# EFFECTS OF PROBLEM SOLVING AND MASTERY LEARNING APPROACHES ON THE INTEREST AND ACHIEVEMENT OF PHYSICS STUDENTS

**BY**

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## Abstract

This study investigated the effects of Problem Solving and Mastery Learning Approaches on the Interest and Achievement of Physics students. In this study, six research questions were raised and six hypotheses were tested. The study adopted quasi-experimental design. The sample of the study consisted of 64 senior secondary school II students from three intact classes in three different schools and the sampling technique used was simple random sampling technique. Two intact classes constituted the treatment groups while the third class was used as the control group. Problem Solving Approach (PSA) and Mastery Learning Approach (MLA) formed the basis for the treatment while Lecture or Conventional approach formed the basis for the control. Two research instruments namely Physics Achievement Test (PAT) and Physics Interest Rating Scale were developed by the researchers. The PAT instrument consists of 40 multiple-choice items and the PIRS instrument consists of 20 Yes/No items. The reliabilities of the instruments (PAT and PIRS) were determined using the split-half method. The reliability tests yielded 0.7 and 0.62 coefficients, respectively. The content and face validity of the instruments were established by experts in Science Education and Measurement and Evaluation at Nasarawa State University, keffi. To establish equivalence of the groups, pretest was administered to the groups. Following the pretest, three intact classes were picked for the study. The treatment and control groups were exposed to four weeks study of selected topics in physics (scalar and vector, speed, velocity and acceleration and uniform acceleration) after which the post-test was given. The data were collected and the research questions were analysed using mean statistics while the null hypotheses were tested at 0.05 alpha level using chi-square for independent groups and t-test. The results showed that there was significant difference in the mean achievement scores of the students in the three schools and PSA was, therefore, found to be the best teaching method that increases students' achievement and interest in physics.

## Introduction

Education is an important and indispensable activity in every society. In the National Policy on Education (NPE), education is described as the greatest investment that a nation can make for the quick development of its human and material resources. (FGN, 2004).

Science is recognized widely as being of great importance internationally both for economic well-being of nations and because of the need for scientifically literate citizenry. The

knowledge of science and technology is therefore a requirement in all countries and all people globally due to the many challenges that are facing them (Wambugu and Changeiywo, 2007). These challenges according to them include emergences of new drugs resistant diseases, effects of genetic experimentation and engineering, ecological impact of modern technology, dangers of nuclear war and explosion and global warming among others. As a result, there are rapid changes taking place in industry, communication, agriculture and medicine. This science as an instrument of development plays a dominant role in bringing about these changes of advancing technological development, promoting national wealth, improving health and industrialization. Arising from all these important gains of science, there is therefore the need for effective science teaching and learning in our schools as sure means of achieving the much needed technological breakthrough in Nigeria. This can only be achieved by a meaningful means of impartation of knowledge through good teaching technique. It is only when knowledge is imparted through good technique and one makes sure that the learner has gained something useful which can make his/her experience relatively permanent that one can say that learning has taken place. In time past, the regular teaching method (Conventional teaching method) has remained the only teaching method in teaching the sciences. This method has not achieved the much needed scientific literacy among the Nigerian youths because of its theoretical nature. Most of the time, students are exposed to the sciences without practical involvement. The relevance of this Conventional method and its attendant criticism has not offered the much needed scientific and technological advancement (Agboghoroma, 2005).

The study of physics as a subject should be regarded as a necessary part of human endeavours. Unfortunately today, it is observed that many students have developed negative attitude towards the subject. It has become almost a general belief among students that physics is an abstract subject and hence too difficult to learn. Owolabi (2009) discovered that the rate of failure in the subject at the senior's secondary school external examination is alarming and reduction in the number of students offering the subject over the years call for concern. Mtsem (2011) reported that teaching method affects the responses of students and determines whether they are interested, motivated and involved in teaching learning process. What constitutes good teaching and learning of school subjects is the use of appropriate methods of teaching. Ogunniyi (2009) asserted that one of the most persistent and compelling problems besetting achievement is poor quality of teaching. Corroborating this assertion, Harrison (2010) reported that many school subjects especially Physics is not being learnt as it ought to be in Nigeria secondary school because of inappropriate teaching methods.

The poor academic achievement in physics could be attributed also too many factors among which teacher's strategy itself was considered as an important factor. This implies that the mastery of physics concepts might not be fully achieved without the use of instructional materials. The teaching of physics without instructional materials may certainly result in poor academic achievement. Olawale, (2011) stressed that a professionally qualified science teacher no matter how well trained, would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him or her to translate his competence into reality.

There is therefore need to motivate students towards studying physics so that the learners can perform and acquire knowledge and skills that will be relevant in future careers. Hancock (2004) asserts that a motivated learner performs well. The teaching approach a teacher adopts is a strong factor that may affect the students' motivation towards learning, therefore affecting the achievement. Motivation can be enhanced through teaching methods that actively involve

students (Keraro, 2006). A teaching method that would help student's to find satisfaction in the subject matter and also make the subject matter relevant to the needs of the leaner would be necessary to motivate them. It is important that a teacher adopts a teaching approach that will enhance the four dimensions of motivation, namely attention, relevance, confidence and satisfaction to learn academic subject matter. Most of the tasks found in physics course that a student is required to perform are not inherently interesting or enjoyable. There is need for a teaching strategy that will promote more active and positive performance (Ryan & Deci, 2000). Therefore, a teaching approach that has continuous feedback to the performance of students can motivate students to value and self-regulate the academic activities, carrying them out on their own. Adeyemo (2010), listed some essential feature that will help learners easily comprehend physics. These according to him include:

1. The method of teaching physics should be guided discovery method instead of the old and routine lecture method used in teaching the subject. This was recommended due to the fact that learning efficiency and effectiveness takes place during explanation and discussion.
2. There should be interaction between the teacher and students, to enable students to expose their minds and what and when, they find difficult they encounter.
3. It was also recommended that each topic should have a target and specific objectives rob a met at the end of this lesson. This is necessary and important if physics is to be appreciated by the students and community at large. Before a topic could be appreciated, it must have attainable goals and objectives and if these objectives are not met, then it is said to be aimlessly taught and of course, have no contribution to the development of students in terms of cognitive, affective and psychomotor domains hence have nothing to add to the society.
4. It is recommended that emphasis should be placed on both theoretical aspect and practical aspects of the subject. This is recommended so that any theory taught in physics could be tested, trusted and consistent at any given situation.

This has led to the development of new teaching approaches for the impartation of knowledge in the sciences and among these techniques are problem solving and mastery learning approaches.

Mastery Learning Approach (MLA) is an instructional method where students are allowed unlimited opportunities to demonstrate mastery of content taught. (Wambugu and Changeiywo, 2008). MLA involves breaking down the subject matter to be learned into units of learning, each with its own objectives. Adepoju (2002) refers to mastery learning as an innovation which in its various forms is designed towards making learners to perform beautifully well in an academic task. Also Adeyemi (2007) described mastery learning as a teaching strategy that involves a pre-specified criterion level of performance which students must master in order to complete the instruction and move on. According to him, mastery learning involves frequent assessment of students' progress, it provides corrective instruction and emphasizes on all participation, feedback and reinforcement. In the same vein, Wambugu and Changeiywo (2007) opined that MLA helps the students to acquire prerequisite skills to move to the next unit. Mastery of each unit is shown when the students acquire the set pass mark of a diagnostic test. The teacher is also required to do task analysis and state the objectives before designating the activities. MLA can help the teacher to know students area of weakness and correct it thus breaking the cycle of failure. Results from research studies carried out on MLA suggest that the approach yields better retention and transfer of material, yield greater interest and more positive attitude in various subjects than Non-Mastery Learning Approaches (Ngesa, 2002; Wachanga and Gamba, 2004 and Wambugu and Changeigwo, 2007).

Problem-solving approach (PSA) is used to refer to many contextualized approaches to instruction sharing that much of the learning and teaching is anchored in concrete problems (Evenson & Hmelo, 2000). Problem-solving approach is a process which covers a wide range of mental abilities. Students should realize what and why they are doing, and know the strengths of these strategies, in order to understand the strategies completely and be able to select appropriate ones (Telli, Brok, Tekkaya, & Cakiroglu, 2009). In the words of Erdemir, (2009), "Problem-solving also involves a student's willingness to accept challenges. Accepting a challenge in this context means that the student is willing to find appropriate methods to solve a problem". Normah and Salleh (2006) discovered that students who can successfully solve a problem possess good reading skills, have the ability to compare and contrast various cases, can identify important aspects of a problem, can estimate and create analogies and attempt trying various strategies. It can be concluded in the words of Hetherington and Parke (1999), "Problem solving involves a higher level of information processing than the other functions and mobilizes perception, attention and memory in a concerted effort to reach a higher goal". Problem solving approach generate students' interest and motivation and improve scientific process skills (Tatar & Oktay, 2011).

It is in the light of the foregoing that this study was designed to find out the effects of problem solving approach and mastery learning approach on the interest and achievement of physics students in secondary schools. These strategies will be investigated to see if they have positive or negative effect on student's interest and achievement in physics and to identify which strategy is more suitable in improving students' interest and achievement in physics in secondary schools.

**Research Questions**

In determining the effects of PSA and MLA on students' achievements in physics, the researchers asked the following questions;

1. What is the difference between the mean achievement score of students taught using PSA and students taught using MLA in physics in secondary schools?
2. What is the difference between the interest rating of students taught using PSA and students taught using MLA in physics in secondary schools?
3. To what extent does PSA affect the interest of physics students in secondary schools?
4. To what extent does MLA affect the interest of physics students in secondary schools?
5. What is the impact of PSA on students' achievement in physics in secondary schools?
6. What is the impact of MLA on students' achievement in physics in secondary schools?

**Hypotheses**

The hypotheses formulated for this study were drawn from the questions asked above.

1. There is no significant difference in the mean score of students taught physics using PSA and those taught using MLA.
2. There is no significant difference between the interest of students taught physics using PSA and those taught using MLA.
3. There is no significant difference between the interest of students taught physics using PSA and those taught using the conventional approach.
4. There is no significant difference between the interest of students taught physics using the conventional method and those taught using MLA.
5. There is no significant difference in the mean achievement score of students taught physics using PSA and those taught using the conventional approach.

6. There is no significant difference between the mean achievement score of students taught physics using MLA and those taught using the conventional approach.

**Method**

The study employed a quasi-experimental research design represented by 3x2 factorial designs. Symbolically, the research design is represented in **figure 1**as shown below:

Experimental group 1($E_1$) = $O_1$ ⟶ X ⟶ $O_2$
Experimental group 11($E_2$) = $O_1$ ⟶ Y ⟶ $O_2$
Control group (C) = $O_1$ ⟶ Z ⟶ $O_2$

Where $O_1$ = Pre-test, $O_2$ = Post-test, Z = Traditional Method (TM) or Conventional Approach
X = Problem Solving Approach (PSA), Y = Mastery Learning Approach (MLA)

**Figure 1.**

The illustration in figure 1 shows that the experimental group 1($E_1$) received the pre-test, the treatment X and the post-test, Experimental group 11($E_2$) received a pre-test followed by the treatment Y and then the post-test and the Control group (C) received a pre-test, the treatment Z and post-test. Experimental group I and II were taught using MLA and PSA respectively while groups III were taught using LM or conventional approach. The sample of study involves 64 students from three intact classes in three different secondary schools in Lafia educational zone and the sampling technique used was simple random sampling. The instruments developed for this research are the Physics Achievement Test (PAT) and Physics Interest Rating Scale (PIRS).

**Results**

The data are presented according to the research questions and hypotheses formulated for this study.

**Research Question 1:** What is the difference between the mean achievement score of students taught using PSA and those taught using MLA in physics in secondary schools?

In order to answer research question 1, the mean and standard deviation of student's scores in the various groups were calculated as shown in table 2

**Table 1:**

Mean, Standard Deviation and Mean Gain scores of PAT Pre-test and Post-test from PSA and MLA groups

| S/N | Schools | Groups | N | Pre-test | | Post-test | | Mean Gain Score |
|---|---|---|---|---|---|---|---|---|
| | | | | $\bar{X}$ | SD | $\bar{X}$ | SD | |
| 1. | A | PSA | 15 | 11.07 | 2.93 | 14.33 | 2.98 | 3.26 |
| 2. | B | MLA | 19 | 10.40 | 3.22 | 10.83 | 3.29 | 0.43 |
| | Total | | 34 | | | | | |

The result of table 1 shows there is significant increase in post-test scores when compared to the pre-test scores for both groups. The result also shows that the PSA groups mean gain score was higher than that of the MLA group which means that there is a difference between students taught physics using PSA and those taught using MLA.

**Null Hypotheses 1:** There is no significant difference in the mean achievement score of students taught physics using PSA and those taught using MLA.

**Table 2**

t-test analysis of Post-test mean achievement scores from PSA and MLA groups.

| S/N | Schools | Groups | N | X | SD | df | t | P |
|---|---|---|---|---|---|---|---|---|
| 1 | A | PSA | 15 | 14.33 | 2.98 | | | |
| | | | | | | 32 | 3.27 | 0.001 |
| 2 | B | MLA | 19 | 10.83 | 3.29 | | | |
| | | Total | 34 | | | | | |

From table 2, the p value (0.001) is less than $\alpha = 0.05$computed t-test is greater that the t-critical value. On this basis, the null hypothesis is rejected. This implies that there is a significant difference between students taught physics using PSA and those taught using MLA.

**Research Question 2:** What is the difference between the interest of students taught using PSA and those taught using MLA in physics in secondary schools?

**Table 3**

Mean statistics of the responses from the PIRS Pre-test of PSA and MLA groups.

| S/N | School | Group | Scale (x) | | Frequency (f) | fx | $\overline{X}$ |
|---|---|---|---|---|---|---|---|
| 1. | A | PSA | Yes | (3) | 154 | 462 | |
| | | | No | (2) | 118 | 236 | 2.42 |
| | | | Undecided | (1) | 28 | 28 | |
| | | | Total | | 300 | 726 | |
| 2. | B | MLA | Yes | (3) | 166 | 498 | |
| | | | No | (2) | 129 | 258 | 2.54 |
| | | | Undecided | (1) | 5 | 5 | |
| | | | Total | | 300 | 761 | |

**Table 4**

Mean statistics of the responses from the PIRS Post- test of PSA and MLA groups.

| S/N | School | Group | Scale (x) | | Frequency (f) | fx | $\overline{X}$ |
|---|---|---|---|---|---|---|---|
| 1. | A | PSA | Yes | (3) | 180 | 540 | |
| | | | No | (2) | 108 | 216 | 2.56 |
| | | | Undecided | (1) | 12 | 12 | |
| | | | Total | | 300 | 768 | |
| 2. | B | MLA | Yes | (3) | 173 | 519 | |
| | | | No | (2) | 127 | 254 | 2.57 |
| | | | Undecided | (1) | 0 | 0 | |
| | | | Total | | 300 | 773 | |

The result of table 3 and 4 with regards to the groups mean statistics shows that there is a difference between the pre-test and post-test on the interest of students taught physics using PSA and those taught using MLA. The result from the post-test simply states that those students who were taught physics using MLA had more positive interest in physics compared to those taught using PSA.

**Null Hypothesis 2:** There is no significant difference between the interest of students taught physics using PSA and those taught using MLA.

**Table 5**

Result of the chi-square independent test analysis of PIRS for PSA and MLA groups.

| Cell | $f_o$ | $f_e$ | $f_o - f_e$ | $(f_o - f_e)^2$ | $(f_o - f_e)^2 / f_e$ | df | Calculated $X^2$ | Critical $X^2$ |
|---|---|---|---|---|---|---|---|---|
| I | 180 | 176.5 | 3.5 | 12.55 | 0.069 | | | |
| II | 173 | 176.5 | -3.5 | 12.55 | 0.069 | | | |
| III | 108 | 117.5 | -9.5 | 90.25 | 0.768 | 2 | 13.67 | 5.99 |
| IV | 127 | 117.5 | 9.5 | 90.25 | 0.768 | | | |
| V | 12 | 6 | 6 | 36.00 | 6.000 | | | |
| VI | 0 | -6 | -6 | 36.00 | 6.000 | | | |
| Total | 600 | | | | 13.67 | | | |

From table 5, the calculated chi-square is greater than the critical value. On this basis, the null hypothesis is rejected. This implies that there is significant difference between the interest of students taught physics using PSA and those taught using MLA.

**Research Question 3**: To what extent does PSA affect the interest of physics students in secondary schools?

**Table 6**

A comparison of the Mean Interest Rating of the Pre-test and Post-test of PSA group.

| | | | Pre-test | | | | Post-test | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S/N | School | Group | x | f | fx | $\overline{X}$ | x | f | fx | $\overline{X}$ | Gain |
| 1. | A | PSA | 3 | 154 | 462 | | 3 | 180 | 549 | | |
| | | | 2 | 118 | 236 | 2.42 | 2 | 108 | 216 | 2.56 | 0.14 |
| | | | 1 | 28 | 28 | | 1 | 12 | 12 | | |
| | | Total | | 300 | 726 | | | 300 | 768 | | |

The result of table 6 shows an increase in the mean statistics of post-test scores when compared to the pre-test scores. The result also shows that the PSA had an impact on the students' interest in physics.

**Null Hypothesis 3:** There is no significant difference between the interest of students taught physics using PSA and those taught using the conventional approach.

**Table 7**

Result of the chi-square independent test analysis of PIRS for PSA and Conventional Approach groups.

| Cell | $f_o$ | $f_e$ | $f_o - f_e$ | $(f_o - f_e)^2$ | $(f_o - f_e)^2 / f_e$ | df | Calculated $X^2$ | Critical $X^2$ |
|---|---|---|---|---|---|---|---|---|
| I | 180 | 181.6 | -1.6 | 2.56 | 0.014 | | | |
| II | 365 | 363.3 | 1.6 | 2.89 | 0.008 | | | |
| III | 108 | 106.7 | 1.3 | 1.69 | 0.016 | 2 | 0.06 | 5.99 |
| IV | 212 | 213.3 | -1.3 | 1.69 | 0.008 | | | |
| V | 12 | 11.67 | 0.33 | 0.11 | 0.009 | | | |
| VI | 23 | 23.33 | -0.33 | 0.11 | 0.005 | | | |
| Total | 900 | | | | 0.06 | | | |

From table 7, the calculated chi-square is less than the critical value. On this basis the null hypothesis is accepted which means that there is no significant difference between the interest of students taught physics using PSA and those taught using conventional approach.

**Research Question 4:** To what extent does MLA affect the interest of physics students in secondary schools?

**Table 8**

A comparison of the Mean Interest Rating of the pre-test and post-test of MLA group.

| | | | Pre-test | | | | Post-test | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S/N | School | Group | x | f | fx | $\overline{X}$ | x | f | fx | $\overline{X}$ | Gain |
| 1. | B | MLA | 3 | 166 | 498 | | 3 | 173 | 519 | | |
| | | | 2 | 129 | 258 | 2.53 | 2 | 127 | 254 | 2.57 | 0.04 |
| | | | 1 | 5 | 5 | | 1 | 0 | 0 | | |
| | | Total | | 300 | 761 | | | 300 | 773 | | |

The result of table 8 shows an increase in the mean statistics of post-test scores when compared to the pre-test scores. The result also shows that the method MLA had an impact on the students' interest in physics.

**Null Hypothesis 4:** There is no significant difference between the interest of students taught physics using the conventional method and those students taught using MLA.

**Table 9**

Result of the chi-square independent test analysis of PIRS for Conventional Approach and MLA groups.

| Cell | $f_o$ | $f_e$ | $f_o - f_e$ | $(f_o - f_e)^2$ | $(f_o - f_e)^2 / f_e$ | df | Calculated $X^2$ | Critical $X^2$ |
|---|---|---|---|---|---|---|---|---|
| I | 365 | 358.7 | 6.3 | 39.69 | 0.111 | | | |
| II | 173 | 179.3 | -6.3 | 39.69 | 0.221 | | | |
| III | 212 | 213.3 | -14 | 196 | 0.008 | 2 | 10.60 | 5.99 |
| IV | 127 | 113 | 14 | 196 | 0.016 | | | |
| V | 23 | 15.33 | 7.67 | 58.83 | 3.838 | | | |
| VI | 0 | 7.67 | 7.67 | 58.83 | 3.838 | | | |
| Total | 900 | | | | 10.60 | | | |

From table 9, the calculated chi-square is greater than the critical value. On this basis the null hypothesis is rejected which means that there is significant difference between the interest of students taught physics using conventional approach and those taught using MLA approach.

**Research Question 5:** What is the impact of PSA on students' achievement in physics in secondary schools?

**Table 10**

Mean Standard Deviation and Mean Gain scores of PAT Pre-test and Post-test from PSA group.

| | | | | Pre-test | | Post-test | | Mean Gain |
|---|---|---|---|---|---|---|---|---|
| S/N | Schools | Groups | N | $\overline{X}$ | SD | $\overline{X}$ | SD | score |
| 1. | A | PSA | 15 | 11.07 | 2.93 | 14.33 | 2.98 | 3.26 |
| | | Total | 15 | | | | | |

The result from table 10 shows that there is significant increase in the mean score and standard deviation of the post-test when compared to the pre-test. This implies that there was an increase in the students' achievement after being taught physics using the PSA approach.

**Null Hypothesis 5:** There is no significant difference in the mean achievement score of students taught physics using PSA and those students taught using the conventional approach.

**Table 11**

The result of the t-test analysis of PAT Post-test mean achievement scores for PSA and Conventional approach groups.

| S/N | Schools | Groups | N | $\overline{X}$ | S.D | df | t | P |
|---|---|---|---|---|---|---|---|---|
| 1. | A | PSA | 15 | 13.20 | 3.62 | | | |
| | | | | | | 43 | 1.43 | 0.07 |
| 2. | C | CONVENTIONAL | 30 | 12.87 | 3.72 | | | |
| | Total | | 45 | | | | | |

From table 11, the computed t value is 1.43 while p - value is 0.07 at df = 43; $\alpha = 0.05$. Since p - value (0.01) is less than $\alpha = 0.05$, the null hypothesis is rejected which implies that there is a significant difference between the mean achievement score of students taught physics using PSA and those taught using conventional approach.

**Research Question 6:** What is the impact of MLA on students' achievement in physics in secondary schools?

**Table 12**

Mean, Standard Deviation and Mean Gain Scores of the PAT Pre-test and Post-test from MLA group.

| | | | | Pre-test | | Post-test | | |
|---|---|---|---|---|---|---|---|---|
| S/N | Schools | Groups | N | $\overline{X}$ | SD | $\overline{X}$ | SD | Mean Gain Score |
| 1. | B | MLA | 19 | 10.40 | 3.22 | 10.83 | 3.29 | 0.43 |
| | | Total | 19 | | | | | |

The result of table 12 shows that there is significant increase in the mean score and standard deviation of post-test when compared to the pre-test of the groups. The result implies that there was an increase in the students' achievement after being taught physics using the MLA approach.

**Null Hypothesis 6:** There is no significant difference between the mean achievement score of students taught physics using MLA and those students taught using the conventional approach.

**Table 13**

Result of the t-test analysis of PAT Post-test mean achievement scores for MLA and conventional approach groups.

| S/N | Schools | Groups | N | $\overline{X}$ | S.D | df | t | P |
|---|---|---|---|---|---|---|---|---|
| 1. | B | MLA | 19 | 10.83 | 3.29 | | | |
| | | | | | | 47 | 2.02 | 0.001 |
| 2. | C | CONVENTIONAL | 30 | 12.87 | 3.72 | | | |
| | Total | | 49 | | | | | |

From table 13, the calculated t value is 2.02 and p - value is 0.001 at df = 47; $\alpha = 0.05$. Since p - value (0.001) is less than $\alpha = 0.05$, the null hypothesis is rejected which simply mean

that there is a significant difference between the mean achievement score of students taught physics using MLA and those using conventional approach.

**Discussion**

The major issue addressed in this study was to determine the effects of problem solving approach and mastery learning approach on the interest and achievement of physics students in secondary schools. In this study therefore, it was found that both problem solving approach (PSA) and mastery learning approach (MLA) enhanced achievement of students in physics but this was more in the case of problem solving approach. This is in agreement with the findings of This is in agreement with Sungur and Tekkaya (2006) who found out those students in an experimental PSA group scored higher on task value (i.e., interest, importance, and utility) than students in the teacher-centered group. Also, Hwang and Kim (2006) demonstrated that PSA students reported higher enjoyment and interest in the academic pursuit. Gallagher (1997) who also said PSA assessment should be structured so that students can display their understanding of problems and their solutions in contextually meaningful way. The results for skill development consistently favour PSA instruction. Problem solving approach generates students' interest and motivation and improve scientific process skills (Tatar & Oktay, 2011). Also mastery learning approach (MLA) enhances achievement in physics than conventional lecture method. This is also in agreement with Anderson, (2000) whose investigation showed that MLA lead to higher achievement in all students as compared to more traditional forms of teaching. Despite the empirical evidence, many mastery programs in schools have been replaced by more traditional forms of instruction due to the level of commitment required by the teacher and the difficulty in managing the classroom when each student is following an individual course of learning.

**Conclusion/Recommendations**

Based on the results of this study, it can be concluded that the use of PSA is the most suitable method for teaching physics and hence it should be preferred to the conventional approach (Lecture method). The use of PSA boosts learner achievement in Physics as it inculcates the required Physics knowledge, critical thinking, evaluation, cooperative and collaborative learning and communication skills in the learners in a better way compared to the use of MLA and conventional approach. This was evidenced by the superior grades achieved by learners exposed to PSA. It is obvious from the results of this study that improved learning ability of the students depends on their exposure to many teaching strategies. Therefore, in order to improve senior secondary school learning ability in physics, all the stakeholders in teaching and learning should embrace the PSA in secondary schools. In view of these findings, the idea of the physics teachers limiting students to conventional/traditional method should be discouraged. Physics teachers should encourage team work among physics students in order to work together cooperatively.

Availability and proper use of learning resources enhances the teaching of Physics. This is evidenced by the fact that teachers reported that schools with proper and adequate resources will boost their chances of using PSA which eventually enhances learners' achievement in Physics.

The findings from this study "Effects of PSA and MLA on the interest and achievement of physics students have some implications on the following:

1. There is a need for the physics teachers to look into the teaching method used in teaching physics. The use of PSA as a teaching method for the subject physics will improve the performance of students in physics.
2. The educational policy makers need to formulate a policy that will ensure adequate provision of instructional materials, both foreign and local since PSA requires the use of different instructional materials to make learning real and effective.
3. Seminars and Workshops should be mounted for physics teachers to train them on how to use the problem solving approach in teaching physics.
4. The physics curriculum needs to be looked into by the Nigerian Educational Research and Development Council (NERDC) in order to organize the physics scheme and create more time for physics students to improve in their thinking and problem solving skills.
5. The curriculum developers should restructure the physics syllabus and create more time for PSA to be used by teachers in teaching physics in schools.

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