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Comparative Analysis of Secondary School Students' Performance in Science Subjects in Ondo State, Nigeria

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Abstract:

The study investigated comparative analysis of secondary school students' performance in science subjects in Ondo State, Nigeria. The study specifically examined the mean average performance of students in the three science subjects in the selected public secondary schools; the trend of students' performance in Biology, Chemistry and Physics in the selected public secondary schools; and the difference in students' performance in the three science subjects in public secondary schools. The ex-post facto research design was adopted in this study. The population for the study consisted of all students who sat for West African Examination Council (WAEC) from 2015 - 2018 in public secondary schools in Ondo state. The sample for the study was students who sat for WAEC in 45 secondary schools in Ondo State using purposive sampling technique. The instrument that was used for this study was an inventory on Senior Secondary School Certificate Examination results. The data collected was analysed using descriptive statistics while the hypothesis postulated was tested using Analysis of Variance (ANOVA) at 0.05 level of significance. The findings of the study revealed that the trend in performance of students does not follow any pattern. In addition, there was difference in students' performance in the three science subjects in public secondary schools in Ondo state as students performed best

in Biology, followed by Physics while they performed least in Chemistry. It was recommended among others that Government should organise seminar and workshop for teachers of science subjects on ways to improve students' performance in science subjects.

Keywords: Comparative Analysis, Students, Performance, Science Subjects,

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Introduction

One of the goals of science education is to improve students' interest towards science and technology. The growth of any nation today lies greatly on its technological and scientific advancement. Biology, Chemistry and Physics are central to many of the scientific fields of human endeavours. Biology is the science which studies living things and concerns itself with the study of the structure, behaviour, distribution, the source of plants and animals and their bond with their environments. Biology occupies a special position in the secondary school education curriculum because of its importance as science of life. In Nigeria, the secondary school Biology curriculum is designed to continue students' investigation into natural phenomena, to expand students' understanding and interest in biological sciences, and also to inspire students' skill to apply scientific knowledge to everyday life in matters of personal, community, health and agriculture among others (Federal Ministry of Education, 2009).

Chemistry is the science that deals with the properties of different atoms, the ways in which they link together to form molecules, the collaboration of various kinds of molecules with one another and the accompanying energy changes. The science of chemistry includes properties, composition and structure of matter as well as structural, compositional and energy changes involved in chemical reactions. The technological development of any nation depends in the study of science especially chemistry (Eremie & Ekpete, 2008). Chemistry as a science, is meant to aid learners obtain knowledge about the nature of chemicals (e.g. facts, concepts, and principles), processes and attitudes and then equip them with the abilities of a professional chemist.

Physics as a science subject is the study of physical properties of matter and its collaboration with energy. It is typically an experimental subject; principles and concepts generated from Physics are very valuable in interpretation of natural phenomena in sciences. This means that efficient practical activities in Physics are important because they enable learners develop a bridge between what they see, hear, handle (hands-on) and scientific ideas that account for their findings (brains-on) (Adolphus & Aderonmu, 2013).

Students' performance has been labelled as the scholastic standing of a learner at a given moment (Olofin, 2020; Adeyemi 2010). This scholastic standing could be proficient in terms of the grades gotten in a course or groups of courses. Falebita and Olofin (2020) and Akiri and Nkechi (2009) see performance as a measure of outputs and that the main outputs in education are expressed in terms of learning. That is, there are variations in knowledge, skills, behavior, and attitudes of learners as an outcome of their experiences within the schools system. For the present study, performance or the academic performance means the results of education, the extent to which learners have attained their educational goals. The study investigated comparative analysis of secondary school students' performance in science subjects in Ondo State, Nigeria. The study specifically examined:

i. the mean average performance of students in the three science subjects in the selected public secondary schools;

ii. the trend of students' performance in Biology, Chemistry and Physics in the selected public secondary schools; and

iii. the difference in students' performance in the three science subjects in public secondary schools.

Research Questions

The following research questions were raised to guide the study:

1. What is the mean average performance of students in the three science subjects in the selected public secondary schools in Ondo State?
2. What is the trend of students' performance in Biology in the selected public secondary schools in Ondo State?
3. What is the trend of students' performance in Chemistry in the selected public secondary schools in Ondo State?
4. What is the trend of students' performance in Physics in the selected public secondary schools in Ondo State?

Research Hypothesis

This null hypothesis was generated for this study:

1. There is no significant difference in students' performance in the three science subjects in public secondary schools in Ondo state.

Methodology

The ex-post facto research design was adopted in this study. The population for the study consisted of all students who sat for West African Examination Council (WAEC) from 2015 - 2018 in public secondary schools in Ondo state. The sample for the study was students who sat for WAEC in 45 secondary schools in Ondo State using purposive sampling technique.

The instrument that was used for this study was an inventory on Senior Secondary School Certificate Examination results. The inventory was used to obtain students' results in science subjects namely Biology, Chemistry and Physics at West African Senior School Certificate Examination in May/June of 2014/2015, 2015/2016, 2016/2017 and 2017/2018 sessions. The results collected through the inventory were already standardized by the external examining body, so the validity and reliability were not necessary.

The data collected was analysed using descriptive statistics of frequency counts, percentages, mean standard deviation and graphs, while the hypothesis postulated was tested using Analysis of Variance (ANOVA) at 0.05 level of significance.

Results

Research Question 1: What is the performance of students in the three science subjects in the selected secondary schools?

Table 1: Performance of students in the three science subjects

Year	No. Reg.	BIOLOGY		CHEMISTRY		PHYSICS	
		A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)
2014/15	1009	681 (67.49)	382 (37.86)	547 (54.21)	462 (45.79)	592 (58.67)	417 (41.33)
2015/16	1261	699 (55.43)	562(44.57)	586 (46.47)	675 (53.53)	603 (47.82)	658 (52.18)
2016/17	1209	813 (67.72)	396 (32.28)	702 (58.06)	507 (41.94)	776 (64.19)	433 (35.81)
2017/18	1283	794 (61.89)	489 (38.11)	651 (50.74)	632 (49.26)	680 (53.00)	603 (47.00)

Table 1 revealed performance of students in the three science subjects in public secondary schools in Ondo State. The result showed that out of 1009 respondents in 2014/2015 session, 681 representing 67.49% had between A1-C6 in Biology, 547 representing 54.21% had A1-C6 in Chemistry and 592 representing 58.67% had A1-C6 in Physics. The result showed that out of 1261 respondents in 2015/2016 session, 699 representing 55.43% had between A1-C6 in Biology, 586 representing 46.47% had A1-C6 in Chemistry and 603 representing 47.82% had A1-C6 in Physics.

The result showed that out of 1209 respondents in 2016/2017 session, 813 representing 67.72% had between A1-C6 in Biology, 702 representing 58.06% had A1-C6 in Chemistry and 776 representing 64.19% had A1-C6 in Physics. The result showed that out of 1283 respondents in 2017/2018 session, 794 representing 61.89% had between A1-C6 in Biology, 651 representing 50.74% had A1-C6 in Chemistry and 680 representing 53.00% had A1-C6 in Physics.
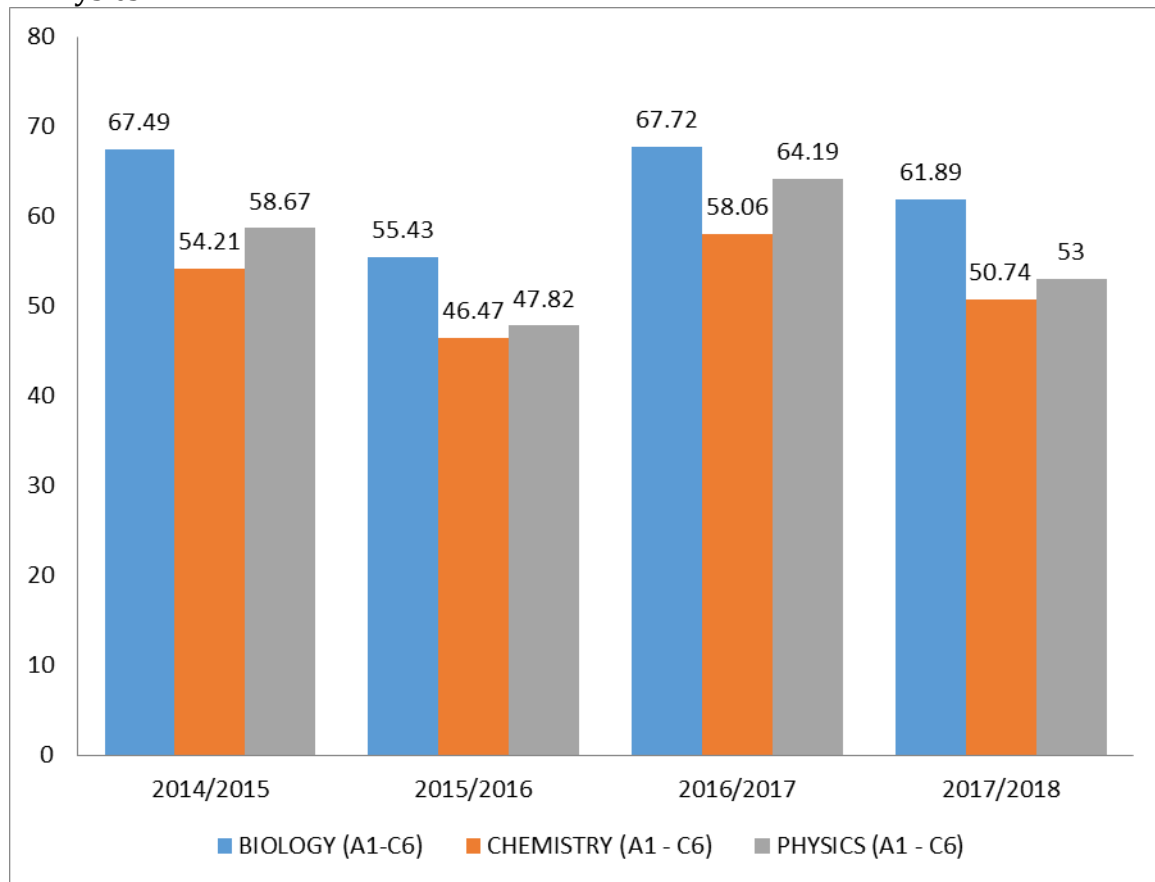

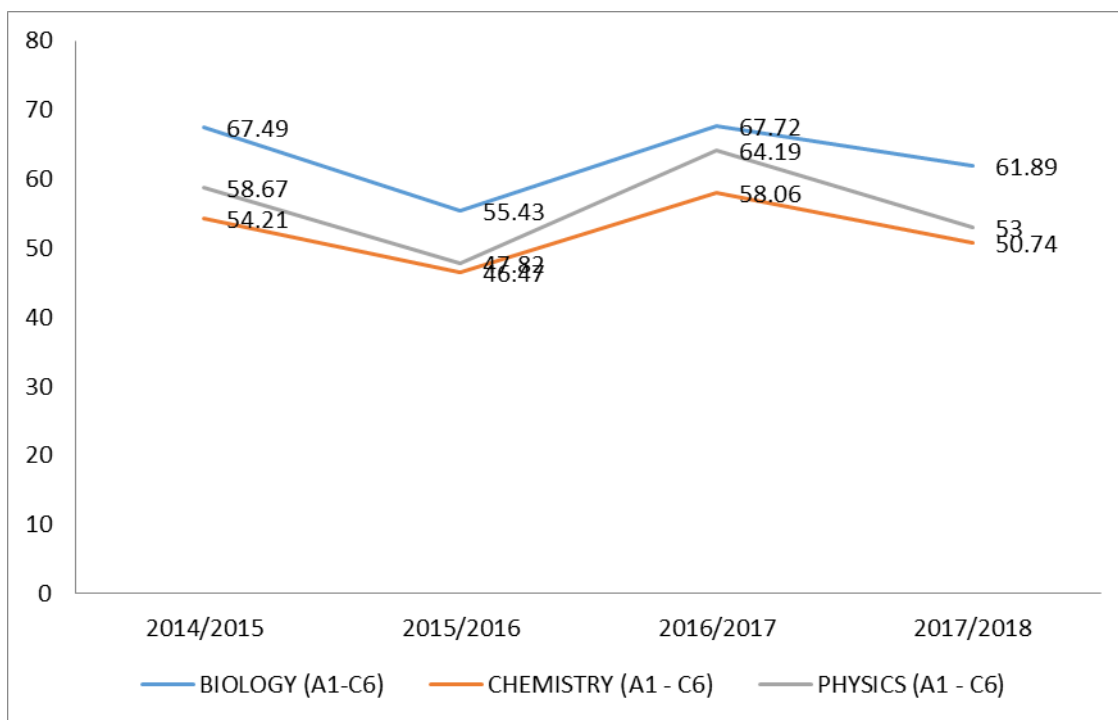**Figure i:** Performance of Students in Three Science Subjects

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Figure ii: Performance Trend of Students in the three subjects

Research Question 2: What is the trend of students' performance in Biology in the selected public secondary schools in Ondo State?

Table 2: Performance trend of students in Biology

	2014/2015		2015/2016		2016/2017		2017/2018	
	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)
No. Reg.	1009		1261		1209		1283	
	681 (67.49)	382 (37.86)	699 (55.43)	562(44.57)	813 (67.72)	396 (32.28)	794 (61.89)	489 (38.11)

Table 2 revealed performance trend of students in Biology. The result showed that out of 1009 respondents in 2014/2015 session, 681 representing 67.49% had between A1-C6 in Biology. The result showed that out of 1261 respondents in 2015/2016 session, 699 representing 55.43% had between A1-C6. In 2016/2017 session, out of 1209 respondents, 813 representing 67.72% had between A1-C6 while the result showed that out of 1283 respondents in 2017/2018 session, 794 representing 61.89% had between A1-C6.
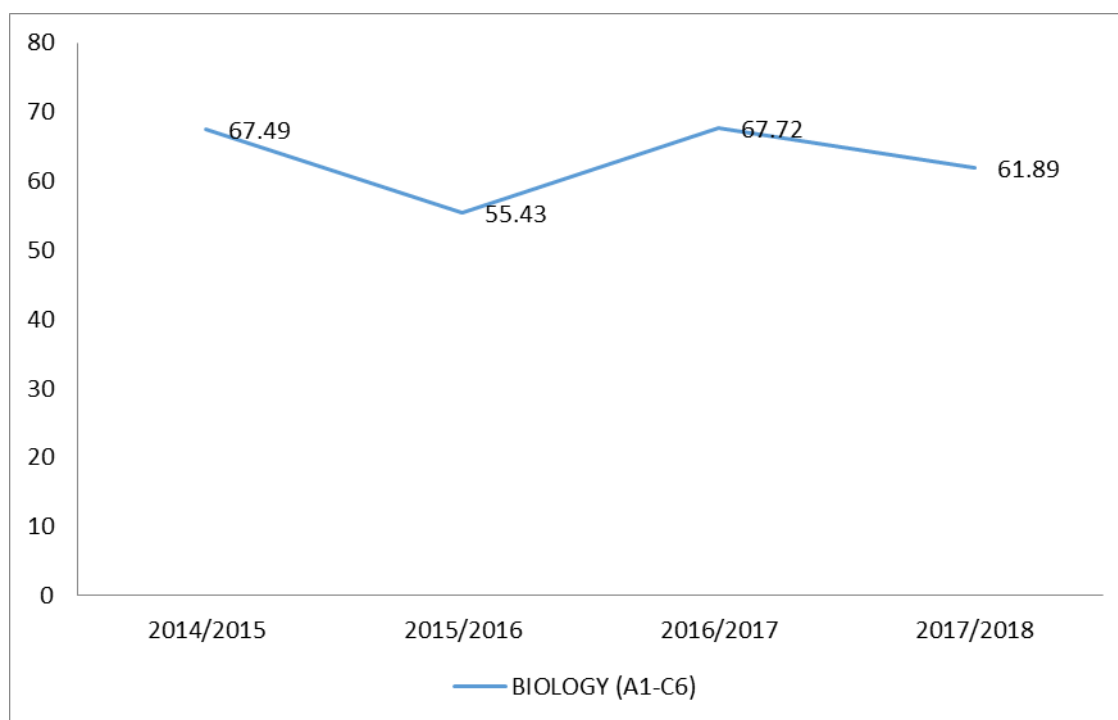
Figure iii: Performance Trend of Students in Biology

From figure iii above, trend in performance of students in Biology does not follow a specific pattern as there was decrease in the second year performance with an increase in the third year performance and drop in performance in the fourth year.

Research Question 3: What is the trend of students' performance in Chemistry in the selected public secondary schools in Ondo State?

Table 3: Performance trend of students in Chemistry

	2014/2015		2015/2016		2016/2017		2017/2018	
	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)
No. Reg.	1009		1261		1209		1283	
	547 (54.21)	462 (45.79)	586 (46.47)	675 (53.53)	702 (58.06)	507 (41.94)	651 (50.74)	632 (49.26)

Table 3 revealed performance trend of students in Chemistry. The result showed that out of 1009 respondents in 2014/2015 session, 547 representing 54.21% had between A1-C6 in Biology. The result showed that out of 1261 respondents in 2015/2016 session, 586 representing 46.47% had between A1-C6. In 2016/2017 session, out of 1209 respondents, 702 representing 58.06% had between A1-C6 while the result showed that out of 1283 respondents in 2017/2018 session, 651 representing 50.74% had between A1-C6.
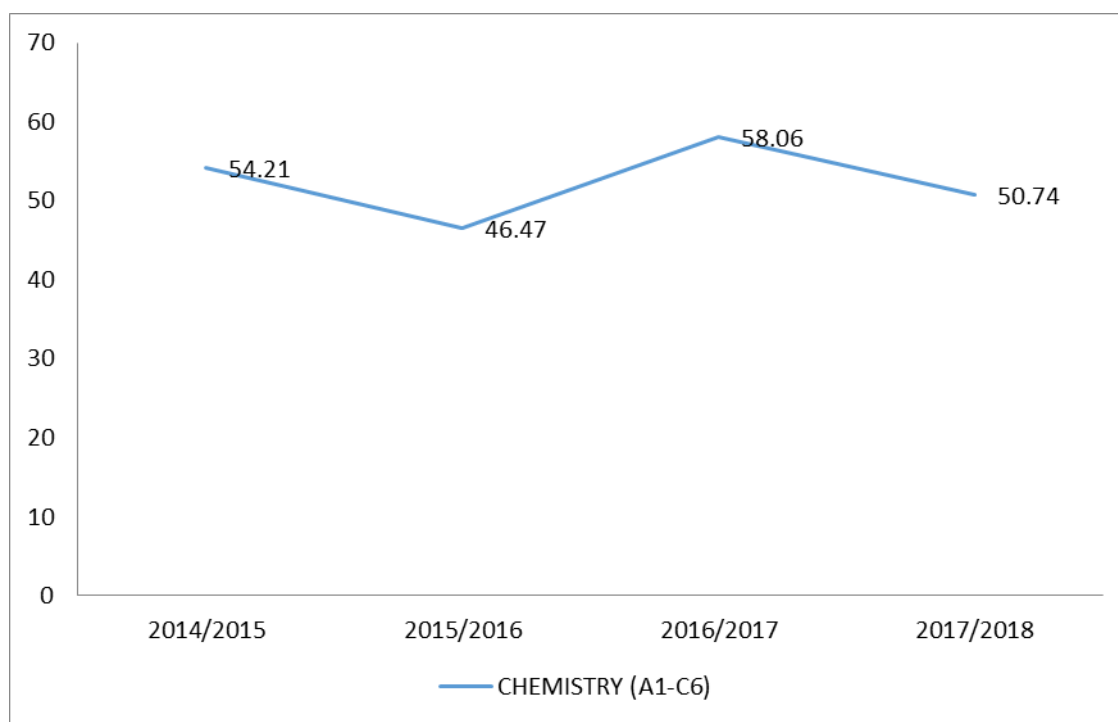
Figure iv: Performance Trend of Students in Chemistry

From figure iv above, trend in performance of students in Chemistry does not follow a specific pattern as there was decrease in the second year performance with an increase in the third year performance and drop in performance in the fourth year.

Research Question 4: What is the trend of students' performance in Physics in the selected public secondary schools in Ondo State?

Table 3: Performance trend of students in Physics

	2014/2015		2015/2016		2016/2017		2017/2018	
	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)	A1-C6 (%)	D7-F9 (%)
No. Reg.	1009		1261		1209		1283	
	592 (58.67)	417 (41.33)	603 (47.82)	658 (52.18)	776 (64.19)	433 (35.81)	680 (53.00)	603 (47.00)

Table 4 revealed performance trend of students in Physics. The result showed that out of 1009 respondents in 2014/2015 session, 592 representing 58.67% had between A1-C6 in Biology. The result showed that out of 1261 respondents in 2015/2016 session, 603 representing 47.82% had between A1-C6. In 2016/2017 session, out of 1209 respondents, 776 representing 64.19% had between A1-C6 while the result showed that out of 1283 respondents in 2017/2018 session, 680 representing 53.00% had between A1-C6.
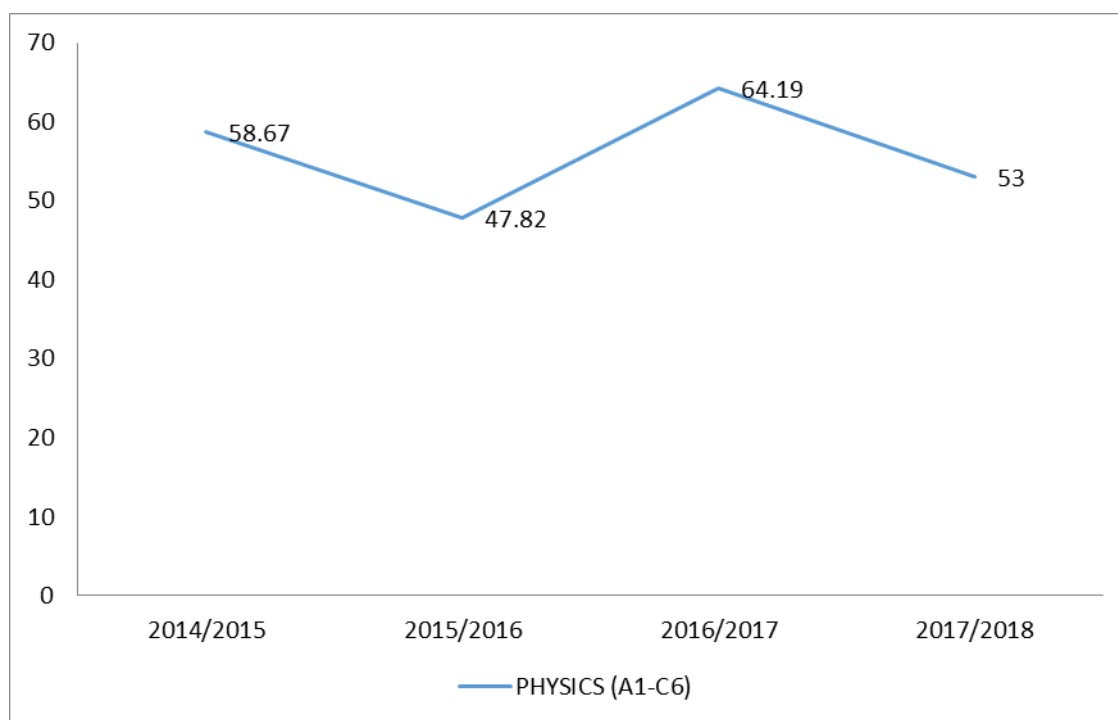
Figure v: Performance Trend of Students in Physics

From figure v above, trend in performance of students in Physics does not follow a specific pattern as there was decrease in the second year performance with an increase in the third year performance and drop in performance in the fourth year.

Testing of Hypotheses

Hypothesis 1: There is no significant difference in students' performance in the three science subjects in public secondary schools in Ondo state

Table 5: Analysis of Variance (ANOVA) for difference in students' performance in the three science subjects

Groups	SS	df	MS	F	Sig.
Between Groups	.811	2	.405	3.486*	.033
Within Groups	20.585	177	.116		
Total	21.396	179			

*P < 0.05

The result presented in table 5 showed that F-cal value of 3.486 is significant because the P value (0.033) < 0.05 at 0.05. Hence, the null hypothesis is rejected. This implies that there is significant difference in students' performance in the three science subjects in public secondary schools in Ondo state. In order to investigate the source of the differences observed, Post – hoc analysis (Scheffe) with mean difference was carried out.

Table 6: Post – hoc Analysis and Mean for Difference in Students' Performance in the three Science Subjects

Groups	Mean	Biology 2.6957	Chemistry 2.5333	Physics 2.5920
Biology	2.6957			
Chemistry	2.5333	0.1623*		
Physics	2.5920	0.1037	0.0623	

* $P < 0.05$

In table 6, a significant difference was found between the performance of students in Biology and Chemistry in favour of students' performance in Biology. However, there was no significant difference between the performance of students in Biology and Physics. Also, there was no difference between the performance of students in Chemistry and Physics. The result of post – hoc test also showed that, students performed best in Biology, followed by Physics while they performed least in Chemistry.

Discussion

The findings of the study revealed that students' performance in Biology was better than their performance in Chemistry and Physics in the four years under consideration. The findings of this study also revealed that the trend in performance of students in Biology, Chemistry and Physics does not follow a specific pattern as there was decrease in the second year performance with an increase in the third year performance and drop in performance in the fourth year. The probable reason for the same pattern of trend in the three science subjects could be as a result of school factor, students' factor, parental factor among others. This finding is in line with the findings of Akinfe, Olofinniyi and Fashiku (2012) who found no specific pattern in trend of performance of students in science subjects.

The study further revealed that there was significant difference in students' performance in the three science subjects in public secondary schools in Ondo state. A significant difference was found between the performance of students in Biology and Chemistry in favour of students' performance in Biology. However, there was no significant difference between the performance of students in Biology and Physics. Also, there was no difference between the performance of students in Chemistry and Physics. The result of post – hoc test also showed that, students performed best in Biology, followed by Physics while they performed least in Chemistry. This finding is in consonance with the findings of Akinfe, Olofinniyi and Fashiku (2012) and Akinsolu (2010) who found difference in students' performance in science subjects in secondary schools. They concluded that students performed best in Biology compared to other science subjects.

Conclusion

Sequel to the findings of this study, there was no specific pattern in the performance of students in the three science subjects and the trend in performance does not follow any pattern. In addition, there was difference in students' performance in the three science subjects in public secondary schools in Ondo state as students performed best in Biology, followed by Physics while they performed least in Chemistry.

Recommendations

Based on the findings of this study, the following recommendations were made;

1. There is need for further research on factors affecting students' performance in Science Subjects and the reason for difference in students' performance in science subjects.
2. Government should organise seminar and workshop for teachers of science subjects on ways to improve students' performance in science subjects.

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