Subject Combination Based Dissonance In Academic Achievement Of Pre Service Chemistry Teachers

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ABSTRACT

The dissonance in pre-service chemistry teachers' academic performance in chemistry as an index of subject combination has been studied. 93 students spanning 3 sessions of 2016/2017 to 2018/2019 of the chemistry department, Tai Solarin College of Education were used. The student's T-test was used to check for the presence of significant differences in the performance of chemistry/biology versus chemistry/physics combination, chemistry/biology versus chemistry/maths combination and chemistry/physics versus chemistry/maths combination. Significant differences exist in the academic performance of pre-service chemistry teachers of chemistry/biology versus chemistry/physics combination and chemistry/physics versus chemistry/maths combination while there is no significant different in the academic performance of pre-service chemistry teacher in chemistry/biology versus chemistry/maths combination.

Keywords: Pre-service teachers, Subject combination, Dissonance, Academic achievement

1. INTRODUCTION

Teachers occupy a central position in a nation's educational system most especially for every system that craves for quality and functional education. Writing on the role of teachers in quality education, Savolainen (2009) notes that teachers play an essential role. Teachers are pillars of any functional education and education can be said to be the foundation for national growth and development. Therefore, teacher education preparatory programs must be directed at equipping teachers to prepare learners towards contributing significantly to overall national development. Learners are to be encouraged to be creative, using their various natural potentials at foundational level and transfer this to a level of inventions and scientific discoveries. Learners take after their teachers. Hence, teachers must undergo training that will match the diversified needs of the learners.

The Philosophy of the Nigeria pre-service teachers college in chemistry programme is inspired by the desire to help Teachers become intellectually informed in Chemistry and to produce competent and effective Chemistry teachers with good mastery of contents and methods and consequently develop the knowledge of the learners (FGN 2012). The pre-service teacher education programme is such that Teachers are expected to offer Chemistry in combination with other science subjects known as "subject combination".

The term subject combination in colleges of education refers to the two teaching subjects offered along with general education courses. There are subject combinations that are „single major" and some double major". Single subject combinations are those in which Teachers have to combine two subjects along with general education while double major subject combinations are those in which Teachers take one subject carrying double weights along with the general education course.

This combinations are Chemistry/chemistry; Chemistry/Computer Science; Chemistry/Integrated Science; Chemistry/Biology; Biology/Biology among others. This step is an attempt to increase Teachers" population in the Chemistry thereby meeting the shortage of man power in Chemistry and other sciences. Very few studies on the effects of subject combination on pre-service Teachers performance in Colleges of Education are available. Studies, such as Arigbadu and Mji (2006), examined the influence of subject combinations on Pre-service Chemistry teachers" examination performance in Nigeria. Also, Arigbadu (2004) examined the influence of subject combination on the performance of Teachers in Chemistry in Nigeria Colleges of Education. The results revealed that Chemistry teachers performed better than other Teachers. In their view, Usman and Memeh (2007), assert that achievement of Teachers in Chemistry was a critical fitter in the physical sciences and technology.

The measurement of performance has posed problem in academic circle. The validity of the test, the competency of the score and how conducive the environment is, are questionable. More importantly when teachers award marks, the reliability is often required. Carter (1953) pointed out that when Grade Point Average (GPA) is used, errors are introduced in the process of aggregating marks from different sources in such computations. When it comes to the use of letter grades, there are usually variations in grade from subject and/or department. However, other available sources for the teacher to test the Teachers" performance apart from the use of marks or grades are rarely used and are less meaningful.

The present study is therefore a study into the influence of subject combinations on Teachers" performance in Chemistry in Nigeria Colleges of Education. It is hoped that the study would provide Colleges of Education and National Commission for Colleges of Education (NCCE) with relevant information about the state of chemistry Teachers" performances in Colleges of Education on the basis of subject combinations and so go on to determine which subject knowledge support learning of chemistry most. Do some combinations in Chemistry give an edge over others in Chemistry achievement?

1.1 Research Hypothesis

The null hypothesis for this research work are:

H_{PO1}:   There is no significant different between the pre-service chemistry academic performance of students in biology combination (Chem/Bio) compared with their physics combination (Chem/Phy) counterpart

H_{PO2}:   There is no significant different between the pre-service chemistry academic performance of students in biology combination (Chem/Bio)   compared with their math combination (Chem/Math) counterpart.

H_{PO3}:   There is no significant different between the pre-service chemistry academic performance of students in physics combination (Chem/Phy) compared with their math combination (Chem/ Math) counterpart.

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2. RESEARCH DESIGN

This research bothers on a comparative study of pre-service chemistry student academic performance as an index of their course combination. A survey research method is therefore adopted where existing data will be collated from an authorized office. Here, academic performance of student is assessed as their performance in the internal examinations conducted for the students in the chemistry department over their three years stay in the college. Their performance in this examinations are summed up and summarized in their C.G.P.A (cumulative grade point aggregate). So the internal examination are adopted because the college and by extension the N.C.E (National Commission College of Education) have internal mechanism or laid down procedure by which this examination are being standardized. Therefore the results from this examination are reliable and valid and can be used for the purpose of this research.

The result of the pre-service chemistry student were therefore obtained from the academic affairs office of Tai Solarin College of Education for 2016/2017, 2017/2018 and 2018/2019 sessions.

3. DATA PRESENTATION ANALYSIS AND DISCUSSION OF RESULTS

The data collected are summarized and presented in a contingency table. They are then summarize using descriptive statistics and presented in another table. Further analysis are then carried out using the student's T-test to elucidate whether significant differences exist between the variables under consideration.

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H_{PO2}:   There is no significant different between the pre-service chemistry academic performance of students in biology combination (Chem/Bio)   compared with their math combination (Chem/Math) counterpart.

H_{PO3}:   There is no significant different between the pre-service chemistry academic performance of students in physics combination (Chem/Phy) compared with their math combination (Chem/ Math) counterpart.

The data collated are presented in a contingency table as table 1

Table 1: Contingency table

Combination/ C.G.P.A	0-1	1.1-2.0	2.1-3	3.1-3.9	4.1-5	Total
Biology	4	17	17	28	5	71
Physics	0	4	6	10	0	20
Maths	0	0	2	0	0	2

As presented in the contingency table math combination students are just 2 while we have 20 physics combination students and 71 chemistry/biology combination in all. All the students in chemistry/ math has their C.G.P.A between 2.0 and 2.9 for chemistry/physics student the 20 students have their C.G.P.A range between 1.0 and 3.9, while for chemistry/biology combination their C.G.P.A range from 0 to 4.9. Most of those in chemistry/biology combination have their C.G.P.A between 3.0 and 3.9 while it is same for those in chemistry/physics combination.

3.1 Descriptive Statistics

The data are summed using descriptive statistics: mean, median, mode, standard deviation e.t.c to describe it and presented in table 2

Table 2: Descriptive Statistics Summary

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std.Error	Statistic
BIOLOGY	71	0.78	4.36	2.6513	0.11721	0.98765
PHYSICS	20	1.53	3.74	2.8345	0.17499	0.78258
MATHS	2	2.00	2.00	2.0000	0.00000	0.00000
Valid N (listwise)	2					

The actual range of the chemistry/biology combination students results is 0.78 to 4.38. This combination has a mean of 2.65 which is a little lower than the average for chemistry/physics combination of 2.83. This is suggesting in part that students in chemistry/physics combination performed slightly better than those in chemistry/ biology combination. Those in chemistry/math combination have an average of 2.0 which is lower than the average for both chemistry/biology and chemistry/physics combination. That is, we can say as in order of performances that chemistry/physics combination performs best while chemistry/math combination is worst. The student's T-test was use to determine the existence of significant difference between the academic performance of pre-service chemistry student in chemistry/biology versus chemistry/physics combination, chemistry/biology versus chemistry/math combination, and chemistry/physics versus chemistry/math combinations the result are presented in table 3.

Table 3: T-Test

	Paired Differences					T	dt	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 BIOLOGY PHYSICS	-.18550	.95942	.21453	-.63452	.26352	-.865	19	.398
Pair 2 BIOLOGY MATH	1.68500	.77075	.54500	-5.23988	8.60988	3.092	1	.199
Pair 3 PHYSIC – MATH	1.18500	.34648	.24500	-1.92802	4.29802	4.837	1	.130

Chemistry/biology versus chemistry/physics combination from table 3 the calculated t is -0.865 and its falls outside the lower and upper limit of the table 't' this implies that there is a difference in the academic performance of the two group under consideration and that the difference is significance. Now that the performance of chemistry/biology combination is significantly different from those of their chemistry/physics counterpart the null hypothesis one which says that there is no significant different between their performances, can now be rejected.

Looking at table two the mean for chemistry/physics combination student is slightly higher than those of chemistry/biology students. This tends to insinuate therefore that chemistry/physics combination students are better than their chemistry/biology counterpart in their performance in chemistry. This may be explained by the fact that their tends to overlap certain topics in chemistry / physics such gaseous state, nature of matter heat e.t.c. this suggest that physics is closet to chemistry in terms of content than biology and other subject therefore the subject of physics taught to those chemistry/physics combination students will enhance or support their studies in chemistry and tends to help them to perform better.

Chemistry/ biology versus chemistry/math combination form table 3, the calculated t is 3.092 which falls within the lower and the upper limit of table 't' this implies that there is no significance difference between the variables under consideration that is academic performance of pre-service chemistry students vin chemistry/biology combination and those in chemistry/math combination but looking at mean value presented in table 2 the performances of students in chemistry/ biology combination is better that those of chemistry/math combination conclusively that it means that the difference is not statistically significant therefore the support to the knowledge of chemistry by supplied knowledge of math and biology are of the same influence. It is safe to accept the null hypothesis 2 therefore which states that there is no significant difference between the pre-service chemistry academic performance of students in biology combination (chem./bio) compared with their math combination (chem./math) counterpart.

Chemistry/physics versus chemistry/math combination form table 3, the calculated t is 4.837 and it did not fall within the upper and the lower limit of the table 't' this implies that there is no significant different in the variable under consideration. The academic performances of pre-service chemistry students in chemistry/physics combination is significantly difference from those in chemistry/math combination. Looking at table 2 the mean performances of 2.8 for chemistry/physics students suggest a superlative performance which is better than 2.0 for those of chemistry/math combination its therefore mean that the knowledge gained in physics classes by chemistry/physics students help them much more than the knowledge gain in mathematics classes by chemistry/math students in learning chemistry. The null hypothesis 3 is there for rejected.

4. CONCLUSION

This study is on subject combination influenced dissonance in pre-service chemistry teachers' academic performance. The following null hypothesis were set forth with the findings:

H_{po1} The null hypothesis which states that there is no significant different in the pre-service chemistry students academic performance of chemistry/biology versus chemistry/physics combination is rejected. There is significant difference in academic performance of pre-service chemistry students in chemistry biology and chemistry/physics combination. It is also discovered that pre-service chemistry students in chemistry/ physics combination performs better than those in chemistry/biology combination.

H_{po2}: The null hypothesis which states that there is no significant different in the pre-service chemistry students academic performance of chemistry/biology versus chemistry/math combination is up held.

H_{po3}: The null hypothesis which states that there is no significant different in the pre-service chemistry students academic performance of chemistry/physics versus chemistry/math combination is rejected.

chemistry of chemistry/ physics versus chemistry/math combination.
It the discovered that students in chemistry/physics performs better than those in chemistry/math and observed that the mean performance of students in chemistry/biology is higher or better that those in chemistry/math combination

It is recommended that further studied be done before this findings could be generalized and that chemistry/biology combination and chemistry/mathematics combination be given more tutorials so as to enhance their performance in chemistry. Also, that Lecturers in chemistry should bear in mind the findings of this research works while teaching so as to give more attention to such students in this combination that needed it. Furthermore, haven't found out that chemistry/ physics students performs better than the other combinations, which suggest that knowledge of physics support learning of chemistry more; admission policy makers could consider making credit in physics a pre-requisite to admission to study chemistry.

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