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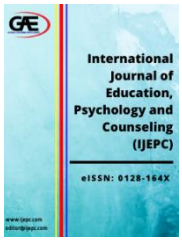

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EFFECTS OF DRILL AND PRACTICE INSTRUCTIONAL STRATEGY ON SENIOR SECONDARY SCHOOLS STUDENTS' MATHEMATICAL SKILLS IN PHYSICS IN EKITI STATE, NIGERIA

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Abstract:

This study focused on the effect of drill and practice instructional strategies on students' mathematical skills in Physics. The pretest posttest control group quasi-experimental research design was employed. The sample size for this study was sixty five (65) Senior Secondary School II physics students was used in this study. Physics Mathematical Skills Test of twenty (20) items multiple choice type questions was used to collect the data. Analysis of covariance (ANCOVA) and Analysis of variance (ANOVA) were used to analysed the data collected. The findings of the study revealed that there was no significant effect of the treatment on students' mathematical skills and there was also no significant effect of gender on students' mathematical skills in physics. Based on the findings of the study, it was therefore recommended that Physics teachers, though drill and practice instructional strategy has no effect on students mathematical skills, should endeavour to employ drill and practice strategy with conventional method in the teaching and learning process due to its advantages.

Keywords:

Drill and Practice; Gender; Mathematical Skills; Physics; Students

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Introduction

Physics, coined from Greek word *physikos* is concerned with all aspects of nature on both the macroscopic and submicroscopic levels that deals with the structure of matter and the interactions between the fundamental constituents of the observable universe. depite being the most important branch of science due to to its immense contribution to mankind(Aladejana, 2021) is being ragarded as abstract subject due to its nature(Apata, 2019; Ukoh & Amuda, 2015), this abstractness has made many senior secondary school students in country to avoid science and choose art or commercial subjects in order to dolge Physics in totality. Even, the performance of some who managed to complete secondary schools after spending three years as science students in senior secondary school certificate examination conducted by West African Examination Council(WAEC) is not encouraging due to failure rate. The table below shed more light.

Table 1 shows Performance of Physics Students in West African Examination Council (WAEC) from 2009 - 2019 in Ekiti State

Year	No of registered Students	% of students (A1-C6)	% of students (D7-E8)	% F9	Total Failure (D7 – F9)
2019	3663	86.89	7.75	5.35	13.1
2018	4989	86.63	6.83	6.53	13.36
2017	5250	51.88	34.64	13.46	48.1
2016	5231	79.77	12.82	7.39	20.21
2015	6069	47.17	33.36	19.45	52.81
2014	5862	55.61	29.56	14.82	44.38
2013	4964	56.28	28.22	13.65	41.87
2012	5155	68.16	22.87	7.52	30.39
2011	7317	83.23	9.07	1.43	10.5
2010	5765	49.76	31.65	13.26	44.91
2009	4662	53.33	28.65	9.80	38.45

Source: Planning, Research and Statistics Department, Ministry of Education, Science and Technology, Ado-Ekiti, Ekiti State, Nigeria

Table 1 above revealed that in 2010 the percentage numbers of students that fail was as high as 44.91% while in 2012; 2013, 2014, 2015 and 2017 the percentage number of failre rates were 30.39, 41.87, 44.38, 52.81, 48.1 respectively.

In tracing the factors that determine students' performance in physics, Aladejana & Olusola (2022) opined that failure in the performances of students in Physics could be traced to poor mathematical skills of the students. In line with this, Awodun & Ojo (2013), Oyedeji (2011), Wang & Santos, (2003) and Delialighi & Asker (1999) reported that mathematics skills is one

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of the predictors of physics student's performance in senior secondary schools. These mathematical skills, according to scholars are computational skills; algebraic process skills; geomentry skills; measuration skills; table and graph interpretation; probability and statistics skills. The mastery of these skills require repeated uses and practices. The repetition of performance of task is the centrality of drill and practice instructional strategy.

Therefore, drill and practice instructional strategy is described as a strategy of instruction characterized by systematic repetition of concepts. The strategy, according to Tella(2007), is based on the principles of programmed learning or instruction which has been utilized indirectly by teachers and learners(Tica, 2004), which has been found to be very effective in teaching and learning(Mohan, Arumugam, Haniffa, Mariandaram, & Haron, 2018). Scholars reported that the strategy encourages students' activeness in classroom and boosts their understanding; it actively build on existing knowledge (Mohan, et.al, 2018); improve learning results(Tica, 2004); increases proficiency of students in subject(Syed & Omar, 2007) and help students to remember the concepts they have been taught previously (Widmayer and Alayne, 2007). In the consideration of Mathematical skills, gender plays crucial role. Gender refers to the characteristics whelther bilogical or socially influenced by which individuals explain male or female(Myers, 2002 cited by Aladejana, 2014).

Literature Review

There is dearth of literature on the effects of drill and practice instructional strategy on mathematical skills but the available one revealed that the research carried out by Mohan, et.al (2018) on drill and practice application in teaching science for lower secondary students showed that the students who used drill and practice strategy in learning cell showed higher performance achievement compared to control group taught with conventional method, that is, drill and practice is more effective method of teaching than traditional method. This gender, according to research conducted by Mohan, et.al (2018) on drill and practice application in teaching science for lower secondary students revealed that the students who used drill and practice strategy in learning cell revealed that gender does not influence comprehension of the students. Also, Awodun, Oni & Aladejana (2014) in the research tittled students' variables as predator of secondary school students performance in Physics found that gender has no influence students' academic performance.

Statement of the Problem

The analysis of performances of students in senior secondary schools certificate examinations revealed that there was poor performance of students in physics due to poor mathematical skills of the students. To arrest this worrisome trend, several researches have been carried out but the problem still persists. To provide clue to these problems, requires drilling and regular practice in the aspect of mathematical skills of the students as suggested by scholars. Therefore, there is need to carry out research on the effects of drill and practice alternative teaching strategy on the mathematical skills of students in Physics in senior secondary schools in Ekiti state of Nigeria.

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Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

Ho1: There is no significant effect of the treatment on students' mathematical skills in physics.
Ho2: There is no significant effect of gender on students' mathematical skills in physics.
Ho3: There is no significant difference in the interactions effects of treatment and gender on students' mathematical skills in physics.

Research Design

This study adopted 2 X 2 pretest posttest control group quasi-experimental research design with treatment at two levels (drill-and-practice instructional strategies and conventional method) and gender at two levels (male and female).

Population for the Study

The population for the study comprises all the students in senior secondary school II offering Physics as a core subject in senior secondary school schools in Ekiti State.

Sample and Sampling Technique

The sample size for this study was sixty five (65) SSII physics students which comprised Fourty Five (45) boys and Twenty (20) girls from the two selected Senior Secondary Schools. Purposive sampling technique was used to select two out of secondary schools that offer physics in Ekiti State. Simple random sampling was used to select one intact school as experimental group and one intact school as control group. One school was labeled experimental group and the other one school was labeled control group.

Instruments for Data Collection

The instruments the researcher used for collecting data for the study was Physics Mathematical Skills Test of objective questions to be answered by the students. The Physics Mathematical Skills Test was a twenty (20) items multiple choice type questions which was developed by the researcher.

Method of Data Analysis

Analysis of covariance (ANCOVA) was used for testing the hypotheses 1 and 2 while hypothesis 3 was tested with aid of ANOVA at 0.05 level of significance.

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Data Analysis and Findings

Hypothesis 1:
There is no significant effect of the treatment on students' mathematical skills in physics.

Table 2: ANCOVA Analysis Of The Effect Of The Treatment On Students' Mathematical Skills In Physics.

Tests of Between-Subjects Effects					
Dependent Variable: Pretest					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	82.006[a]	11	7.455	1.135	.363
Intercept	48.527	1	48.527	7.390	.010
Drill and Practice	10.415	1	10.415	1.586	.216
Posttest	68.011	10	6.801	1.036	.433
Error	249.514	38	6.566		
Total	1768.000	50			
Corrected Total	331.520	49			
a. R Squared = .247 (Adjusted R Squared = .029)					

Table 2 shows the effect of the treatment on students' mathematical skills in physics. It was revealed that the significant value is 0.363 which is higher than the significant level of 0.05. This indicated that the groups does not differ significantly on the effect of the treatment. Hence the null hypothesis was upheld. This implies that there was no significant effect of the treatment on students' mathematical skills in physics.

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Hypothesis 2:

There is no significant effect of gender on students' mathematical skills in physics.

Table 3: ANCOVA Analysis Of The Effect Of Gender On Students' Mathematical Skills In Physics.

Tests of Between-Subjects Effects					
Dependent Variable: Pretest					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	93.064[a]	11	8.255	4.254	.413
Intercept	31.727	1	48.527	7.390	.010
Gender	11.415	1	11.915	1.586	.236
Posttest	68.011	10	6.801	1.036	.573
Error	249.514	38	6.666		
Total	2818.000	50			
Corrected Total	428.520	49			
a. R Squared = .259 (Adjusted R Squared = .036)					

Table 3 shows the effect of gender on students' mathematical skills in physics. It was revealed that the significant value is 0.236 which is higher than the significant level of 0.05. This indicated that the groups does not differ significantly on the effect of the treatment. Hence the null hypothesis was upheld. This implies that there was no significant effect of gender on students' mathematical skills in physics. This indicated that both gender in the groups had homogenous performance when they were exposed to treatment on mathematical skills in physics. This finding contradics

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Hypothesis 3:
There is no significant difference in the interaction effects of treatment and gender on students' mathematical skills in physics.

Table 4: ANOVA Analysis Of The Interaction Difference Effects Of Treatment And Gender On Students' Mathematical Skills In Physics.

ANOVA					
Interaction Effects of treatment and gender					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.637	1	.637	.130	.720
Within Groups	235.783	48	4.912		
Total	236.420	49			

p>0.05

The result in table 4 on the interaction effects of treatment and gender on students' mathematical skills in physics indicates that there was no significant difference in the interaction effects of treatment and gender in the experimental and control groups at 0.05 level of significance (0.720). Hence, the null hypothesis was not rejected.

Discussion of Findings
The study focuses on the effects of drill and practice instructional strategy on the students' Mathematical skills in Senior Secondary School in physics students in Ekiti State. The inferential analysis of the study revealed that there was no significant effect of the treatment on students' mathematical skills in physics. This is in contrast with the finding of Mohan, et.al (2018) that drill and practice is more effective method of teaching than traditional method.

Also, it was further revealed that that there was no significant effect of gender on students' mathematical skills in physics. This also is at variance with the finding of research conducted by Mohan, et.al (2018) on drill and practice application in teaching science for lower secondary students that the gender of students who used drill and practice strategy in learning cell does not influence comprehension of the students. Also, this finding is in disagreement with the finding of Awodun, Oni & Aladejana (2014) that gender has no influence students' academic performances in Physics.

Lastly, it was shown that there was no significant difference in the interaction effects of treatment and gender in the experimental and control groups.

Conclusion and Recommendations
In conclusion, the study established that there was no significant effect of drill and practice instructional strategy pedagogy on students' mathematical skills in physics. Also, that there was no significant effect of gender on students' mathematical skills in physics. The study further concluded that significant difference does not exist in the interaction effects of treatment and gender.

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Based on the findings from this study, it is considered pertinent to give some recommendations which are considered useful. It is hereby recommended that;

- Physics teachers, though drill and practice instructional strategy has no effect on students mathematical skills, should endeavour to employ drill and practice strategy with conventional method in the teaching and learning process due to its advantages.
- Effort should be made to enhance the knowledge of physics teachers through various seminars, workshops, in-service training.
- Physics teachers should master the use of drill and practice strategy in order to appreciate the modern approach of teaching.

Limitation Of The Study

The study was limited to drill-and-practice instructional strategies on some selected concepts in physics in secondary schools. The study covered two public secondary schools in Ise/Orun local government, Ekiti State. Gender was the moderating variable considered among various variables that could have effect on the outcome of the study. Seven weeks were used for the study and this might be too short to make generalsations.

Further research should focus on the use of drill-and-practice instructional strategy in other physics concepts not examined in this study. The strategy could be replicated in other related subjects such as biology, chemistry and mathematics. It is also suggested that similar studies could be extended to variables like learning style, cognitive styles, school location, test anxiety to mention but a few. The study could be replicated all the geopolitical zones in Nigeria, using more states, LGA's, schools, teachers and students so that a more generalized claim could be made.

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