

Anderson, M. (2000). An investigation of teacher's instructional problems in mathematics. *Benin Journal of Education Studies,* 11(3), 43-54

Baranek, L. K. (1996). The Effect of Rewards and Motivation on Student Achievement. Masters Theses. 285. https://scholarworks.gvsu.edu/theses/285

Brophy, J. (1981). Teacher Influence on Student Achievement: *Journal of Research and Development in Education,* 14(1), 3-20.

Brown, A. (2018). Professional Development as an Incentive for Teacher Retention: Evidence from a Longitudinal Study. *Teachers and Teaching*, 24(4), 456–473.

Federal Republic of Nigeria (2004). *National Policy on education,* Lagos: Government Press.

Garcia, D. (2021). Non-monetary incentives and their impact on students' academic performance in social studies. *Social Studies Education Journal*, 28(4), 123-138.

Hattie, J., and Timperley, H. (2007). The power of feedback. *Review of Educational Research,* 77(1), 81-112.

Hawkins, S. M., & Heflin, L. J. (2011). Increasing secondary teachers' behavior-specific praise using a video self-modeling and visual performance feedback intervention. *Journal of Positive Behavior Interventions*,*13*(2) 97–108.

Hawkins, S. M., & Heflin, L. J. (2011). Increasing secondary teachers' behavior-specific praise using a video self-modeling and visual performance feedback intervention. *Journal of Positive Behavior Interventions*,*13*(2) 97–108.

Hebert, A. K. and Guenther, M. F. (2020). Incentivizing Students to Encourage Consistent Study Group Attendance is Associated with Improved Course Performance. *Journal of the Human Anatomy and Physiology Society,* 24(1); 66-69

Henderlong, J., and Lepper, M. (2022). The Effects of Praise on Children's Intrinsic Motivation: A Review and Synthesis. *Psychological Bulletin,* 123(3); 774-795

Holmstrom, S. & Milgrom, E (1991). Helping children like social studies. *Southern Social Studies Journal*, 16: 21-32.

Jonassen, D. H. (2011). Learning to solve problems with technology: A constructivist perspective (2nd ed.). Upper Saddle River, NJ: Pearson Education.

Kern, L. (2007). Antecedent strategies to promote appropriate classroom behavior. *Psychology in the Schools*, 44, 65–75.

Khan, T. (2019). Effectiveness of ICT based Teaching Social Studies to Class IV in terms of Achievement in Social Studies. Available at:

https://www.researchgate.net/publication/338230571_Effectiveness_of_ICT_based_Teaching_Social_Studies_to_Class_IV_in_terms_of_Achievement_in_Social_Studies

Langlois, R. J. (2001). *Making the most of college: Students speak their minds*. Cambridge, Mass.: Harvard University Press.

Liu F (2021) The Role of EFL Teachers' Praise and Love in Preventing Students' Hopelessness. *Front. Psychol*. 12:800798. doi: 10.3389/fpsyg.2021.800798

Lopez, M. (2003). *Factors that affect student achievement.* Retrieved from: http//voices.yahoo.com/ factors-that-affect-student-achievement-738248.html?cat=4.

Osiki, J. O. (2001). *Motivation for academic study scale*. Ibadan. Stirling-Horden Publisher

Presnky, M. (2004). The role of technology in teaching and the classroom. *Educational Technology.*

Sanacore, J. (2008). Turning reluctant learners into inspired learners. *Clearing House: A Journal of Educational Strategies, Issues and Ideas, 82*(1), 40-44.

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, 78(1) , 153-189.

Walden University. (2024). Teaching Strategies: Sparking Curiosity in Learning. Available at: https://www.waldenu.edu/online-masters-programs/ms-in-education/resource/teaching-strategies-sparking-curiosity-in-learning.

Warschauer, M. (2007). Technology and social inclusion: Rethinking the digital divide. Cambridge, MA: MIT Press.

Yinka (2003). The Impact of Motivation on Student's School Academic Performance in Nigeria. *Journal of Personality Study and Group Behaviour*, 23(1),107-114.

Yusuf, A. F. (2007). Influence of principals' leadership styles on students' academic achievement in secondary schools. *Journal of Innovative Research in Management and Humanities*, 3(1), 113 -121.