

## Comparative Study of Student Performance in NCE 1 for Three Consecutive Years: A Case Study of Chemistry Department, Federal College of Education, Zaria (2012/13 – 2014/15)

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### Abstract

*This study compared the performance of the Chemistry students of Federal College of Education Zaria (2012/13 – 2014/15) to investigate the relative performance in carry-over courses with those students taking the course afresh. A total of 1,671 students comprising 1,492 students taking the three courses afresh and 179 students carrying the courses in the three years, constituted the sample size for the study. The courses investigated were CHE111, CHE113 and CHE114, respectively. The documented examination result were used in the study. Data were analysed using mean, standard deviation, t-test statistical tool at  $P < 0.05$  which is used in hypothesis testing. The study found out, among others, that the fresh students clearly perform better than carryover students in all the courses analysed in the three consecutive sessions. The t-test shows that there was significant difference ( $P < 0.05$ ) in the performance of carryover students relative to the fresh students taking the course in most cases, as the t-calculated is more than the t-table for CHE 111 and 114 in both 2012/13 and 2014/15 session with CHE 113 having no significant difference. Teachers are expected to vary their teaching strategy to enhance performance in all categories of students.*

### Article History

Received: June 2022

Review processes

July-August 2022

Received in revised form:

September 2022

Accepted: November 2022

Published online: December 2022

### KEYWORDS

- Fresh Courses
- Carryover Courses
- Chemistry Students
- T-test

### Introduction

Chemistry is the foundation of all environmental professions (Bennett *et al.*, 2001). Science students who offer Chemistry must learn and pass it before graduating (Omwirhiren, 2002). Many have been withdrawn from chemistry related program due to inability to pass the basic Chemistry courses (Berg, 2005). In a good learning environment where the best teaching methods for chemistry and instructional materials have been utilized, successful chemistry learning may however not be achieved if the students lack the necessary characteristics that are associated with successful chemistry learning (Omwirhiren, 2003). The performance of chemistry students in

public examinations continues to fall below average. Hence, this study seeks to investigate the student characteristics (learning styles preferences) that are associated with successful chemistry learning in the Department of Chemistry at Federal College of Education, Zaria. The most important student characteristics of concern to this research study are their improvement while doing the course for the second time. Furthermore, there are reported cases of poor performance of students after carrying over certain courses again in the school (Hofstein and Naaman 2011).

This follows that the low achievers who scored below an established standard must be re-drilled until they are qualified

to pass through the system. This process of repeating a course in the academic institutional system until the learner score up to the standard is termed as “carry over”.

Accordingly, the student handbook, FCE Zaria (2002) defines carry over as a situation where a student’s academic performance on a particular course is below the pass mark of 40% or grade (E) in a particular semester but with CGPA of 1.00. Such a student is expected to re-register for the failed course in a semester that the course is available. He is expected also to attend lectures and undergo an assessment in the course.

This mixing of repeating student and fresh student in a class raises an interesting question: does the difference in prior experience lead to a corresponding difference in course outcomes? In other words, are the carryover students generally more successful than the first time students because of their previous experience? Or are they less successful given their unsatisfactory outcomes the first time through?

The answers to these questions would obviously be of interest to repeating students and their academic advisors. It would be helpful to know what students should expect when retaking a course. Will they have an easier time of it than most of their classmates, or will they need to work harder to compensate for their previous weakness?

The performance of carryover student is similarly relevant to instructors. If repeaters perform differently than first-

timers, then professors may want to adjust their teaching methods accordingly (Micheal and Ernest 2014).

Student performance when repeating should also be of interest to public policy makers and university administrators [see, e.g., NCHEA, 2013]. If deficient courses are not repeated successfully students may be forced to change majors or withdraw from university. The extent of students’ repeating success therefore can influence their retention and graduation rates (Micheal and Ernest 2014)

Thus, it is explicit that the introduction of carry over system aims at quality control in the academic system.

It is hoped that this study will highlight to colleges of education instructors the performance of their NCE students taking a course afresh and those rewriting a course for the second or third time, there by contributing to the improvement of instruction at the NCE program especially in Chemistry Department.

It will also aid in reforming the teaching trend and possibly return to the old practice of carefully handling student for better performance.

Also, the study hopes to recommend to the immediate community, local government and even developed nation around to consider the ways of contributing to the improvement of students’ performance in colleges of education to promote science education.

In this research we compare the performance of repeating students to that

of first-time students in some chemistry courses. There have been very few studies on the performance of repeating students, and the research results have been inconsistent. Unlike previous work, this study considers both repeating and first-time students, and we distinguish among three different categories of repeating students. Our analysis uses data from official departmental records and thereby avoids potential problems associated with self-reported survey data.

This study will also serve as a guide to chemistry teachers in handling carry-over students.

It is in the light of the above, that the study set to investigate the performance of students in NCE 1 Chemistry for three consecutive years at Federal College of Education, Zaria.

### **Purpose of Study**

The purpose of the study is to investigate the relative performance of students in carry-over courses with those students taking the course afresh.

Specifically, the study compared:

- i. The mean score performance of fresh and carry over students taking the same course.
- ii. The overall performance of students in selected NCE 1 courses in the Chemistry Department, FCE Zaria.

### **Review of Literature**

Many factors have been examined for their potential impact on student performance. Examples include mathematical skills [Ballard and Johnson, 2004], motivation levels [Arnold and

Straten, 2012], peer influence [Contreras *et al.*, 2012], studying time [Bonesronning and Opstad, 2012], and attendance [Patron and Bisping, 2006].

Michael and Ernest 2014 examine the performance of students repeating introductory microeconomics and macroeconomics courses, relative to that of students taking the courses for the first time. The study covers 937 grades received by 439 undergraduate business students. We find that the grades of students who previously failed or withdrew from the course are lower and more variable than those who took it for the first time. By contrast, the grades of students who previously passed the course are higher than the grades of the new students. These differences remain statistically significant after controlling for high school averages.

Another study by Armstrong and Biktimirov [2013] concentrates more directly on the issue of course repeating. It examines students repeating first-year business core courses in calculus, data analysis, financial accounting, macroeconomics, microeconomics, and statistics. The study reports a positive relationship between students' original grades and the new grades they obtain when repeating, but a negative relationship between the original grades and the extent of improvement when repeating. That is, students with high grades in the original attempts tend to obtain the highest grades when repeating; but students with low grades in the original attempts tend to have the largest increases in grades when repeating.

### Research Hypotheses

The following nulls were tested at 5% level of significance.

- i. There is no significant difference in the grades of the learner before and after carrying over a course.
- ii. There is no significant difference in the performance of carry over students relative to the fresh students taking the course.

### Population and Sampling

This study employed a quasi-experimental research design, based on the documented NCE result in chemistry department, Federal College of Education, Zaria from 2013 to 2015. The population of those offering the courses in the three consecutive sessions were calculated from the summation of the highest number of students in each session since it is the same set of students that write the three courses in each session. Therefore 1,492 students were taking the three courses afresh and 179 students repeating the courses in the three years, with total population of 1,671 students.

The sample used in this study was made up of the entire students in each session of the three consecutive years offering the three (3) courses out of the ten (10) courses offered in Chemistry department, Federal College of Education, Zaria. The courses include CHE 111 (General Chemistry), CHE 113 (Practical Chemistry 1) and CHE 114 (Application of Maths to Chemistry) that fall under folds of 2012/13 to 2014/15 session.

The researcher decided to restrict himself to the students of chemistry only that offered the three selected courses in the department for the said years, because using this small group of students would give a clue to the expected performances of the students in other courses.

The sample is deduced from the population as given in the table 1 below.

### Instrumentation

The instruments used in carrying out this research were primary record; that is the documented NCE result in chemistry department, Federal College of Education, Zaria from 2013 to 2015.

### Validity and reliability of the instrument

The instrument used was valid and reliable in the same vain, for no standardized or even aptitude test of achievement was possible to be given to the attached student in these courses under consideration. In the research, since all of them had since undertaken the courses or even left the school. Therefore, in order to have reliable measure of the academic achievement of the affected students, the examination result obtained by the students in the three courses of the study were considered suitable and dependable data for the research, since all the affected students sat for the examination in the whole years under study.

### Method of data collection

The study involves the collection of fresh and carry over student's result from 2012/13 to 2014/15 session. The

procedure for this involves writing an application through the head of department and to the examination officer of the department. This was further facilitated by the fact that the researcher is also a lecturer in chemistry department, Federal College of Education, Zaria.

### Method of analysis

The scores obtained from the result documented in chemistry department, federal college of education, Zaria were analysed using mean, standard deviation to analyse the research question and t-test statistical tool to test all the null hypothesis each at 0.05 significant level, for CHE 111, 113 and 114 both for fresh and

carry over students in the three consecutive years.

### Results

The result obtained from the analysis of data using mean, standard deviation and t-test are presented in tables shown below. The mean and the standard deviation was calculated by substituting the data in their formula while the t-critical was found in the T-distribution table to be 1.645 at 0.005 significant level and  $DF = \infty$  because N values were higher than 120 and the t-calculated was generated from excel using the available data in the tables.

**Table 1: Result of t-test Analysis for 2012/13 Session**

Course	Students	N	X	S.D	Df	t-cal	t-cri	remark
CHE111	Fresh	372	44.5	16.42	387	1.996	1.645	Rejected
	Carryover	17	36.8	19.5				
CHE113	Fresh	372	41.1	12.8	382	0.266	1.645	Accepted
	Carryover	12	34.6	14.4				
CHE114	Fresh	373	44.3	17.2	399	3.550	1.645	Rejected
	Carryover	28	33.9	14.2				

*N = Number of samples; X = score means; S.D = standard deviation; Df = degree of freedom; t-cal = calculated t-value; t-cri = critical t-value*

The result in Table 2 shows that the mean scores of fresh students was higher than that of repeating students in all the three courses and that there is significant difference ( $P < 0.05$ ) between fresh and carryover students for CHE111 and CHE114 as t-calculated is more than the

t-table hence the null hypothesis is rejected, while for CHE113 there is no significant difference ( $P < 0.05$ ) between the performance of fresh and carry over students as the t-calculated (0.266) is less than the t-tabulated (1.645) hence the null hypothesis is accepted.

**Table 2: Result of t-test Analysis for 2013/14 Session**

Course	Students	N	X	S.D	Df	t-cal	t-cri	remark
CHE111	Fresh	546	38	16.61	591	0.072	1.645	Accepted
	Carryover	47	34.5	9.3				
CHE113	Fresh	545	43	15.1	568	1.663	1.645	Rejected
	Carryover	25	39	10.6				
CHE114	Fresh	543	31.5	16.3	596	2.680	1.645	Rejected
	Carryover	55	27	10.0				

The result in Table 3 also shows that the mean scores of fresh students was higher than that of repeating students in all the three courses and that shows that for CHE111 there is no significant difference ( $P < 0.05$ ) between fresh and carry over students as the t-

calculated is less than the t-tabulated hence the null hypothesis is accepted. While there is significant difference ( $P < 0.05$ ) between fresh and carryover students for CHE113 and CHE114 as t-calculated is more than the t-table hence the null hypothesis is rejected.

**Table 3: Result of t-test Analysis for 2014/15 Session**

Course	Students	N	X	S.D	Df	t-cal	t-cri	remark
CHE111	Fresh	573	35	12.8	657	2.100	1.645	Rejected
	Carryover	86	30.5	19.9				
CHE113	Fresh	524	39	15.3	546	0.072	1.645	Accepted
	Carryover	24	39	9.4				
CHE114	Fresh	553	29.5	18.9	647	5.306	1.645	Rejected
	Carryover	96	18.75	14.6				

The result in Table 4 also shows that the mean scores of fresh students was higher than that of repeating students in all the three courses and that that there is significant difference ( $P < 0.05$ ) between fresh and carryover students for CHE111 and CHE114 as t-calculated is more than the t-critical hence the null hypothesis is rejected, while for CHE113 there is no significant difference ( $P < 0.05$ ) between fresh and carry over students as the t-calculated is less than the t-tabulated hence the null hypothesis is accepted.

### Discussion

The result of comparative analysis of the academic performance of students that are offering chemistry courses in Federal College of Education, Zaria for the second or third time to those that are offering it afresh from 2012/13 to 2014/15 academic session shows that shows that the mean scores of fresh students was higher than that of repeating students in all the three courses and when comparing the t-critical, 1.645 ( $DF \approx \infty$ ) on the T-distribution table and the t-calculated from excel as in table

1, 2 and 3, there is no significant difference ( $P < 0.05$ ) in the performance of carryover student relative to the fresh students taking the course in most cases. This result is in conformity with Michael and Ernest 2014 which states that The mean grade for repeating students is 6.2 marks lower than that of new students, and a  $t$ -test shows that this difference is statistically significant ( $p = .006$ ). These results serve as an eye-opener to some extent what may likely be the case with the college. The result as seen with more failure in carryover (repeat) students may be suggestive of an inherent danger as regards the future of the next generation of elders and the fate of educational industries in this country. The anticipated future problems become more evident when one considers the proportion of the Nigerian populace going to colleges' vis-à-vis the financial involvement of sending ones child to schools (Alewu *et al.*, 2013).

This was in conformity with Morrison and No (2007), which showed that there were no statistically significant differences with respect to learning styles and learning strategies between repeaters and non-repeaters. Also in a college case study, Fenton (2002) found that there were no differences between those who repeated and those who did not repeat courses. Therefore, the result follow the same pattern across the three consecutive sessions where the students taking each of the courses afresh perform better than carryover students. In a meta-analysis of several hundred studies, Jimerson (2001) found a relationship between course repetition and students'

academic performance. Students who repeated courses did not perform as well as those who did not. A similar relationship between students' academic performance and course repetition was found in studies in different parts of the world.

The general result of repeating courses suggests that monitoring course repetition by institutional and policy research offices is greatly needed. Further, programs and courses should be analyzed to determine which courses have the highest rate of repetition in order to improve programs and help students to progress to successful completion (Ramzi and Diane 2012).

These higher performance of fresh students over the carryover students could be as a result of a number of factors, some of which are; change in lecturers taking the course over time, Nature of the course, some of the carryover students are feeling ashamed to join their junior ones in taking lectures, incessant negligence on the part of the carryover students, clashes in timetable, the rise in the population growth in the school, less motivation, demoralized and so many others.

However due to the fact that the research was not conducted the year all exams were conducted and scored, and the fact that the exact factor which is in play at the time the result of the analysis are taken with the two decision standing i.e. the null hypothesis would be both accepted and rejected.

## Conclusions

From this analysis it can be concluded that fresh students perform far better than those repeating some courses for the second or third time as the mean scores shows that the mean scores of fresh students were higher than that of repeating students in both CHE 111, 113 and 114 courses and that t-test shows that there was significant difference ( $P < 0.05$ ) in the performance of carryover students relative to the fresh students taking the course in most cases, as the t-calculated is more than the t-table for CHE 111 and 114 in both 2012/13 and 2014/15 session with CHE 113 having no significant difference while in 2013/14 session the t-calculated is higher than the t-tabulated for CHE 113 and CHE 114 with CHE 111 having no significant difference.

Our data came directly from the college official records, and so has the advantages of being objective and reliable. However, these records naturally do not contain many of the attitudinal, behavioral, and situational factors that would be needed to investigate these within-group differences. For example, while the database tracks the year and semester that each student takes a given course, it does not track the time of day it is offered, the name of the instructor who teaches it, or the classroom that it occupies. One of the contributions of this study is to show that non-trivial performance differences do exist among repeating students; it consequently

opens the door for future research on the causes of those differences.

## Recommendation

The researcher at this juncture strongly wish to forward the following recommendation that if stake holders in Federal College of Education Zaria considered would obviously boost the academic performance of students in the college.

1. Teachers are expected to vary their teaching strategy and based on students' group and experience to enable both the learners easily understand what is being taught to them
2. Teachers are expected to use teaching strategies, guided discovery, cooperative and polya problem solving to enhance performance in all category of student.

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