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Effect of Indigenous Knowledge Systems Strategy on Secondary School Students' Performance in Physics in Lagos State, Nigeria

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Abstract:
Poor performance and low enrollment in senior secondary school physics examinations have drawn the attention of the examination bodies, researchers, parents and other stakeholders in Nigeria. This is because despite the importance of physics in the scientific, technological and consequently, economic development of any nation, physics in Nigerian secondary schools, has suffered serious setbacks, ranging from poor teaching, poor learning, poor performance and finally to low enrollment. Of all these, poor teaching stands out as the fundamental, since if the learners did not learn, then the teacher, has not taught. This study therefore was carried out using our indigenous knowledge system strategy to present physics in the classroom as a familiar science. Three research questions were raised and two null hypotheses were formulated to guide the study. This study adopted mixed method research design, where both qualitative and quantitative data were collected and analysed. The qualitative approach involved the use of Focus Group. The quantitative approaches of data gathering employed was non-equivalent control pre-test and post-test quasi experimental design using a sample of 321 Senior Secondary two physics students consisting of two intact classes from two schools. One hundred and thirty three students (69male and 64 Female) formed the treatment group while 188 students (101 male and 87female) formed the control group. Focus Group Discussion Protocol (FGDP) was applied to unravel the indigenous knowledge systems within the community where the school is located while pre- and post-achievement tests were used for quantitative data collection for the study. The instruments were validated by two experts in physics education. Data collected were analyzed with ANCOVA using SPSS 23.0. Findings showed that students from the locality possess rich indigenous knowledge backgrounds and systems that can be deployed to teach physics. Results also revealed that students taught harnessing their indigenous knowledge system performed better than those taught using the conventional method [F (1,318) =68.27; p<0.05]. More so, there is no statistically significant difference in performance between male and female students taught using indigenous knowledge system strategy [F (1,130) =0.002; p>0.05]. It is therefore recommended that physics teachers should use indigenous knowledge system strategy in teaching classroom physics for meaningful learning and consequent better performance.

Keywords: *Indigenous knowledge systems, learning difficulties, strategy, physics*

1. Introduction

Today, there is an increasing recognition of the importance of using indigenous (traditional) knowledge for contextualising school science instruction, because it forms essential part of students' prior experiences and sources of information that they carry to school learning. Despite its proven effectiveness as useful teaching tool, there is yet no systematic effort, to develop effective framework for incorporating indigenous knowledge into school science curriculum to complement instruction process in Nigeria schools. No wonder, poor performance still persists (Erinosho, 2013).

Indigenous Knowledge System (IKS) is described in the South African Revised Curriculum Statements as a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years (DOE, 2002). It is also a way for people to understand themselves (Semali&Kincheloe, 1999). Nakashima and Roue (2002) described it as sophisticated arrays of information, understandings and interpretations that guide human societies in their innumerable interactions with the natural milieu. It is the sum total of the knowledge and skills which people in a particular area possess and which enable them to get the most out of their natural environment (Mhakure&Mushaikwa, 2014; De Beer & Whitlock, 2009; Odora Hoppers, 2004). Jones and Hunter (2003), and Michie (nd)identified the following common themes embedded within indigenous knowledge that are intrinsic to its integration into the science curriculum:

- Based on experience
- Often tested over centuries of use

- Developed collective data base of observable knowledge
- Adapted to local culture and environment
- Dynamic and changing a living knowledge base
- Application of problem solving
- Oral transmission sometimes encapsulated in metaphor
- Not possible to separate indigenous knowledge from ethics, spirituality, metaphysics, ceremony and social order
- Bridging the science of theory with the science of practice
- A holistic(indigenous knowledge) versus a reductionist(Western science) approach
- An ecologically based approach
- Inclusive versus the specialisation of knowledge
- Contextualised versus decontextualized science.

Teaching sciences generally needs to be rooted in indigenous knowledge and practices (Ugwu&Diovu, 2016). Jegede and Aikenhead (2000) observed that the current development towards 'science for all' in all parts of the globe necessitates that consideration be given to how pupils move between their everyday life–world and the world of school science; how pupils deal with cognitive conflicts between those two worlds, and what this means for effective teaching of science. They maintain that all learning is mediated by culture and takes place in a social context. Culture encompasses the knowledge, beliefs, art, morals, laws, customs and habits acquired by the people of the society (Jegede&Okebukola, 1991).

It has been observed that without going to formal school, learning and quoting any theory or law of physics by Western scientists, Africans had evolved industries, produced tools, instruments and machines that apply or utilize so many physics concepts, principles, theories and laws, such as production and use of heat (furnace) in black smiting, gold smiting and pottery; musical instruments such as African Guitar, animal leather percussion drum, talking drum, wooden drum, metal gong, konga, wooden flutes and animal horn flutes; use of crow-bar as lever system machine for lifting heavy loads, inclined plane also for lifting loads to heights, carving wooden canoes that carry heavy loads and still float and move on water. These and many other physics concepts are unknowingly or unconsciously practised indigenously but in isolation from physics as a school science subject (Owolabi et al, 2016).

Physics is one of the science subjects taught in senior secondary school that deals with the fundamental constituents of the universe, the force that exerts on one another and the effects of these forces, and the most basic of the science field (Adeyemo, 2012). Knowledge of physics established the means of transport in the air, on the land and in the sea. Factory plants and equipment, home and office appliances, and the world most needed development force-the information and communications technology (ICT), are all products and applications of physics. Despite the importance of physics in the scientific, technological and consequently, economic development of any nation (Onasanya and Omosewo 2011), physics in Nigerian secondary schools in the past, has suffered serious setbacks (Owolabi, 2010) ranging from poor teaching to poor learning, poor performance and finally poor enrollment. Of all these, poor teaching has been found to be the fundamental, as buttressed by Mohapatra (2015) that if the learner did not learn, then the teacher has not taught.

The genesis of the anomaly is secondary school where physics as a separate science subject is presented to the students for the first time and therefore how the subject is presented by the teacher is how the supposedly innocent students would see it. That is why classroom delivery remains a very essential part of curriculum implementation. Plethora of studies have shown a persistent poor performance in physics examinations such as WAEC SSCE, NECO SSCE and GCE, which in turn leads to poor enrollment in physics and physics-related courses. Obviously, within the teaching and learning process, there must be a lacuna. To this Owolabi, Akintoye and Adeyemo (2011) lamented that, the teaching of physics in most Nigerian schools was dominated by teachers without professional qualifications and so cannot work out the teaching strategy that will work. Okoronka and Wada (2014) in their study identified poor teaching methodology as the strongest force causing poor learning and consequently poor performance and low enrollment.

African society has rich indigenous knowledge system and live applications of physics concepts and principles that would enhance the teaching and learning of physics in secondary schools, but they are not harnessed nor utilized in the physics class (Owolabi, 20I0). It therefore, becomes imperative to integrate indigenous knowledge and practices of the people in the society into physics teaching in order to dispel the notion that the subject is foreign, abstract and has no relevance to the community daily activities. If the teacher can build on the previous knowledge of the students which include their indigenous knowledge system, indigenous language, indigenous instructional materials and indigenous technologies that utilize the theories, laws and principles of physics concepts, then physics will become familiar and friendly and understanding will be enhanced optimally.

The thrust of this study therefore is to identify the physics concepts inherent in the indigenous knowledge system examine their effects if deployed in classroom physics teaching to demystify the difficulties and abstractions in physics learning to the students.

1.1. Research Questions

- Are there indigenous knowledge systems within the students' locality that can be deployed to teach physics?
- What is the effect of deploying the students' indigenous knowledge systems within the environment on their academic performance in physics?
- Is there any statistically significant difference in performance between male and female students taught using indigenous knowledge system strategy?

1.2. Null Hypotheses

- HO_1: There is no statistically significant difference in achievement between students taught using indigenous knowledge systems strategy and those taught using the conventional method.
- HO_2: There is no statistical difference between the performance of male and female students exposed to indigenous knowledge systems strategy.

2. Methodology

This study adopted mixed method research design, where both qualitative and quantitative data were collected and analysed accordingly. An interpretative-ethnographic qualitative investigation, using Focus Group Discussion Protocol (FGDP) was applied to unravel the indigenous knowledge systems within the community where the school is located. The quantitative approach of data gathering employed was non-equivalent control pre-test and post-test quasi experimental design.

2.1. Population and Sample

The population for this study comprised all public Senior Secondary School Two (SSS 2) Physics students in the Lagos State Education District V. Badagry Zone of the district was purposively chosen for housing schools in rural areas which still have reasonable level of indigenous knowledge system, cultural practices and indigenous live applications of physics concepts and principles that have not been adulterated or corroded by urbanization. A sample of 281 SS2 students consisting of two groups of respective intact classes was used. One group made up of 133 students comprising 69 male and 64 female for the experimental group; and the other group made up of 188 students comprising 101 male and 87 female for the control. The focus group comprised of 10 students.

Teaching Strategy	Gender		Total
	Male	Female	
Focus Group	5	5	10
Indigenous knowledge System	69	64	133
Conventional method (Control Group)	101	87	188
Total	211	203	414

Table 1: Sample Distribution by Strategies and Gender

2.2. Instrumentation

Instruments for data collection were Focus Group Discussion Protocol and Achievement test. The Focus Group Discussion Protocol was structured to elicit the indigenous knowledge systems, the tools and local applications of physics concepts within the students' environment. The Physics Achievement Test (PAT) was developed on those concepts discussed during the FGD. The test consisted of four sections. Section A sought demographic data of the student. Section B contained 30 Physics Multiple Choice Achievement Test (PMCAT) items. Section C was Physics Essay Achievement Test (PEAT), while section D was Test of Indigenous Knowledge and Associated Scientific Principles, Concepts and Applications (TIKASPCA).

The question items were well spread according Blooms' taxonomy of educational objectives of recall, comprehension, application, analysis, synthesis and evaluation. The items were validated by five members of Okebukola Elite Research Team (ERT), and two secondary school physics teachers with at least 15 years cognate teaching experience and were ratified by an erudite physics education scholar in the Science and Technology Education Department of a university. Marking guide was developed and the total mark was 100%. The achievement test was subjected to test-retest administration at two weeks interval in a different equivalent school. A reliability coefficient of 0.76 obtained through applying Pearson's product moment correlation, and the value was considered good to go.

2.3. Data Collection and Analysis

Before treatment, 10 students made up of five from each group were engaged in Focus Group Discussion (FGD) to elicit information on indigenous knowledge system, live applications of concepts of simple machines such as lever systems and inclined planes; musical instruments such as African guitar and talking drum; generation/energy conversion and utilisation of heat energy in a local blacksmith workshop; generation of light and sound in the natural thunder and lightning phenomenon and their different time of arrival as always noticed by the observer. The researchers administered the pre-test to the students in both groups to determine their entry knowledge about the concepts/topics, and thereafter, the experimental group was taught using this indigenous knowledge systems strategy for the physics concepts while the control group was taught using the conventional method. The administration of the treatment lasted for five weeks of double periods of 80 minutes per week.

For the experimental group, the researcher came to class with the indigenous live application instruments or tools which the students themselves are used to. The teacher explained the physics concepts linking them to the indigenous knowledge system of the students. In the case of blacksmith's workshop in their locality which they have visited, their previous indigenous knowledge on the operations, were harnessed for the explanation of the physics concepts involved. In the case of lightning and thunder which they have been observing, the scientific explanations of their production, various speeds and why lightning is always observe, before thunder, were explained to their understanding. The control group was taught the same concepts or topics using the preponderant conventional method of board and marker without referring to their indigenous knowledge system as previous knowledge. Illustrations were theoretically made without the relias (live or real things) in the students' locality.

The statistical tool applied for the analysis of data collected and testing of the hypotheses was Analysis of Covariance (ANCOVA) at 0.05 alpha level of precision, using IBM Statistical Package for Social Sciences (SPSS) version 23.0.The audio recording from the focus group discussion was listened to several times by the researcher and transcribe verbatim. Transcripts were used, read through several times by the researcher to identify emerging themes that are relevant to the study for interpretation and analysis.

3. Results

- Research Questions 1: Are there indigenous knowledge systems of the students that are relevant to the identified physics concepts?

Focus Group Discussion was used to answer this research question. From the Focus Group Discussion (FGD) question items, the activities and processes in the blacksmith's workshop show that the students know and utilize the following: Energy conversions of chemical energy in wood and charcoal through burning to heat energy, conduction of heat energy in metals, softening or melting due to heat and malleability of metals. In 'talking drum', a wooden hollow cylinder or conical hollow frame open at both ends is covered with animal skin attached to pegs. When the skin leather or membrane is tapped, the membrane vibrates with the air column in the drum thereby producing sound regulated by pegs that adjust or alter the tension of the membrane thereby varying the frequency of the sound for entertainment. This is played in a skillful manner that an organized music is produced for entertainment.

Similarly, African guitar is used to produce music by plucking the string, setting it into vibration, while varying the tension of the string as to vary the frequency of the sound produced thereby producing good music for entertainment. With the indigenous knowledge in the use of crowbar, the students can identify the effort, pivot, load, effort distance or effort arm and load distance or load arm, and the knowledge of these applications helps in drawing the arrangement and the calculations associated with lever systems and moments in classroom physics. With indigenous knowledge, the students themselves can practically and skillfully vary the tension of the percussion membrane of talking drum, or the string of an African guitar as to vary the frequency of the sound produced as music. The students have been observing that lightning always comes before thunder as a proof that light travels faster than sound as it was explained to them that both were produced at the same time.

- Research Questions 2:What is the effect of deploying the students' indigenous knowledge systems within the environment on their academic performance in physics?

Dependent Variable: Post-test Achievement				
Teaching Methods	**Mean**	**Std. Deviation**	**N**	**Mean Diff.**
Indigenous Knowledge System	55.0902	14.16647	133	
Conventional Method	46.8351	9.57322	188	9.2551
Total	50.9627	11.86985	321	

Table 2: Mean, Standard Deviation of Indigenous Knowledge System, and Conventional Method Groups on Post-Test Physics Achievement Test
Source: Field Work, 2021

Table 2 shows that the mean scores and standard deviations of students taught utilizing their indigenous knowledge are respectively 55.09 and 14.17 while those of the students taught using conventional method are 46.84 and 9.57 respectively. This shows that the students taught utilizing their indigenous knowledge performed better than those taught using conventional method. This is because indigenous knowledge is an unforgettable previous knowledge already resident in the mind of a learner, hence enhances understanding of the related concepts.

- Research Questions 3: Is there any significant difference in performance between male and female students taught using indigenous knowledge systems strategy?

Dependent Variable: Post-test Achievement				
Teaching Method	**Ge Gender**	**Mean**	**Std. Deviation**	**N Mean Diff.**
Indigenous Knowledge System	Male	56.1014	14.4692	69
	Female	54.0000	13.8633	642.1013
	Total	55.0902	14.1665	133

Table 3: Mean, Standard Deviation of the Performance between Male and Female Students Taught Using Indigenous Knowledge Systems Strategy
Source: Field Work, 2021

Table 3shows the mean and standard deviation of male as 56.1014and 14.46918respectively while those of the female were 54.0000and 13.86328respectively. This implies that male students do not perform better than their female counterparts when concepts live application strategy is used in physics teaching.

3.1. Hypotheses

- HO_1: There is no statistically significant difference in academic achievement between students taught using indigenous knowledge system strategy and those taught using the conventional method.

Dependent Variable: Post-test Achievement						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	14830.847[a]	2	7415.423	69.140	.000	.303
Intercept	41122.221	1	41122.221	383.416	.000	.547
PretestAchievement	9522.599	1	9522.599	88.787	.000	.218
Teaching Method	7321.655	1	7321.655	68.266	.000	.177
Error	34106.206	318	107.252			
Total	859658.000	321				
Corrected Total	48937.053	320				
a. R Squared = .303 (Adjusted R Squared = .299)						
Source: Field Work, 2021						

Table 4: Analysis of Covariance (ANCOVA) on the Pre-Test and Post Test Physics Achievement of the Indigenous Knowledge System and Conventional Method Groups

Table 4 shows that the students came into the treatments at significantly different levels, as pretest achievement is significant, [$F(1,318)=88.79$; $p<0.05$].The result also shows that there is statistically significant difference in achievement between students taught using indigenous knowledge system and those taught using conventional method. [$F(1,318)=68.27$; $p<0.05$]. This implies that when students are taught, harnessing their indigenous knowledge, they perform better than those taught without bringing in their indigenous knowledge. The hypothesis which states that there is no statistically significant difference between students taught using indigenous knowledge system and those taught using conventional method is therefore rejected.

- HO_2**:** There is no statistical difference between the performance of male and female students exposed to indigenous knowledge systems strategy.

Dependent Variable: Post Test Achievement						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6694.613[a]	2	3347.306	21.981	.000	.253
Intercept	20394.821	1	20394.821	133.930	.000	.507
Pretest Achievement	6547.985	1	6547.985	43.000	.000	.249
Gender	.248	1	.248	.002	.968	.000
Error	19796.305	130	152.279			
Total	430137.000	133				
Corrected Total	26490.917	132				
a. R Squared = .253 (Adjusted R Squared = .241)						

Table 5: Analysis of Covariance (ANCOVA) on the Pre-Test and Post Test Achievement of Indigenous Knowledge System Group by Gender
Source: Field Work, 2021

Table 5 shows that male and female students in the indigenous group, entered the treatment at statistically significant at different levels [$F(1, 130) =43.00$; $p<0.05$]. Posttest result shows that there is no statistically significant difference in performance between male and female [$F(1,130)=0.002$; $p>0.05$]. This implies that when male and female students are taught together in class using indigenous knowledge system strategy, the female students understand and perform as well as the male students. Therefore, the hypothesis which states that there is no statistically significant difference in performance between male and female is not rejected.

4. Discussion of Findings

The study revealed that, the communities and the students' environment have rich indigenous knowledge systems that are relevant to physics concepts and the students have embraced them fully. The indigenous knowledge systems of their communities and local environment are harnessed and utilized by the indigenes in their social and cultural activities such as farming, fishing, hunting, fighting, cooking, raising or lifting loads, playing musical instruments. These applications and practices become inheritance from ancestors, living parents and elders, down to the students themselves. These include the use of local simple machines like knives, hoes, levers especially crowbar as first class or second class lever depending on the location of the pivot; inclined planes; ladder; staircase; the knowledge of tripod stand and heating of pots from below as an application of the fact that water is a poor conductor of heat, allowing heat to travel only by convection from down upwards and not the other way round or even sideways; the energy conversions that are utilized in a blacksmith's workshop converting chemical energy in wood/charcoal to heat energy, transferred by conduction through metals; construction and playing of music in talking drums, konga, African guitar, varying frequencies through the tensions of the string or membrane.

The finding from hypothesis one revealed that students taught using indigenous knowledge system strategy performed better than those taught using conventional method. Indigenous knowledge systems are imbibed and unforgettable previous knowledge because the students from birth are part of the system. Indigenous knowledge is the previous knowledge the students bring to class. The students find it interesting and motivating when there is relevance of their indigenous knowledge with the classroom physics. The study revealed that, when students' indigenous knowledge is utilized in the teaching of related physics concepts, understanding, learning and performance are enhanced more than when the conventional method is applied.

This finding is in agreement with the findings of Ugwu and Diovu (2016), who carried out a study on 'integration of indigenous knowledge and practices into chemistry teaching and students' academic achievement' and found that students performed better. This also agrees the assertion of Parsons and Carlone (2013), that if both hands work together, then culture can become a vehicle to, not only advancing our understanding about an equitable, robust science education for the 21st century but in acting in systemic ways to create it. Further in support of this finding are the findings of Abonyi (2002) and the assertions of Fafunwa (1971) that infusing some elements of the child's culture into science curriculum will improve interest and achievement in modern science. In corroboration of this finding, Cadwallader (2004) opined that, when indigenous knowledge is systematically and holistically included into school's curriculum, students' achievements are improved. This is because when there is relevance to and positive correlation with what the student knows already and what is being learnt, there will be positive transfer of knowledge and learning will be meaningful.

Whereas there is replete of literature attesting to the efficacy of integrating indigenous knowledge and practices into science teaching, on the other hand, there is sparse literature in contrast to these findings. However Owolabi and Olatude, in their study 'Cultural beliefs and conceptual understanding of science: a resolution of cognitive dissonance in science classroom', found that, when there are superstitious beliefs, and the teacher is unable to give correct scientific interpretation of the natural phenomenon, the indigenous knowledge will jeopardize the meaningful learning of classroom science. The findings of this study are also in disagreement with the submissions of Okafor (2011) that presently, students in Nigeria, study science with some mystical conceptions because of cultural biases. Consequently, they suffer misconceptions in science and thus see science as unreal and irrelevant to the real life situation (Ucheoma, 2005; Ivowi, 2010).

The impediments indigenous cultures pose to science education give grave concern to education stakeholders in Nigeria. Still in total disagreement to the findings of this study, Mhakure and Mushaikwa (2014) in their study found that 67% of the science teachers-participants perceived that indigenous knowledge was the reason the African continent was backward or behind in development and that therefore integrating indigenous knowledge with school science which is predominantly Western science would maintain the underdevelopment of the continent. One of the responses that generated this finding was: 'I saw indigenous knowledge as being uncivilized and a let-down for black people. I could not imagine advocating for the use of anything indigenous from clothes, food to medicine.' Similarly 33% of the participants in the study perceived that indigenous knowledge was solely for the use of uneducated people and thus could not see why it should be brought into the school curriculum. The finding prompted their assertion that 'in many Sub-Saharan African countries, there is an inherent tension between Eurocentric Western Sciences (WS) and the indigenous knowledge of African students, both of which are products of their respective socio-cultural constructs. These two worldviews when experienced by students in science classrooms, are often different if not properly mediated during science lessons, this could potentially lead to 'complicating the learning process and potentially resulting in cognitive conflict or as the literature describes it, cognitive dissonance and perturbation (Le Grange, 2007).

However, in this study, students taught harnessing their indigenous knowledge system, performing better than those taught using the conventional method must have been due to the fact that indigenous knowledge is an unforgettable previous knowledge which the child grew up with and currently are involved in it. Indigenous knowledge is part of the student and so when it forms the entering behaviour of the student, he will be ready and happy to learn meaningfully and therefore perform better. The significant performance can also be attributed to the positive correlation between what they have been practicing in their day to day live activities and the new classroom physics context.

The joy of familiarity and realization that their indigenous knowledge and practices are relevant to the classroom physics account for the better performance. Largely accountable to the enhanced performance of students taught integrating their indigenous knowledge into the classroom physics is the fact except lightning and thunder which happen in the inaccessible high atmosphere and therefore creates grey area for conflicting superstitious belief, all other topics are so observable and practical that the indigenous knowledge associated with them are in total alignment with the classroom physics. Even where there is dissonance between the indigenous knowledge and the scientific knowledge, as in the case of causes of lightning and thunder, the students tend to be eager and excited to learn the new authentic scientific knowledge or the amendment. The children are happy and fascinated to discover that there are things and concepts they know already that are applicable to physics. All these help them to learn better and perform better.

The finding from hypothesis two revealed no statistically significant difference in performance between male and female students when they were taught harnessing their indigenous Knowledge [$F(1,130)=0.002$; $p>0.05$].This depicts that male students do not understand and perform as better than their male counterparts when they are taught in class deploying their indigenous knowledge related to the topics. This discovery is line with the findings of Ugwu and Diovu (2016) that the integration of indigenous knowledge and practices into chemistry teaching has no significant effect on male and female students' achievement. This is likely to be due to the fact that both male and female students grew in the same environment, language, traditions, social and cultural practices thus acquired the same indigenous knowledge, participated in the same practices and activities and under the tutelage of the same elders, and so are equally conversant with them, hence the same indigenous knowledge system. With the same indigenous knowledge system, it is expected that when the teacher draws from it and relates to the class work no gender will be endangered or disadvantaged.

Women nowadays are struggling hard to practically reject the hitherto common assertion that female is a weaker gender. Moreover, under the strong women propaganda these days, that whatever men can do women can do also, female students are working hard to be at par with the male if not even better. With this, it is not surprising that there was no significant difference in performance between male and female students. Here irrespective of gender, the gap between the learners' culture and the new field of knowledge has been narrowed down and bridged by the integration of indigenous knowledge.

However, on the other hand, this finding disagrees with the finding of Eya and Mgbo, (1997) who in their study found that there is a significant difference in the achievement of male and female students in favour of male's students. Still in disagreement with the finding of this study is the conclusion of Fasan and Oziyi (2011), that it is clear that in the world as a whole, that gender bias has been slanted against women, this view is shared by Fasan (2008) in his statement that women are not equal to men in all parts of the world, call it legal, social, political and economic. Burnette (2000), Moronfolu (2008) and Adewunmi (2008) also submit that females are not rated equally like their male counterparts in reward, power and authority

5. Conclusion

The persistent poor performance in WAEC senior school certificate examinations in physics in Nigeria over the decades, suggests that the teaching and learning of physics in Nigeria are largely unsatisfactory. In this study, the researcher applied the teaching strategy that harnessed the indigenous knowledge system of the students. The students became fascinated, and learned more meaningfully. As a result their performance was commendably higher than those taught as usual (conventional method). Findings showed that indigenous knowledge system strategy is integrated into classroom physics, will solve the problem of poor performance that has characterized physics examinations over the years.

6. Recommendations

From the findings in this study, the researcher made the following recommendations.

- Physics teachers should identify and harness the relevant indigenous knowledge systems of the students to demystify physics.
- Physics teachers should use the students' indigenous knowledge system to make physics familiar and friendly as to imbue meaningful learning.
- Practical physics should employ the local concepts live applications that constitute the students' indigenous knowledge systems.
- Ministry of education should adapt teacher preparatory programme to incorporate indigenous knowledge systems, and their integration with the classroom science teaching.
- Federal and state governments through the curriculum planners should integrate these indigenous knowledge systems into the educational system.
- Nigerian authors of physics textbooks should use local examples and familiar illustrations to show that physics is part of the students' local community and not foreign.
- Physics teachers and authors should incorporate female students in physics demonstrations and assignments, to balance gender consideration so that physics should stop being classified as masculine subject.

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