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ANALYSIS OF INTEGRATED SCIENCE AND COMPUTER SCIENCE STUDENTS' ACADEMIC PERFORMANCES IN PHYSICS IN COLLEGES OF EDUCATION, NIGERIA

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ABSTRACT

Seventy four students of Integrated Science/Physics and Computer Science/Physics were sampled in four Colleges of Educations to analyze their performance in Physics. Frequency counts, percentages and T-test were used to analyse their results from year one to final year in Physics. Results shows that there was no significant difference between Integrated Science and Computer Science students' academic performance in Physics: mean difference in academic performance of Integrated Science/Physics and Computer Science/Physics students was not significantly difference and there was no relationship between students' academic performance of Integrated Science/Physics and Computer Science/Physics. The paper made some recommendations based on the findings.

Keywords: Academic programme, Academic performance, Subject area specialization, Integrated science.

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1. INTRODUCTION

Colleges of Education are teachers' training institutions in Nigeria. The objective of government in establishing these colleges of education was to produce graduates who will be teaching in primary and junior secondary school.

Academic programme of these institutions were designed to combine two teaching subjects with education. The minimum duration for students' training in Colleges of Education leading to the award of Nigerian Certificate in Education (NCE) is three years.

The body charged with the responsibility of coordinating programmes of these institutions is National Commission for Colleges of Education (NCCE). There are different kinds of subject combinations permitted by NCCE in sciences; here are some of them as stipulated in NCCE programme as shown in the table below.

Table-1. Subject combinations

	Biology	**Chemistry**	**Mathematics**	**Physics**
Integrated Sci.	Int. Sci/Bio	Int. Sci/Chem.	Int. Sci/Mat.	Int. Sci/Phy.
Computer Sci.	Comp. Sci/Bio.	Comp. Sci/Chem.	Comp. Sci/Mat.	Comp. Sci/Phy.

Students' performance in science has not been very good due to many factors one of which is subject combination (Aina, 2013).

Students' performance in physics among colleges is poor because of teachers' method of teaching (Wanbugu *et al*., 2013); it could be due to subject area specialization or wrong subject combination (Aina, 2011).

Student should combine subjects that are closely related to enhance good academic performance especially physics is mathematically oriented; therefore any subject combine with it should be mathematically inclined.

Integrated science is teaching of science in a way to present scientific ideas as a unified whole (Ajao, 1996). It is a subject that comprises of biology, chemistry, physics and partly any other science related subject while computer science is a subject that has more relationship with mathematics than any other subject. Integrated science is an amalgamated course designed to show unity, wholeness and interrelationship of the distinct that make up science (Daudu, 1984). Integrated science syllabus is simply a collection of topic from single science (Abba, 2000).

The expectation is that students combining physics with integrated science should be able to do better than those combining with computer since some of the things learnt in integrated science are in physics.

According to National Commission for Colleges of Education (2008), state of matter, geometry and trigonometry, light sound atomic structure, speed and acceleration, momentum, work energy and power, motion in circle, simple harmonic motion, magnetism, electrostatics, current electricity, electrical circuits, costing of electric energy and radioactivity are all common topics to both physics and integrated science. Number system, logic gates and truth tables are common to physics and computer science while there is no common topic between computer science and integrated science (NCCE, 2008).

This study is significant because it will enable both physics students and teachers to know a better choice when there is the need to combine physics with either integrated science or computer science in college of education.

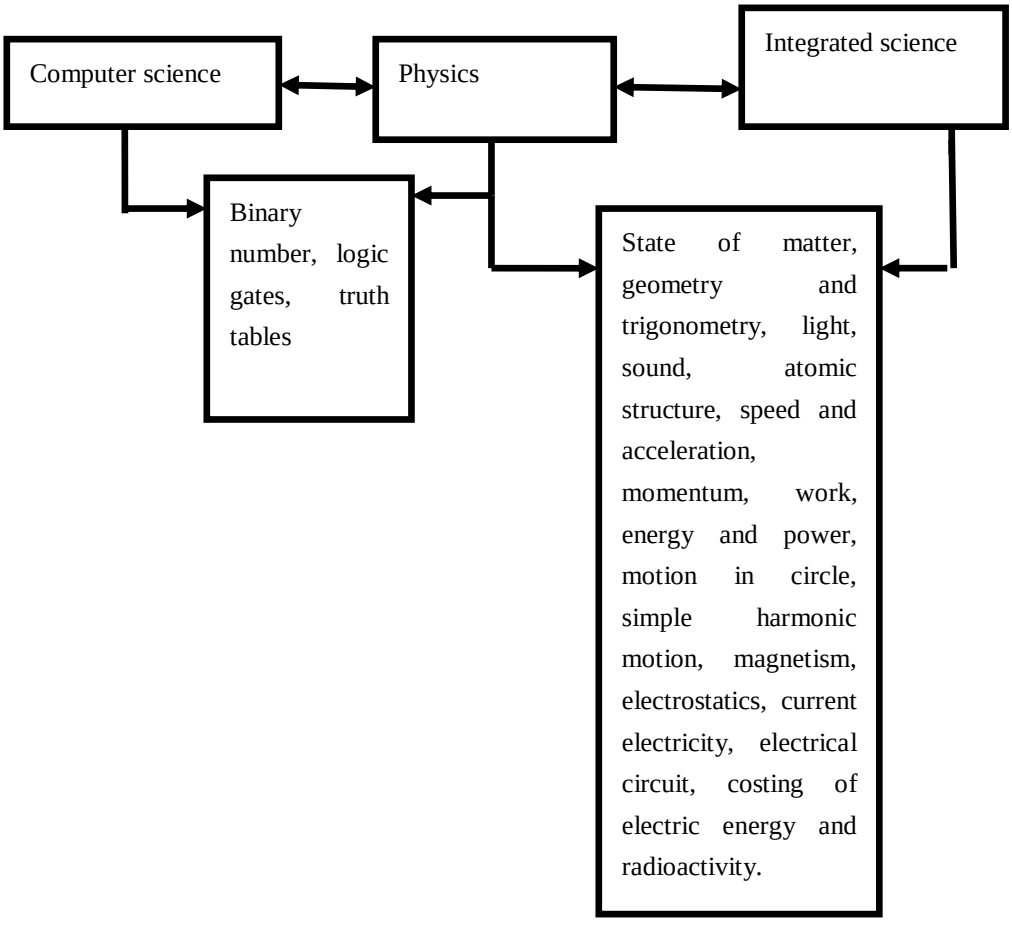

Fig-1. topical relationships between the subjects.

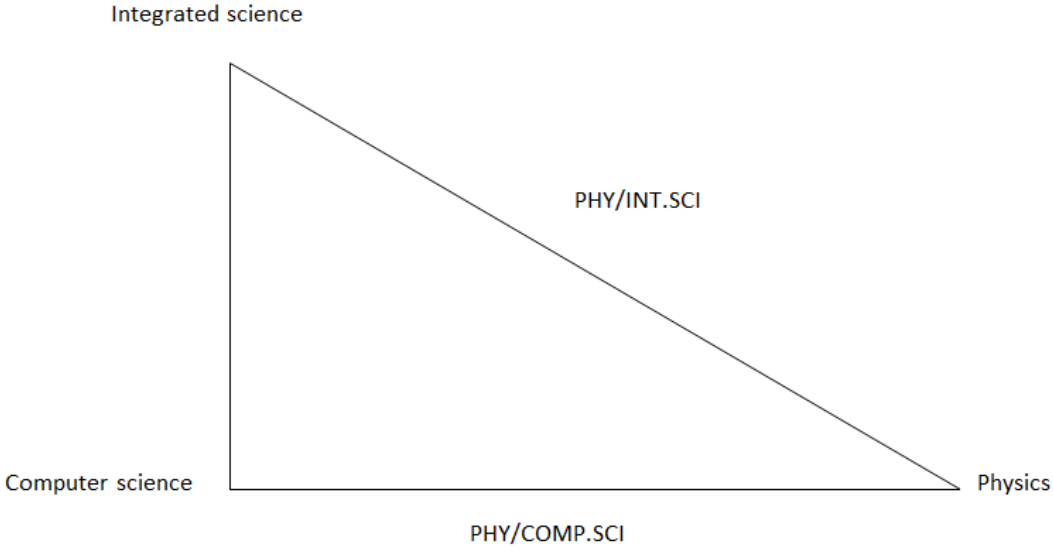

Fig-2. Interdependence between the subjects

Fig. 2 shows the strength of interdependence of the subjects. The longest side of the figure indicates strong dependence between physics and integrated science: the base of the figure represents the strength of dependence between physics and computer while the shortest side represents weak interdependence of computer science and integrated science.

The relationship between computer and Physics cannot be overemphasized thus Wilson and Redish (1989) observed that computer has revolutionized Physics but not significantly altered the way we teach Physics. Relay (1996) said computer science students are exposed to tools and practices which are believed to enhance their academic performance. Expectedly students' performance in physics should be better because of the tools and practices they are already familiar with in computer science.

Computer science are better exposed to computer technology and according to Brekke and Hogstad (2010), the uses of computer technology has greatly improved students understanding in physics. Computer science students have advantage of application of Information Communication and Technology (ICT) to Physics learning than integrated science students; ICT improves students' learning in Physics (Nguyen *et al*., 2012; Aina, 2013).

1.1. Research Design

This is a descriptive survey type of research where students' scores in physics based on subject combinations were collected for analysis. These scores were generated from the end of semester examinations; the scores were graded in percentage.

1.2. Participants

Participants were sampled from four colleges of educations among physics students. These comprise of 37 students from physics/integrated science and 37 students from physics/computer sciences.

1.3. Instrumentation

The instrument for this study was End of Semester Physics Examination Scores (ESPES). These were all students' scores in physics examination for their studies in college of education. The instrument was scrutinized by experts in physics education both within and outside the college for face and content validity.

The statistical methods found appropriate for this study were frequency counts, percentage and T-test.

1.4. Research hypothesis

There is no significant difference between computer science and integrated science students' academic performance in physics

2. FINDINGS

Table-2. Paired samples correlation

	N	correlation	sig
Computer & Int. sci	37	0.086	0.166

Table-3. t test table

	mean	std	t-cal	t- tab	df
Phy/comp	0.97297	20.38	0.29	1.31	36
Phy/int sci					

Significant at 0.05

Table-4. Mean

	Mean	N	Std. deviation	Standard error mean
Computer Science	46.37	37	11.43	1.85
Integrated Science	47.43	37	15.81	2.60

Table 2 shows that value of t calculated is less than t table value ($t_{cal} < t_{tab}$) therefore the research hypothesis which stated that, there is no significant difference between Computer science and integrated science students' academic performance in Physics is accepted.

From table 3 the mean scores of Physics/Computer science students was 46.3684 while that of Physics/integrated science students was 47.4324; the mean difference is not significant.

Table 4 revealed that there is no correlation between performances of students in Physics/Computer science and Physics/integrated science because their correlation coefficient was 0.086.

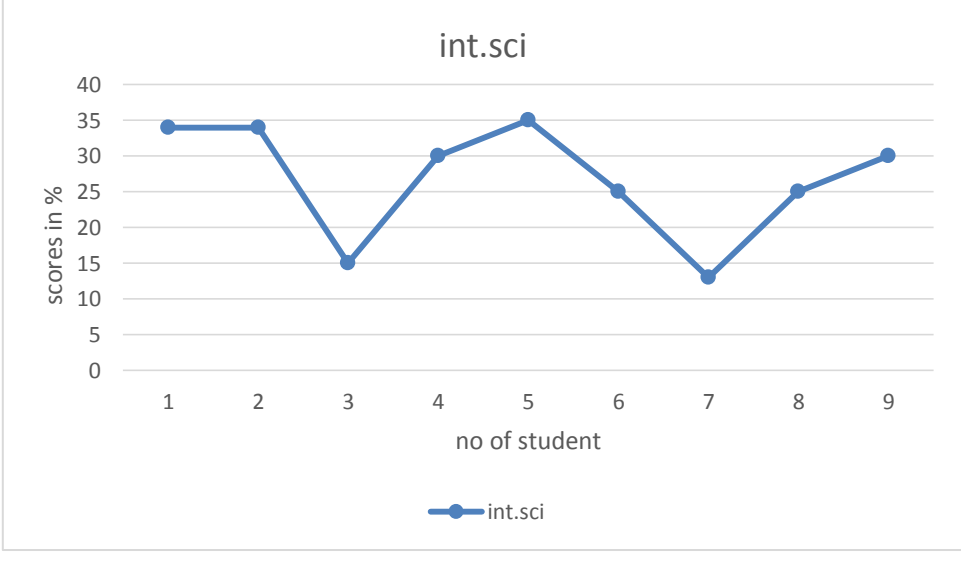

Fig-3. Graph of students' failure in Integrated Science/Physics

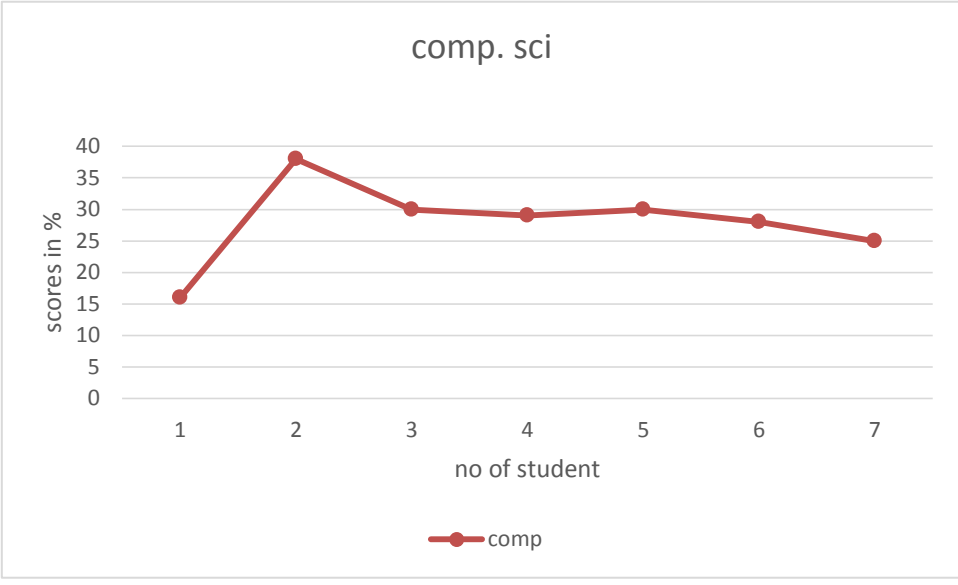

Fig-4. Graph of students' failure in computer science/physics

Figure 3 shows that seven students from integrated science/physics scored less than 15% in physics and five scored 35%.

From figure 4 only one student from computer/science scored 15% while two students scored above 35%.

3. DISCUSSION

The finding of this study reveals that combining Computer science or integrated science with Physics does not make any difference in students' academic performance. The finding of this study is in contrast with Aina (2011) that student who combined Physics with Computer science performed better than other combinations.

Findings of the study also revealed that more of students of integrated science/physics combination failed physics than that of Computer science/Physics combination. Reason for this could not be explained by this study because integrated science is more related to physics based on chart 1 above; expectedly students should not fail as in computer combination.

However, likely remote cause could be over confidence by Physics/Integrated science students. The students may feel that they don't need much preparation in Physics since there is overlapping of topics between Physics and Integrated science as could be seen in chart 1 above. This problem always occurs in any statistical course like Educational Statistics; science students do think they are familiar with calculations and needs little preparation to pass the course. Those students without background in science in most cases performed better because they are more serious and determined than their counterparts in science.

4. CONCLUSION

Based on the finding of this study there was no significant difference between academic performance of students who combined Physics with Computer science and integrated science. However, more students from Physics/integrated science combination failed Physics more than Physics/Computer science. This outcome suggest that students who offers courses where topics overlap like in Physics and integrated science, Physics and Chemistry, Physics and Mathematics etc should not take things for granted but be committed to their studies. This finding could also be link to the reviewed literature that students in computer science have more opportunity in applying ICT to learning in Physics than those in integrated science. This could give them advantage over integrated science students and thereby passed physics more.

6. RECOMMENDATIONS

In view of the findings of this study the following suggestions are hereby recommended:

1. Physics students should take their studies serious irrespective of the combination.
2. ICT should form part of Physics curriculum in all level of education.
3. Physics teacher should teach all Physics topics found in integrated science.

6.1. Limitation

The participants for this study were few in number due to the general problem of low enrolment always experience in Physics as observed by Aina (2011) and Wanbugu *et al.* (2013).

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Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

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