

Bridging Gender Gap in Physics Classrooms: Do Teaching Approaches Matters?

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Abstract. Gender issues in Nigeria have become an issue of concern in the past few years. As schools and educational institutions become more structured, sex differences in education and academic achievement assume new and more focus of researchers. It is quite obvious that despite government effort in achieving gender equity in all sectors of the economy, gender inequality still persist in achievement and enrolment in physics classroom. This has been attributed to the teachers' factor i.e the teacher and her/his methods of teaching physics concept. Therefore, this study investigated to what extent can constructivist instructional strategies bridged gender gap in physics classroom.

The study adopted a quasi-experimental research design with 194 SSII physics students as participants. Physics Achievement Test (PAT) was used for data collection with reliability coefficient of 0.76. It was discovered from the analysis that using appropriate teaching approaches helped female students to learn and remember facts, apply skills, comprehend concepts, analyses and synthesises principles which are cognitive objectives of physics education. Recommendations and suggestions were proffered.

Key words: Gender Disparity, Action learning strategy, inquiry-based strategy, conventional strategy, Physics

1. Introduction

The Beijing declaration and platform for Action, approved in September, 1995 at the Fourth world conference on women which was endorsed by the united nations general assembly in 1996 constitutes a global commitment to achieving gender equality, development and peace for women worldwide as stated in the mission statement. The mission statement aimed at removing all obstacles to women's active participation in all sphere of public and private life through a full and equal share in education, economic, political decision-making, at home, work place, national and international communities ('Beijing Declaration and Platform for Action: Fourth World conference on Women' UNESCO.Org, 1995). Based on this declaration, the 1999 constitution of the Federal Republic of Nigeria was amended which prohibits *inter alia* discrimination on the ground of gender. Sections 18 and 42 of the 1999 Nigerian constitution provides for equal educational opportunities at all levels for every citizenry such as free secondary education, free compulsory universal education, free adult literacy, however, many factors have restricted elimination of discrimination practices against women in Nigeria (FRN, 1999).

With constitutional provision of equality, evidences abound of the persistent gender inequality in employment and educational attainment (Ukoh-Aviomoh, 2004). According to Adeyemi and Akpotu (2004) which stated that gender imbalance in enrolment and achievement

is pronounced at all levels and across disciplines and programmes in secondary and tertiary levels of education in Nigeria. World Bank (2002) reported that consistent disparity in students enrolment against the female at the primary and secondary levels of education is far reaching and has direct consequences on the gender distribution in university enrolments and consequently in the participation of women in high-level man power occupation. The campaign of the human rights and freedom for women has gained support in the developed world with United Nations intervention that women should be empowered. In Nigeria, a lot has not been achieved as a number of factors still militate against gender equity and women achievement of human rights. Such factors include social, economic, cultural, political and religion beliefs to mention a few (Eze, Chikwendu and Onyejegbu, 2006 and Afolabi and Akinbobola, 2012). Briggs (2010) cautioned that in striving to achieve gender equity in science and technology and making women relevant in all sector of the nation's economy, efforts should as well guide against abandonment of our social institute, customs and cultural heritage but rather preserve them as education should prepare us for a changing society and itself generate social change.

In the studies of Erinosh(1997), Adeyemi and Akpotu (2004), Afuwape and Oludipe (2008), Onadeko(2009) established that gender effect is significant on achievement in Physics. Iroegbu (1998) reported that male students performed significantly better than female students' achievement in physics. While Ukwungwu and Ezeike (2000) studied gender disparity and physics achievement in Nigeria, the results showed a mean effect size of 0.32 in favour of males corresponding to a correlation coefficient of 0.16, the square r showed that 2.6% of the variance in physics achievement was accounted for by gender. In contrast, Almahdi and Serage (2013) investigated if any relationship exist between selected factors namely gender, school and student factors and academic achievement in physics of high school students' in Tripoli, Libya and discovered that female students were found to perform better than their male counterparts. With these observed differences in

the academic achievement of between male and female students in physics and science related subjects one could attribute the differences to the methods used in teaching the subject.

The issue of gender disparity in academic achievement in the senior secondary physics points to the need for more research work and initiatives on gender related research, it appears that influence of gender on achievement of students has not been established. Most initiative carried out reflects are inconsistency in terms of suggestion and what need to be done to secure gender equality in physics education. Researchers found that gender factors have positive, negative or no contribution to academic achievement. One of the initiatives that could be adopted is assuming that male and female have different approaches to learning of physics and contribute differently to the development of scientific knowledge. Often times, the instructional strategy employed by teachers for students to acquire knowledge determine the achievement of physics students in the class room and invariable causes gender disparity. Thus, this study will examine the influence of gender on academic achievement of physics students using two instructional strategies against the commonly used conventional method, probably a reasonable improvement might occur on the achievement of female physics students. This paper therefore reports on a study that implemented these two strategies in order to establish whether they contribute to any difference in gender achievement.

Action learning strategy is a dynamic process of teaching that involves a small group of people solving real problems, while at the same time focusing on what they are learning and how their learning can benefit each group member, the group itself and the organisation as a whole (Mumford, 1996). The impact of action learning on elementary school students' achievement and attitudes towards science was measured by Kaptan and Korkmaz (2002). The action learning tasks were designed with regard to multiple intelligences. The findings indicated that the science achievement scores of the experimental group is better than that of the control group. The author also found significant

differences with respect to students' attitudes toward science in favor of the experimental group. Consequently, Kaptan and Korkmaz showed evidence that action learning impacts positively on student achievement at elementary level in a Turkish context. It is believed that incorporating action learning strategy into the classroom setting will probably bring about a success story and improve students' achievement most specifically, female students achievement in physics classrooms. Another strategy which has been found to enhanced students' achievement in Physics is Inquiry-based instructional strategy.

Inquiry-based instructional strategy is another key area that has generated a lot of key interest. Hmelo-Silver, Duncan and Chinn (2007) described inquiry based science teaching as a way of acquiring knowledge through the process where students play a major role in answering the question with the help of a teacher. A number of studies have reported the benefits of inquiry-related teaching approaches, suggesting that these techniques foster understanding of scientific processes, scientific literacy and critical thinking among other competencies (Cavallo, Potter and Rozman, 2004). It is therefore, believed that when these two strategies are adapted to teach concept in physics it would stimulate and improve achievement of students in physics.

2. Statement of the Problem

Despite various government interventions on equality for both sexes evidences abound of the persistent gender inequality in employment, educational attainment, between male and female in Nigeria. Most science classrooms especially physics in Nigeria is faced with the problem of female underrepresentation and underachievement. Some researchers and writings have addressed this issue of underachievement of female students in physics in an attempt at establishing linkages between gender difference and academic achievement in the classroom setting but the result remain conflicting and inconclusive. Therefore, this study seeks to find out which learning strategy

will enhance and foster female student achievement in physics.

3. Significance of the Study

It is expected that the findings of this study would provide relevant information on the main and interactive effects of instructional strategies and gender in influencing the learning achievement of the senior secondary school students. Hopefully, the findings from this study would enable teachers and students' device new approaches and strategies for improving on the current level of achievement in physics.

4. Hypotheses

This study is designed to test the following null hypotheses at 0.05 level of significance.

H₀₁: There is no main effect of treatment on student achievement in physics

H₀₂: There is no significant main effect of gender on students' achievement in physics

H₀₃: There is no significant interaction effect of treatment and gender on students' achievement in physics.

5. Research Methods

The research design adopted for this study was a pre-test post-test control group. Participants for this study comprised all the senior secondary two (SS2) Physics students in two Local Government Areas of Kwara State. The SS2 students are considered for the study because of the following reasons:

- They have acquired some vital basic concepts and skills in Physics (unlike the SS1 students).
- SS2 students are likely to be more receptive than SS3 students who will be under pressure of preparation for external examinations..
- Students have enough time to carry out practical work.
- Public and co-educational secondary schools that have at least one class of SS2 physics
- The content to be used is in SS2 syllabus

Nine secondary schools were purposively selected for the study in two Local Government Areas of Kwara State (four schools in Ifelodun Local Government Area and five schools in Ilorin east Local Government Areas. The participating Local Government Areas were stratified according to distance. A purposive sampling technique was used to select schools from the target schools. The following criteria were used for the selection of schools.

- Schools that have at least one graduate Physics teacher with not less than three years of teaching experience and teaching Senior Secondary II classes.
- Schools that have well equipped and functional Physics laboratory.
- Schools that are currently presenting candidates for Senior Secondary School Certificate Examination (SSCE).
- Public and co-educational secondary schools that have at least one class of SS II Physics students.

Six schools that met the criteria were selected for the main study out of the nine purposively selected schools by distance stratification i.e three schools from Ifelodun Local Government Area and three schools from Ilorin east Local Government Area. Two schools each from the selected Local Government Area (Ifelodun and Ilorin east) were assigned by balloting to each treatment condition. The researcher made sure that the schools selected for the preliminary study and main studies were far apart from each other to avoid contamination. In all 194 SS2 Physics students participated in the study.

6. Research Instrument

The researcher made instrument physics Achievement Test (PAT) comprised of 25-multiple choice items in the concept of waves was used in collecting data for the study. Each item had four options with only one correct answer and three distracters and the correct answer was scored 4marks. The content covered different levels of cognitive domains namely remembering, understanding, applying, analysing, creating, evaluation (Anderson and Krathwohl, 2001). The questions on remembering on Achievement test in Physics (ATP) constitute 24 percent while on application

in the Achievement test in Physics (ATP) constitute 32 percent of the total questions.

The draft questions originally comprised of 32 questions drawn by the researcher from the West African Examination Council Physics syllabus and was given to three experienced teachers in Physics for construct and face validity of the test items which was reduced to twenty-five (25) multiple-choice test items. This was administered to a trial testing group of (50) fifty students who were not part of the main study but who were found to be equivalent in all respects to the students in the study. The reliability coefficient was 0.76 while the average discriminating power and difficulty indices of the items were 0.52 and 0.52 respectively.

The teachers' instructional guide was developed by the researcher as a teaching guide written out for the participating subject teachers in action learning strategy to ensure uniformity. This is divided into stages as described by the researcher as adopted from Marquardt (2004) action learning process. Each lesson involving action learning strategy lasted for 40 minutes because of the nature of the strategy. Stages in Action Learning Process according to Marquardt, (2004)

Step1: Group formation. The teacher helps in the forming of the action learning sets from the four intact classes. The sets are grouped based on their performances in the pre- test and each set comprises of five students of mixed ability. Action learning sets met twice daily to discuss the problem based on the time available for its resolution.

Step2: Presentation of the problem or the task to the set. A set may handle one or many problems.

Step3: Analyze the issue(s): this involves identification of action learning for resolving them.

Step4: Presentation of the problem: the leader of the set represents the problem briefly to the set and awaits the group's recommendations.

Step5: Reframe the problem. After a series of questions, the sets, often with the guidance of the action learning teacher, reach a consensus on the most critical and important problem the sets should work on. The sets establish the crux of

the problem, which might differ from the original presented problem.

Step6: Determine goals. Once the key problem or issue has been identified, the set seeks consensus for the goal.

Step7: Develop action strategies. Much of the time of the sets is spent on identifying, and pilot testing, of possible action strategies.

Step8: Take action. Between action learning sessions, the whole sets and individual members collect information, identify the support status, and implement the strategies developed and agreed to by the sets.

Step9: Repeat the cycle of action and learning until the problem is resolved or new directions are determined.

Step10: Capturing learning. Throughout and at any point during the sessions, the action learning teacher may intervene. He asks questions to the set members, which enable them to:

- Clarify the problem.
- Find ways to improve their performance as a set.
- Identify how their learning can be applied to develop themselves and the team.

The teachers' instructional guide was developed by the researcher as a teaching guide for participating teachers in the inquiry-based teaching strategy to ensure uniformity. This is divided into stages as described by Beyer (1971) and Akinlaye (1998) and adapted for this study. Each lesson involving inquiry-based strategy lasted for forty minutes because of the nature of the strategy. The procedure for teaching is as follows:

Stage1. (5 Minutes)

Introduction and discussion of the basic concepts, waves as energy in motion, and the teacher presents and defines basic concepts clearly to the students.

Stage2. (10minutes)

The teacher posed thought-provoking questions to clarify issues. Five questions were asked to stimulate and direct the inquiry.

Stage3. (10minutes) The teacher directs students to identify sources of information

Stage4. (5 minutes)The teacher divides the class into small groups

The teacher helps in the division of the class into small groups. Each group comprised of mixed ability and consists of 5 to 7 students.

Each group selected their leader who presented the findings.

Each group is directed to develop plans on how to involve all the members in the group in collecting facts, arranging and assessing the findings and

Each group developed and proceeded to information gathering

Stage5. (5minutes) Each group leader presents findings to answer questions.

The teacher directs each group leader to present findings to the whole class.

The teacher asks probing and analytical questions with, 'what', when, why, who, and how on each controversial points.

The teacher uses chalkboard to conclude based on the data generated.

Stage6. (5minutes) Students draw conclusion and make decisions on issues.

The teacher directs the class to conclude in the light of evidence from the data

The teacher further directs students to re-examine their conclusion with a view to take a rational decision, leading to future inquiry.

Conventional strategy teacher's guide was developed from the course content outline of classroom activities in the school curriculum.

Stage1: A statement of the topic to be taught

Stage2: Listing behavioural objectives

Stage3: Learning resources

Stage4: Entry behaviour

Stage5: Introduction of the concepts to be taught

Stage6: Presentation, Step by step presentation of the class activities

Step7: Summary

Step8: Evaluation

The validity of the three instruments was ascertained by giving the teachers' instructional guide to three secondary school teachers and two Physics educators to validate and to determine the suitability of the instrument for classroom use.

The variables of teacher quality were controlled by using research assistants who were the

physics teachers in each school to teach each group. Detailed instructions with lesson plan on the concept of wave given to the research assistants during the training that was conducted for them in one week. Pre-test was administered to both the experimental and control groups and the results were used as covariate measures in order to take care of the possible initial difference in the groups. Two days after the administration of the pretest, treatment was introduced to the two groups (experimental and control groups) for 80 minutes (double period) in each class by the research assistants.

The teaching of the concept, wave was done by the research assistants in each school from a well-articulated lesson package developed by the researcher for six (6) weeks. All the hypotheses were tested at 0.05 level of significance.

7. Research procedure

Teaching in both the experimental and control group were done simultaneously by institution-based teacher for six weeks. The researcher was however, directly involved with the administration of both pre and post-tests. This is to ensure that norms associated with examination exercise are strictly maintained. The first three schools located in the same local government had their pre and post test administered on the same day while the remaining three schools in the other Local Government Area had their pre and post-test the second day. This allowed the researcher to monitor the conduct of the test administration since the Local Government Areas are far apart to allow the research to cover them the same day. The researcher was present in all the schools to monitor the teaching and testing sessions. The whole experiment lasted for 9 weeks.

8. Results

Hypothesis One

There is no significant main effect of treatment on students' achievement in Physics.

Table 1: Summary of ANCOVA of Posttest Achievement Scores of Students by Treatment and Gender

Source	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Covariates	3991.78	1	3991.78	35.10	.00*	Sig.
Main effects	88751.21	5	17750.24	156.08	.00*	Sig.
Treatment	85008.05	2	42504.03	373.74	.00*	Sig.
Gender	1196.17	1	1196.17	10.52	.01*	Sig.
2-Way Interactions	1565.32	8	195.67	1.72	.09	n.s.
Trtgrp x Gender	584.34	2	292.17	2.57	.08	n.s..
Explained	94497.51	15	5249.86	.46.16	.00	
Residual	19905.16	175	113.73			
Total	114399.67	193	592.74			

* Significant at p< 0.05
n.s = Not significant

The result of treatment in Table 1 reveals that the main effect of treatment on students' achievement in Physics was significant at 0.05 alpha level ($F_{(2,190)} = 373.74; p < 0.05$). This implies that the posttest scores of students in Physics differ significantly across the two experimental groups and control. Therefore, hypothesis 1 is rejected.

The Multiple Classification Analysis (MCA) in Table 2 shows the magnitude of the post-test, mean achievement scores of subjects exposed to the different treatment conditions

Table 2: Multiple Classification Analysis (MCA) of Posttest Achievement Scores According to Treatment, and Gender
Grand Mean = 53.96

Variable + Category	N	Unadjusted variation	Eta	Adjusted for independent + covariates deviation	Beta
Treatment groups					
Action Learning	59	25.63	.86	25.72	.86
Inquiry Based Learning	74	2.20		2.13	
Control	61	-27.47		-27.46	
Gender					
Male	103	-2.64	.12	-2.34	.10
Female	91	2.99		2.65	
Multiple R-squared					.81
Multiple R					.90

In the Table 2, the adjusted mean scores of the different Treatment groups are: Action Learning (79.68), Inquiry Based Learning (56.09), Control (26.50), Male (51.62), and Female (56.61) respectively.

This shows that the Action learning group had the highest adjusted mean score (53.96+25.72) or $\bar{x}=79.68$, followed by the Inquiry Based Learning group (53.96+2.13) or $\bar{x}=56.09$ and the Control group (53.96 + -27.46) or $\bar{x}= 26.50$. The teaching strategies have an index of relationship of 0.74 (0.86²), hence the observed relationship in favour of teaching methods, shows that the teaching strategies have a significant relationship of 0.74 (Beta value of 0.86²) with achievement of students in Physics. Table 2 also shows a Correlation Coefficient (R) of 0.90 with square coefficient of determination (R²) of 0.81. This implies that 81% of the total variance in the achievement of students in Physics is attributable to the influence of teaching methods. This implies that the treatment given has significant effect, hence H₀₁ is rejected.

Table 3: Pairwise Multiple Scheffe Post-Hoc Analysis of Treatment Effect on Students’ Achievement

Treatment group	N	Mean	Control	Action group	Inquiry group
Control	61	26.50		*	*
ActionGrp	59	79.68			*
InquiryGrp	74	56.09		*	

*Pairs of groups significantly different at p< 0.05

Table 3 reveals that the post-test achievement of students mean score of the conventional group ($\bar{x}= 26.50$) is significantly different from each of the action learning (79.68) and inquiry based group ($\bar{x}= 56.09$).

Hypothesis Two

There is no significant main effect of gender on student’s achievement in Physics.

Table 1 reveals that there is a significant main effect of gender on students’ achievement in Physics (F_(2,191) =10.52; p<0.05). On this basis, hypothesis 2 is rejected. Table 2 also shows a correlation coefficient (R) of 0.10 with a coefficient of determination (R²) of 0.01. This implies that 1% of the total variance is attributable to the influence of gender.

Hypothesis Three

There is no significant interaction effect of treatment and gender on student’s achievement in Physics.

Table 1 shows that there is no 2-way interaction effect of treatment and gender on students’ achievement in Physics (F_(6,187) =2.57; p>0.05). Hence, hypothesis 3 is not rejected.

9. Discussion of Results

The data revealed that action learning strategy is a potential tool that can be used to improve students’ achievement in secondary school Physics. Action learning strategy was found to be more effective as a teaching strategy than the Inquiry based strategy. This might be due to the fact that in action learning, students study their own actions and experiences in order to improve achievement. It focuses on research into actions taken and as a result, knowledge emerges which lead to the improvement of skills, achievement,

self-understanding, self-development and systematic learning occurs which becomes self-sustaining in the long term.

Furthermore, action learning involve small groups that meet regularly to take action on critical problem using the collective experience of group members to create learning opportunities which include discussion of goals, share ideas and information, seek additional information, make decisions about the results of their findings and present it to the whole class. It enhances appropriate behaviour in organising work, asking questions, encouraging social interaction, demonstrating self-management and facilitating better study habit and retention of knowledge. Action learning strategy was able to reduce the abstract nature of the concept by presenting it real to the students.

This study is in agreement with the findings of Dixon (1998), Marquardt (2004); Chambers and Hale, (2007) and Kramer (2007) that action learning is a viable strategy that improves performance, promotes learning and position groups or organisations to adapt better in turbulent times. It is also a way to develop the capabilities of individuals, groups, team and overall organisations. Although, Physics students achieved higher in action learning (79.59) than inquiry based strategy (56.16) and lastly the conventional strategy (26.49), inquiry based strategy can equally be used to teach difficult concepts in Physics in a situation where action learning is not realistic due to certain constraints. Inquiry strategy exposes the students to more realities of life and tends to work as scientist and acquire knowledge by themselves in which the teacher serves as a guide and correct their misconceptions (Afolabi and Akinbobola, 2009).

From the findings, Action learning strategy can also be used effectively to improve students' attitude towards Physics. This can be attributed to the fact that students did all the learning exercise together throughout the treatment period and learners constructed their knowledge at their individual pace. A good number of research works have shown that the information that is self – discovered is best retained (Adesoji,

2003; Ikitde, 2008; Afolabi, 2009). This probably may be responsible for the students showing more positive attitude than students in other groups.

Data analysis showed that gender has a significant effect on students' achievement in Physics. Female students had the higher achievement mean score than their male counterparts. The significant gender related difference in achievement could be explained. Applying appropriate teaching approaches helped female students learn and remember facts, apply skill, comprehend concepts, analyses and synthesis principles which are cognitive objective for Physics education.

The result is contrary with the findings of Akinbobola (2006), Akinbobola (2008) and Afolabi and Akinbobola (2009) that showed no significant difference in the mean performance between boys and girls in the manipulation of the same instructional materials as well as in their rate of contribution and class participation. He noted that every child, both male and female must be given the opportunity to display his/her ability as fully as possible, be they quick or slow, deep or superficial in thinking, once they are taught with the same teaching approach. This is because the good performance of a student depends on his interest as well as the techniques used by the teacher and the types of instructional materials involved. The result is consistent with the findings of Dagoli (2000), Ukwungwu and Ezeike (2000), that gender difference really exist in science classroom and that females displayed higher mean scores than their male counterparts when appropriate instructional strategy is used. Jones (1990) concluded that ability correlated significantly with science achievement while gender was not identified as predictor of science improvement.

The data analysis also revealed that there is no significant interaction effect of treatment and gender on students' achievement in Physics. This shows that gender has no effect on the achievement of students in Physics. That is, the three instructional strategies groups, there was no significant difference in the performance of both male and female students. As discussed

earlier, this could be as a result of the nature of these strategies. The students were able to learn through many senses most especially the two treatments applied. The two learning strategies are more effective and the concepts learnt are more retained. The strategies are more suitable for both sexes.

10. Conclusion and Implications

The results of the study have found out that the use of action learning and inquiry-based instructional strategies are both effective at improving achievement of physics students' in Physics than the conventional method.

The study provided a useful insight into the effects of teaching strategies on students' learning outcomes in physics. The action learning is a strategy which facilitates meaningful learning, retention and transfer of knowledge of physics concepts and enhances the ability to master the subject matter, apply the concepts to various situations.

The inquiry-based strategy is a strategy in which the teacher could help the students makes connections to new materials to be learnt by highlighting the organizational structural patterns of the materials and indicating how they relate to other materials already learnt.

The study has provided a useful insight into the effects of teaching methods on students' achievement in secondary school Physics. In the light of the findings discussed, this study has the following implications for Physics teaching.

The researcher concluded that action learning strategy enhances students' achievement in Physics more than inquiry based strategy. Also, gender has a significant effect on the academic achievement of students taught with action learning and inquiry based learning strategies.

Result from this study indicate that students exposure to action learning enhances the ability to master the subject matter, apply the concepts to various situation and render unnecessary much of the rote memorization of concept or propositions without the recognition of the

meaning of the words in the concepts which the students often resort to.

Gender has a significant main effect on students' achievement in Physics with female students performing significantly better than male students.

The interaction effect of treatment and gender on students' achievement in Physics was not significant.

The findings of this investigation have implications for the improvement of science and technology in Nigeria.

11. Recommendation

In view of the implications of the findings from the study, the following recommendations are made:

Physics teacher should make effective use of action learning strategy in the classroom in order to enhance the achievement of their students in the subject.

This research would suggest that order to encourage more women into pure science and science oriented courses, interventions need to be designed that focus not only on the academic achievement of girls but also, on how to make science-related occupations more interesting for young, high achieving girls. This type of intervention should start early in the academic careers for these young girls. Poor attitude to science subjects is one of the main reasons why many of these promising girls do not show interest in single science subjects at the secondary level and science-oriented courses at the nation's tertiary institutions respectively.

Publishers, federal and state ministries of education should sanitise on the use of action learning and thereafter organise conferences, seminars, and workshops for Physics teachers to acquaint them with the use of action learning strategy in teaching various concepts in Physics. Physics teachers should also be encouraged to attend in-service training through government sponsorship in Nigeria.

The use of action learning strategy should not be limited to Physics as a subject, but should be incorporated in other science subjects.

Textbooks authors should emphasize action learning strategy as an instructional procedure that should be adopted by Physics teachers for effective teaching and learning of the subject. Efforts should be geared towards the provision of science equipment necessary for enhancing the new strategy (action learning) by the government of Nigeria (state and federal), philanthropist, non-government organisations, private sectors and organisations.

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