Effects of I-Do-We-Do-You-Do Instructional Strategy on The Academic Performance of Students in Physics Practical in Ondo State, Nigeria

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Abstract
Teaching is an essential tool to bring about desired learning outcomes from the learners, so the need to package it with essentials is imperative. However, many researchers have contributed to different innovative and interactive teaching strategies that are effective to enhance the performance of students in science. It was from this perspective that this study sought to investigate the effects of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) and Conventional Instructional Strategy (CIS) on the academic performance and retention of secondary school students in Physics practical in Ondo state, Nigeria. The study further sought to clarify gender differences on physics students' retention. This was a view to ascertain the effect of (IWYIS). The study adopted the pretest posttest non-equivalent control group quasi-experimental research design. The population for the study comprised of Physics students in Ondo State, Nigeria. The sample for the study was fifty-five SSS 2 physics students drawn through multi-stage sampling procedure from four public secondary schools in the state. A self-developed Practical Physics Test (PPT)) was validated by three experts and used for the study. The reliability of the instrument was established using Kuder-Richardson 21 which yielded a reliability index of 0.85. The hypotheses were tested at 0.05 alpha level using Analysis of Covariance (ANCOVA) and independent sample t-test. The findings of the study showed that there were significant differences between the effect of IWYIS and CIS on the academic performance and retention of senior secondary school students in Physics practical at [F (1, 52) =19.07, p=0.000,] and [F (1, 52) =5.423, p=0.024,]respectively . IWYIS had more effect on the performance and retention of the students in Physics practical than the CIS. The findings further showed no significant difference in the mean score of male and female students in the Physics retention ability when exposed to I-Do-We-Do-You-Do Instructional Strategy. Based on the findings, recommendations made which included among others, I-Do-We-Do-You-Do Instructional Strategy, being gender friendly, should be used in the teaching of Physics, in Nigerian secondary schools.
Keywords: Effects, I-Do-We-Do-You-Do Instructional Strategy, Academic Performance, Students, Physics Practical
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1.1 Introduction

One of the skillful initiatives a science teacher should have and demonstrate during the pedagogical contents teaching is innovative strategy. This mode is not negotiable or to be trivialised in the class of science because of various forms in which science appears. Science revolves around activities that need continuous investigations for it to be understood in the context of our natural world, this therefore made science to be socially and practically inclined demanding the usage of different teaching strategies to enhance its dynamism and students' comprehension. This is so because of the meaning and contents of science in the curriculum. Science is therefore the search, understanding and application of knowledge of the natural and social world through a systematic methodology (Adebisi, 2021). Science is an inquiry process involving observation, questioning, investigation, measurement, reporting, gathering and analysing data, testing hypotheses, predicting and communication of scientific results. This defines the process of science and enables its practice to be characterised with interactions.. Within the domain of science is Physics which is taught from secondary schools to higher levels of studies contributing immensely to technological developments and innovations through problem solving and practical skills. This has made the studying of Physics to be intellectual demanding occasioned for critical thinking and problem solving. This was the reason for Adebisi, Seweje and Ajayi (2015) explained that the study of Physics revolves around intelligence, social and practical activities (Adebisi, Seweje

&Ajayi, 2015).

Physics as a subject shared characteristics of the nature of science, rests its balance on practical activities at all levels of education. For it to be real, practicable, anxiety free and for students to go along with it, it must be activities based which is practical oriented. The practical activity is an educational activity in which students learn by handling materials and equipment, making use of them for observation and experimentation (Mllar,2004), it facilitates cognitive and psychomotor skills (Oladimeji &Adebisi,2020), help the students to develop the skills and ability to solve problems scientifically (Nwakonobi & Okoye,2010). The presentations of Physics concepts can be easily comprehended in the classroom if it is taught with sufficient practical activities to arouse the students' interest; a platform that could give a solid background for students to appreciate and develop their academic self-efficacy in the subject. Also from the assertion of Adebisi and Ajayi (2015) that if science is to be learned effectively, it must be experienced and close to the students through practical activities. This is in consonant with underlying objectives in Physics curriculum to enhance scientific skills and attitude that could be possessed through practical involvement. Physics objectives in the national curriculum emphasise that students are to be taught to become scientific literate. The objectives of studying Physics in Nigerian as stipulated in the New Senior Secondary Physics Curriculum (2008) are to: provide basic literacy in Physics for functional living in the society; acquire basic concepts and principles of Physics as a preparation for further studies; acquire essential scientific skills and attitudes and a preparation for technological application of Physics: and enhance creativity. With these intended objectives and the nature of Physics, interactive instructional strategy is important for teachers to use on students for them to acquire basic literacy and principles for their functionality in scientific world.

Interactive instructional strategy has many forms such as brainstorming, Think-pair share, cooperative, tutorial groups, collaborative and others. Interactive instructional strategy is the strategy that allows for discussion, sharing of knowledge and opportunities to react to ideas, experience, insights, and knowledge of the teacher or peer learners and to generate ways of thinking and feelings (Badru, 2022).

In science education, the search for more effective forms of delivering instruction is an ongoing effort. There is an acceptable view that teaching strategy should focus on students' centred learning, however the teachers' involvement should never be belittling. I-Do-We-do-You-Do instructional strategy is a strategy that allows for maximum cooperation in the science class and a form of interactive instructional strategy. I-Do-We-do-You-Do instructional strategy is a step-by-step way of carrying out instructions. Corinne (2007) defines I-Do-We-do-You-Do instructional strategy as a means of differentiating instructions. The driving motive is that students take active role while the teachers facilitate the instruction for achieving educational goals. I-Do-We-do-You-Do instructional strategy is three levels modified serial instructional strategy. In the first instance which is "I-Do" is a demonstration approach in which the teachers demonstrate how to carry out the instructions to students. Here the teacher does whatever the students are expected by showing them how to do it and explaining the step-by step process to them (Ameh, Daniel & Akus, 2007). Such an approach draws maximum attention to the teachers by inviting the students to follow the procedural steps during practical sessions to enhance their skills through active participation. Mundi (2006) describes that demonstration strategy as a means of displaying the experiment usually by the teacher while the students watch with keen interest. A number of researches have been conducted to show the benefits of demonstration mode of teaching to sciences. This benefits includes generalization and active participation on the part of the students (Buncick, Betts & Horgan, 2001; Ranya, Jamhari, & Rede, 2013); enhances level of students' attention (Basheer, Hugerat , Kortam, & Hofstein, 2017); embolden rationality as well as motivating students to learn difficult and abstract concept.

The second step of "We-do" is a step-by- step approach in a cooperative form. The importance of this approach is that the students worked together along with the teacher to achieve a shared learning through cooperative influenced methods. In cooperative learning, teachers may also play a greater role in scaffolding activities by creating intentional groupings the students, or randomly assigning students to groups. Further scaffolds may also be necessary to ensure successful cooperation between the group members, such as instructing them directly and enabling teaching interaction skills. This intentional grouping reflects the influence of the free interactive atmosphere enjoy in cooperative learning, and the desire to integrate diverse groups of students working toward common goals, thus reducing prejudice (Aronson & Bridgeman, 1979). This makes cooperative approach an indispensable in the class of science. This gives the benefits of cooperative mode of learning to include: creating a non-threatening atmosphere in which students can more readily take academic risks (Tripathy, 2004); peer support, encouragement and motivation (Singh & Agrawal, 2011).

The "You-Do" is an individualized approach where each student is expected to use the knowledge acquired from "I do" (teachers' approach) and "We do" (cooperative approach) to organize the arrays of his/her learning in the class. Here the teacher takes cognizance of individual characteristics, cognitive levels, attitude and family background to work toward achieving the stated objective. Individualized instruction demands that the teacher assume some roles such as a motivator, planner, and evaluator. The teachers are available for each student at his or her pace. Individualized approach used for this study is teacher-directed instruction at the forms of usage of worksheets, differentiated homework assignments, problem based instruction for each student on the experiment done. This refers to the use of resources and assessments to meet the needs of each students at the time of learning.

In response to assist the students to be motivated and to overcome fear in leaning of Physics , creative and interactive strategy such as I-Do-We-do-You-Do instructional strategy is imperative to promote integrative thinking among the students in order to aid the performance of male and female in physics practical class because of gender related issue in science class. Gender child education generally touches on fundamental issues of gender disparity, which is both ancient and global (Aboho & Saliu 2016). The controversial discussion on the topic of gender and academic performance in sciences has been there over decades, the advert of technology and innovative teachings did not abate the discussion. In Nigeria, it has been observed that there is low enrolment and poor performance in Physics (Adebisi , 2015) compared to other science subjects with low female representative compared to male at the secondary schools in public secondary. Why this disparity? Physics is considered as the most problematic area within the realm of science, and it traditionally attracts fewer students than Chemistry and Biology (Rivard &Straw, 2000), with girls alienated mostly from Physics. However, upon this background is attention of the study is focused.

1.1 Statement of the Problem

The performance of students in Physics in both internal and external examinations is a concern to teachers and stakeholders because Physics is vital to pursuing courses in health sciences, sciences and technology at the higher levels of education. So it cannot avoid to be neglected by the researchers. Several studies have been carried out on improving the performance of students in Physics with most of them concentrating on the theoretical aspects of Physics, neglecting the fact that the performance of students in Physics practical has a great effect on the overall performance and retention ability. There is therefore the need to research into strategy which has potential of bringing about a better performance and retention ability of students in Physics practical. This therefore necessitated the intention of carrying out a research on the effect of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) on the performance and retention of students in Physics practical.

1.2 Purpose of the study

Specifically, the study sought to:

1. compare the effects of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) and Conventional Instructional Strategy (CIS) on the academic performance of secondary school students in Physics practical in Ondo state, Nigeria;
2. compare the effects of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) and Conventional Instructional Strategy (CIS) retention of secondary school students in Physics practical in the study area; and
3. compare the mean scores of male and female students' retention ability of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) group in Physics practical in the study area.

1.3 Hypotheses

1. There is no significant difference between the effect of (IWYIS) and (CIS) on the academic performance of secondary school students in Physics practical in Ondo state.
2. There is no significant difference between the effect of (IWYIS) and (CIS) on the retention of secondary school students in Physics practical in the study area;
3. There is no significant difference between the mean scores of male and female students in the retention ability of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) group in Physics practical in the study area.

2.0 Methods

2.1 Research Design

The study adopted the pretest posttest non-equivalent control group quasi-experimental research design. The two groups used for the study are I-Do-We-Do-You-Do Instructional Strategy (IWYIS) and Conventional Instructional Strategy (CIS). The two groups were pretested before the treatment. Post test instruments were administered on the groups after the treatment.

2.2 Participants

The focused and target population for the study comprised of senior secondary Physics students (SSSII) in Ondo state, Nigeria. The sample for the study was fifty-five students from two intact classes of Senior Secondary

School two (SSSII) Physics students selected through the multistage sampling procedures. In stage one, one senatorial district was selected using simple random sampling technique from the three senatorial districts in the state. In the next stage, one local government was also selected from the selected senatorial district using simple random sampling technique. In the following stage, four secondary schools were selected from the local government area through simple random sampling technique. Finally, two intact classes were randomly assigned to experimental group 32 students and the other two classes for the control groups of 23 students.

2.3 Research Instruments

The research instrument titled Practical Physics Test (PPT) was designed and used by the researchers to collect data for the study. The PPT consists of twenty multiple choice items used to elicit observation, measurements and communication skills in Physics practical procedures.

2.4 Validation of Research Instruments

Face and contents validity were established by three experts in the Department of Science and Technology Education, Obafemi Awolowo University, Ile-Ife, Nigeria. The instrument was vetted in terms of clarity, suitability and compliance with curriculum of senior secondary schools II to elicit the required information for the study. The corrections, criticisms and useful suggestions of the experts were incorporated into the final draft of the instrument. The pilot test was conducted by the researchers on a sample of forty senior secondary school (SSSII) students outside the study area to determine the reliability coefficients of the instrument. This was determine by Kuder Richardson 21 and found to be 0.85, considered appropriate for the study.

2.5 Procedures for Data Collection

The research instrument was administered by the researchers after obtaining permission from the authority of the schools considered for the study. The respondents from the intact class were prepared by their class teachers and the purpose of the research was explained to them. The researcher pretested the experimental and control groups with Practical Physics Test (PPT) in the first week. The treatment was carried out for six weeks. The posttest of Practical Physics Test (PPT) was administered on the two groups. Practical Physics Test (PPT) items were therefore reshuffles and administered three weeks (3) after the administration of posttest to determine the retention ability.

3.0 RESULTS

1. **Hypothesis one** There is no significant difference between the effect of (IWYIS) and (CIS) on the academic performance of secondary school students in Physics practical in Ondo state.

Table 1: ANCOVA showing the pretest and posttest scores of students' performance in Physics practical.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	144.846[a]	2	72.423	23.057	.000	.470
Intercept	293.956	1	293.956	93.585	.000	.643
Preppt	99.707	1	99.707	31.743	.000	.379
Instructional strategy	59.906	1	59.906	19.072	.000	.268
Error	163.335	52	3.141			
Total	8470.000	55				
Corrected Total	308.182	54				

a. R Squared = .470 (Adjusted R Squared = .450)

Table 1 shows that there is a significant difference between the effect of IWYIS and CIS on the academic performance of senior secondary school students in Physics practical [F (1, 52) =19.07, p=0.000] and the null hypothesis was therefore rejected. To further determine the direction of the significance of the interventions, pairwise comparisons of the posttest was determined using Bonferroni pairwise comparison. The result is presented in table 2 below.

Table 2: Pairwise comparison of posttest scores of the students in Physics practical.

(I) instructional strategy	(J) instructional strategy	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
CIS	IWYIS	-2.099*	.481	.000	-3.064	-1.135
IWYIS	CIS	2.099*	.481	.000	1.135	3.064

Based on estimated marginal means
*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni.

As shown in the table 2, the difference in the mean between the scores of IWYIS and CIS is 2.099. This therefore implies that IWYIS had more effect on the performance of the students in Physics practical than the CIS.

Hypothesis two: There is no significant difference between the effect of (IWYIS) and (CIS) on the retention of secondary school students in Physics practical in the study area

Table 3: ANCOVA showing pretest and retention scores of students in Physics practical

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	27.607[a]	2	13.803	2.717	.075	.095
Intercept	708.007	1	708.007	139.383	.000	.728
Preppt	.635	1	.635	.125	.725	.002
Instructional strategy	27.549	1	27.549	5.423	.024	.094
Error	264.139	52	5.080			
Total	8873.000	55				
Corrected Total	291.745	54				

a. R Squared = .095 (Adjusted R Squared = .060)

Table 3 shows that there is a significant difference between the effect of IWYIS and CIS on the retention ability of senior secondary school students in Physics practical. [$F(1, 52) = 5.423$, $p=0.024$,]. The null hypothesis was therefore rejected. To further determine the direction of the significance of the interventions, pairwise comparisons of the posttest was determined using Bonferroni pairwise comparison. The result is presented in table 4 below.

Table 4: Pairwise comparison of posttest scores of the students in Physics practical.

Pairwise Comparisons
Dependent Variable: retention

(I) instructional strategy	(J) instructional strategy	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
CIS	IWYIS	-1.424*	.611	.024	-2.650	-.197
IWYIS	CIS	1.424*	.611	.024	.197	2.650

Based on estimated marginal means
*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni.

As shown in the table 4, the difference in the mean between the scores of IWYIS and CIS is 1.424. This therefore implies that IWYIS had more effect on the retention of the students in Physics practical than the CIS.

Hypothesis Three: There is no significant difference between the mean scores of male and female students in the retention of I-Do-We-Do-You-Do Instructional Strategy (IWYIS) group in Physics practical in the study area.

Table 5: t-test showing the mean scores difference of male and female students in the retention ability of IWYIS group in Physics practical

Group	N	$\bar{X}$	SD	df	t	P	Remark
Male	15	13.357	1.737	30	0.588	0.56	Not significant
Female	17	13.000	1.468				

Table 3 shows that there is no significant difference in the mean score of the male and female students in the Physics retention ability after they have been exposed to the I-Do-We-Do-You-Do and Instructional

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Strategy ($t=0.588$, $p>0.05$). This therefore means that the stated null hypothesis is therefore accepted.

4.0 Discussion of Findings

Table 1 showed variability in the performance of senior secondary school students in Physics practical between IWYIS and CIS groups which was found to be statistically significant, the null hypothesis was therefore rejected. The research further showed in Table 2 that IWYIS group performed better than CIS group. Results of this finding is in supports the study of Corinne (2007) that the I-Do-We-Do-You-Do Instructional strategy had more effect on the performance of students in computer studies. Moreover, students can learn from peers (We do) and teachers (I do) to develop their social skills and abilities and to organize their thoughts as well as to develop rational arguments (Tobih,2017, Imoko &Agwagah,2014). In their recent studies, Bambang, Natalina, Kevin., Eduard , Veriatika. Dian, Falentina, & Johan, (2022) found out that demonstration method which is one of the segment of IWYIS could improve students learning outcomes in science subjects. It is therefore implied that the first segment in IWYIS is fundamental to the performance in physics practical. Furthermore, the performance in IWYIS might be due to the fact that the instructions were released to the group in stages, this also agrees with Akdeniz (2016) who said that the gradual release of instruction and responsibility to the students will further help them in comprehending the instructions given to them.

Table 3 showed differences in the retention ability of senior secondary school students in Physics practical between IWYIS and CIS groups which were found to be statistically significant, the null hypothesis was therefore rejected. The research further showed in Table 4 that IWYIS group had better retention ability than CIS group. The results of this study is in line with the findings of Onyenma and Olele (2020), that using different teaching methods to teach bring about a better retention of what the students are being taught. A situation that favour I-do, We-do and You-do of three serial methods of teaching of Physics practical. This study also agreed with the findings of Narli (2011) who found out that the use of constructivism helped the students to have better retention of the concepts being taught than the students in the conventional class. This supports the argument that students need to be taught using several instructional orientations for them to have better retention of the concepts being taught.

The findings of the study further showed that there was no significant difference in the mean score of the male and female students in Physics practical when they were taught using the I-Do-We-Do-You-Do Instructional strategy. The result of the study is line with study of Onyenma and Olele (2020), that gender of the students had no influence on the retention of Physics contents. Further studies of Nwankwo and Achufusi, (2019) showed that there was no significant difference in retention scores of male and female students taught heat and temperature in physics using MTA (an innovative and interactive strategy like I-Do-We-Do-You-Do Instructional strategy) in their posttest conceptual change.

5.0 Conclusion and Recommendations

The study concluded that I-Do-We-Do-You-Do Instructional strategy will help the students to have better performance in Physics practical and will also advance the retention of the Physics practical concepts which in turn will increase their performance both in internal and external examinations than the conventional instructional strategy. The study found out that the gender difference of students do not a determinant factor in their retention of Physics practical concepts when taught with I-Do-We-Do-You-Do Instructional strategy. Based on the findings of the study, it was recommended that I-Do-We-Do-You-Do Instructional strategy should be adopted by the teachers as an instructional strategy while teaching the students Physics practical, the teachers should be allowed to undergo in-service training from time to time to help them get acquainted to instructional strategies that can enhance the performance of students in Physics practical rather than stick to the conventional instructional strategy which several studies have shown that it might be one of the reasons for the unsatisfactory performance of students in Physics. This supports the emphasis of Bruner's learning theory that learning is an active phenomenon that needs categorization for maximum benefits of the learners. The implication is that concept of this strategy is fragmented into category which aided the performance and the retention of the students.

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