

## **INTEGRATION OF APPRENTICESHIP SCHEME INTO THE NCE (TECHNICAL) CURRICULUM PROGRAMME TOWARDS SELF-RELIANCE IN THE 21<sup>ST</sup> CENTURY**

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### **Abstract**

*This paper examined how to integrate apprenticeship scheme into the NCE (Technical) curriculum programme towards the positive realization of self-reliance by its graduates in the 21<sup>st</sup> Century. The paper exposed the failure of the current TVET programmes in creating employment and wealth creators against seekers of white collar jobs as well as mentioned the unemployment alarming rates amongst our youths. This paper also explains the efforts of the National Directorate on Employment with its seven folds of employment plans which in no doubt failed woefully. This paper is therefore of the view that apprenticeship scheme be integrated into the NCE (Technical) Programme through its curriculum reform drawing from the experiences of priority placed on apprenticeship scheme by developed countries who saw this as a bedrock for industrial and economic revolution some centuries ago. To this end, the paper recommended seven points that can lead to curriculum reforms providing for one full year practical Apprenticeship Scheme training in industries in the second year of the NCE programme while the first and third year be devoted to academic, teaching practice, project work and essential certifications.*

### **Introduction**

Currently, Nigeria is passing through a difficult time in her history clouded with political struggles, survival to sustain, economic instability, recession challenges just to mention a few. One of the issues that have been driving our economy to state of constant turbulence is the rising unemployment. An economy with constant increasing unemployment is certainly moving towards a suicidal end. Loss of jobs due to closure of businesses and factories is on the high side. Our economy is so bad that even various government agencies and parastatals are considering mass retrenchment and down-sizing of its work force as an alternate route to sustain governance but for the resistance of labour unionist and perhaps the adverse effect on the political fortune of the politicians who coincidentally are the managers of our economy, the case would have been a different story. Lately, slashing of salaries and paying in percentages is what most organizations do and this is a cardinal threat to the economy and the Nigerian nation as the increase in rate of unemployment is skyrocketing. The rising unemployment saga especially amongst the youth is alarming and needs speedy solution.

Nigeria population as at now stands at 203,452,505 (about 203.5) million people and its ranked 7<sup>th</sup> in the world (Central Intelligence Agency (CIA), World Fact Book, 2019). Of this, it is

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Chemistry which revealed that there is significant difference between Divergent learning styles on achievement and motivation in Chemistry in favor of divergent learners.

### **Conclusion**

Convergent and Divergent learning styles improves secondary school students' achievement and motivation in Chemistry.

### **Recommendations**

Based on research findings for this study, it was recommended that students learning Skills or potentials should be identified and explored frequently by teachers during Chemistry instructions using STAD strategy so as to aid better achievement and motivation in Chemistry among secondary school students.

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motivation than convergent learners. Thus, to find out how significant the difference was, analysis of covariance (ANCOVA) was used to test the null hypothesis from research question 2 raised as shown in table 7.

### Hypothesis Two (Ho<sub>2</sub>)

There is no significant difference between Convergent and Divergent learning styles on senior secondary school student's motivation in the concept electrolysis.

**Table 7: Summary of ANCOVA Test Results of Groups with Motivation**

Source	Type III Sum of Square	df	Mean Square	F <sub>cal</sub>	P <sub>value</sub>
Corrected Model	36452.765 <sup>a</sup>	3	12150.92	245.976	0.000
Intercept	46541.824	1	46541.824	176.104	0.000
Pretest	162.211	1	162.211	0.614	0.434
Groups	34294.971	2	17147.485	64.882	0.000
Error	54442.992	206	264.286		
Total	566991.000	210			
Corrected Total	90895.757	209			

Significant at P ≤ 0.000

Table 7, revealed that F<sub>(2, 206)</sub> = 64.882) and P = 0.000 at 0.05 level of significance. This shows that p value is less than 0.05 (0.00 ≤ 0.05) which is significant. Therefore, null hypothesis three was rejected. This means that there is significant difference between Convergent and Divergent learning styles on senior secondary school student's motivation in the concept electrolysis.

### Summary of findings

The following Submissions are the summary of findings for this study

- i. There is significant difference between Convergent and Divergent learning styles on senior secondary school student's achievement in the concept electrolysis in favor of divergent learning styles.
- ii. There is significant difference between Convergent and Divergent learning styles on senior secondary school student's motivation in the concept electrolysis in favor of convergent learning styles.

### Discussions of Findings

There is significant difference between Convergent and Divergent learning styles on senior secondary school students' achievement and motivation in the concept electrolysis in favor of divergent learners. The finding disagrees with findings of Haruna, *et al* (2018) and Babatunde, *et al* (2019) who revealed that there is no significant difference between convergent learning style on achievement and motivation in Chemistry. These may be attributed to some intervening variables such as Hawthorne effects and study maturation among others which were not taken into consideration accordingly. However, the findings of this study supports earlier findings of Adams *et al* (2018) and Jacobs, *et al* (2019) which revealed that there is a significant difference between Convergent learning styles on achievement and motivation in

**Hypothesis One (Ho<sub>1</sub>)**

There is no significant difference between Convergent and Divergent learning styles on senior secondary school student's achievement in the concept electrolysis.

**Table 5**  
**Summary of ANCOVA Test Results of Groups with Achievement**

Source	Type III Sum of Square	df	Mean Square	F <sub>cal</sub>	P <sub>value</sub>
Corrected Model	9958.241 <sup>a</sup>	3	3319.414	14.685	0.000
Intercept	28667.327	1	28667.327	126.821	0.000
Pretest	536.457	1	536.457	2.373	0.125
Groups	8248.057	2	4124.028	18.244	0.000
Error	46565.573	206	226.046		
Total	373365.000	210			
Corrected Total	56523.814	209			

Significant at 0.05  $\square$  P

Table 5 revealed that  $F_{(2, 206)} = 18.244$  and  $P = 0.000$  at 0.05 level of significance. This shows that p value is less than 0.05 ( $0.00 \square 0.05$ ) which is significant. Therefore, the null hypothesis one was rejected. There is significant difference between Convergent and Divergent learning styles on senior secondary school student's achievement in the concept electrolysis.

**Research Question 2**

What are the effects of Convergent and Divergent learning styles on secondary school students' motivation in the concept electrolysis?

**Table 6: Mean and Standard Deviation of Students Motivation Rate in Chemistry**

Group	N	Pre motivation		Post motivation		Mean Gain
		X	SD	X	SD	
Convergent	74	22.45	3.22	55.27	2.37	32.82
Divergent	89	20.82	3.19	54.18	2.53	33.36
Control	47	21.12	4.61	23.15	2.47	2.03

Table 6, revealed a pretest result for convergent group having a mean score of 22.45 with standard deviation of 3.22, while posttest result shows a mean score of 55.27 with standard deviation score of 2.37. Hence, had a mean gain score of 32.89. Similarly, pretest result for divergent group revealed a mean score of 20.82 with standard deviation of 3.19, while posttest result gave a mean score of 54.18 with standard deviation score of 2.53, had a mean gain score of 33.36. The control group pretest results revealed mean achievement score of 21.12 with standard deviation of 4.61, while posttest result gave mean achievement score of 23.15 with standard deviation of 2.47, had a mean gain score of 2.03. These, results revealed that both convergent and Divergent learners had higher mean motivation score than control group, but divergent learners had higher mean gain score on

## Results

**Table: 3 Summary of ANOVA Pretest Results on Achievement Scores in Chemistry.**

	Sum of Square	df	Mean Square	F	Sig
Between Groups	2887.463	11	262.497	0.932	0.031
Within Groups	43936.822	156	281.646		
Total	46824.286	167			

Significant at  $P \leq 0.031$

Pretest results presented in table 3 revealed that P value gives 0.031 at 0.05 levels of significance ( $0.031 \leq 0.05$ ). Therefore, there was significant difference between experimental and control groups on pretest scores. This implies that both groups were found to be different before treatment commenced. Hence, the use of Analysis of Covariance (ANCOVA) to test the null hypotheses using pretest results justifies the choice of inferential statistics for the study.

### Research Question 1

What are the effects of Convergent and Divergent learning styles on secondary school students' achievement in the concept electrolysis?

**Table 4**  
**Mean and Standard Deviation of Students achievement in Chemistry**

Group	N	Pretest		posttest		Mean Gain
		X	SD	X	SD	
Convergent	74	27.45	3.12	42.04	4.61	14.59
Divergent	89	25.82	3.87	42.76	4.17	16.94
Control	47	24.12	4.92	26.38	6.35	2.263

Table 4, revealed a pretest result for convergent group having a mean achievement score of 27.45 with standard deviation of 3.12, while posttest result shows a mean score of 42.04 with standard deviation score of 4.61. Hence, had a mean gain score of 14.59. Similarly, pretest result for divergent group revealed a mean achievement score of 25.82 with standard deviation of 3.87, while posttest result gave a mean score of 42.76 with standard deviation score of 4.17. Hence, had a mean gain score of 16.94, the control group pretest results revealed mean achievement score of 24.12 with standard deviation of 4.92, while posttest result gave mean achievement score of 26.38 with standard deviation of 6.35. Hence, mean gain of 2.263.

These, results revealed that both convergent and Divergent learners had higher mean achievement score than control group, but divergent learners had higher mean gain than convergent learners. Thus, to find out how significant the difference was, analysis of covariance ANCOVA was used to test the null hypothesis from research question 1 raised as shown in table 5.

**Table 2: Sample of the Study**

School	Group	Male	Female	Total
D.S.S Eyagi Bida	Convergent	45	29	74
G.T.C Bida	Divergent	49	40	89
G.D.S.S Bida	Control	23	24	47
	<b>TOTAL</b>	<b>117</b>	<b>93</b>	<b>210</b>

Chemistry Achievement Test (CAT), Questionnaire on Chemistry Students Motivation Towards Learning of Electrolysis (QCSMTLE) and Chemistry Students Learning Style Inventory (CSLSI) were used for data collection. The CAT was developed by first constructing a test blue print for the different content specified on the concept electrolysis to generate 25 multiple choice questions options A - D. the QCSMTLE consist of 30 items on Chemistry students motivation towards learning of the concept electrolysis using a 5 point likert scale of Highly Motivated (HM), Moderately Motivated (MM), Averagely Motivated (AM) and Not Motivated (NM) respectively were scored 5, 4, 3, 2 and 1 for positive statements. While negative statements were scored in reverse order.

The CSLSI was adopted to identify students learning style, which consists of 24 items with 6 items drawn from each of the 4 learning skills which are concrete experience, reflective observation, active experimentation and abstract conceptualization, respectively. The CAT, QCSMTLE and CSLSI were validated by chemistry and science education experts each from Federal University of Technology, Minna, Niger State, respectively. A pilot study was carried out using 63 (40 male & 23 female) class II Chemistry students of Government model secondary school, Bosso. The administration of the CAT was done twice within an interval of two weeks.

The CAT, gave a reliability Coefficient of 0.93 using Guttman Split half reliability test. While the QCSMTLE and CSLSI gave a reliability coefficient of 0.84 and 0.76 respectively, using Cronbach alpha reliability test. Hence, the CAT, QCSMTLE and CSLSI were considered reliable and suitable for the study. The CAT and QCSMTLE were administered to the students in a normal class room setting for pretest scores. Experimental groups were taught the concept electrolysis using STAD lesson plan while control group were taught electrolysis using lecture method. A reshuffled version of the CAT was then administered to the students to measure achievement while CSLSI was used to identify students learning style respectively. The QCSMTLE was then used to collect data on motivation levels of students. The Research period lasted for six (6) weeks. Mean and standard deviation was used to answer research questions raised. However, analysis of variance was used to analyze if pretest result was significant or not. Thus, Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 levels of significance. The statistical package for social sciences (version 23.0) was used for the analysis.



veritable strategy used to regulate an individual's belief, idea, thinking or actions which may be favorable or unfavorable to teaching and learning process (Ezenwa, Rabiun & Oyewo). These implies that when learning environment fails to meet the need of students will mean a manifestation of negative attitude which shows lack of adequate motivation to learning but when learning environment meets students needs will mean a manifestation of positive attitude which shows adequate motivation to learning among students respectively (Njokoku, Ezeugo & Kalu, 2018).

Research findings have shown varying opinions on effects of Convergent learning style on achievement and motivation in Chemistry. Thus, Adams, Odeyemi and Kafewo (2018) revealed that there is a significant difference between Convergent learning styles on motivation and achievement in Chemistry while Haruna, Kabiru and Rufai (2018) revealed that there is no significant difference between convergent learning style on motivation and achievement in Chemistry. Some other findings on Divergent learning styles such as Jacobs and Aruwon (2019) revealed that there is significant difference between Divergent learning styles on motivation and achievement in Chemistry while Babatunde and Seyi (2019) revealed that there is no significant difference between Divergent learning styles on motivation and achievement in Chemistry. Base on divergent findings of learning styles on Chemistry achievement and motivation, the aim and objective of this study are to determine the impact of convergent and divergent learning styles on secondary school students' achievement and motivation in the concept electrolysis. Thus, investigated the impact of convergent and divergent learning styles on Chemistry achievement and motivation among government secondary school students in Bida local government, Niger State.

### **Research Questions**

The following research questions guided the study:

- i. What are the effects of Convergent and Divergent learning styles on secondary school students achievement in the concept electrolysis?
- ii. What are the effects of Convergent and Divergent learning styles on secondary school students motivation in the concept electrolysis?

### **Null Hypotheses**

The following null hypotheses were tested in the study;

- Ho<sub>1</sub>. There is no significant difference between Convergent and Divergent learning styles on senior secondary school student's achievement in the concept electrolysis.
- Ho<sub>2</sub>. There is no significant difference between Convergent and Divergent learning styles on senior secondary school student's motivation in the concept electrolysis.

### **Methodology**

Pretest - Posttest non - equivalent and non - randomized control group causal comparative research design was adopted for this study. The population of study consists of 1620 (1124 male & 496 female) Class II Chemistry students. Sample size of 210 (117 male & 93 female) class II Chemistry students using an intact class of 3 out of 8 secondary schools randomly selected by lottery technique in Bida local government area was used for the study as shown in table 2.

Despite the importance of Chemistry, it is disappointing to note that performance of students during internal and external examinations has remained considerably poor as shown in table 1

Table 1: WAEC 2014 – 2018 Niger State Chemistry Result

Year	A1 – C6 (%)	D7 – E8 (%)	F9 (%)	ABS (%)
2014	23.23	33.11	41.88	1.62
2015	21.19	32.79	45.20	0.89
2016	18.32	29.59	50.41	1.63
2017	15.58	27.43	55.30	1.69
2018	10.25	24.24	63.20	2.32

Source: WAEC National Head Quarter, Yaba Lagos (2018)

Table 1, revealed a decrease in percentage pass rate at credit level of 23.23 % to 10.25 % from 2014 – 2018, while percentage failure rate increases from 41.88 % to 63.20 % in 2014 - 2018 respectively. These shows that there is continues poor performance in Chemistry among secondary school students in Niger state from 2014 – 2018, respectively. Thus, this poor performance of students in chemistry has continued to be a major concern, particularly to those in the mainstream of chemical education in Nigeria (Olagunji, Adesoji, Iroegbu & Ige, 2003; Adesoji & Olutunbosun, 2008).

The West African Senior School Certificate Examination (WASSCE, 2014 - 2018) chief examiner's report identified candidates poor performance in chemistry to inability of students to tackle numerical and arithmetic questions, poor expressions, memorization of concept without understanding, writing of half life reaction and incorrect balancing of ionic equations. Moreover, Shedrach, Pascal & Richard (2016) identified the concepts electrolysis, redox reactions and electrochemical cells, as most difficult Chemistry topics among secondary school students. Interestingly, each of these concepts pointed out are rooted from the concept electrolysis. In addition, Bamidele *et al.* (2013) stated that the students were observed to be deficient in understanding ionic equations and its application in electrolysis.

Research findings have linked the cause of students' difficulty in electrolysis to quality and quantity of students learning style explored during instructions (Olorukooba, 2001; Eniayeju, 2002; Danjuma, 2005; Novak & Canas, 2008). While some other findings revealed cause of students difficulty in the concept electrolysis to lack of adequate motivation for teaching and learning (Adesoji & Olutunbosun, 2018). Convergent and divergent learning styles have been identified as the most prominent learning styles among secondary school students in Nigeria (Jacobs & Aruwon, 2016).

Convergent learning styles involves the ability of students to understand learning objectives by exploring their sense of touch, taste, sight, smell and hear respectively which defines their attributes of abstract conceptualization and active experimentation during instruction (Ariyo, Bonire & Dhulkifl, 2017). While divergent learning style defines students learning skill potentials associated to reflective observation and active experience related to the lessons objective (Gabriel, Sunday & Mathew, 2017). Motivation is a driving tool or

## IMPACT OF CONVERGENT AND DIVERGENT LEARNING STYLES ON CHEMISTRY ACHIEVEMENT AND MOTIVATION AMONG SECONDARY STUDENTS IN BIDA LOCAL GOVERNMENT, NIGER STATE

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### Abstract

*This study investigated the impact of convergent and divergent learning styles on Chemistry achievement and motivation among secondary school class II Chemistry students in Bida local government, Niger State. The study employed causal comparative (Expo factor) research design using pretest posttest non randomized control group design. Population of study consists of 1620 (1124 male & 496 female) Chemistry students from all the 8 government secondary schools in Bida local government area of Niger state. Sample size for the study consists of 210 (117 male & 93 female) students using an intact class of 3 out of 8 government secondary schools randomly selected by lottery technique. The instruments used for data collection were Chemistry Achievement Test (CAT), Questionnaire on Chemistry Students Motivation Towards Learning of Electrolysis (QCSMLTE) and Chemistry Students Learning Style Inventory (CSLSI) respectively. Each of the CAT, QCSMLTE and CSLSI were validated by Chemistry and Science Education experts from Federal University of Technology, Minna respectively. Thus, the CAT gave a reliability Coefficient of 0.93 using Guttman Split half reliability test while QCSMLTE and CSLSI gave a reliability coefficient of 0.84 and 0.76 respectively using Cronbach alpha test. Mean and standard deviation was used to answer research questions raised and Analysis of Covariance (ANCOVA) to test the null hypotheses at 0.05 level of significance. Findings from this study revealed that there was a significant difference between convergent and divergent learning styles on senior secondary school students' achievement and motivation in the concept electrolysis in favor of divergent learners, respectively. Based on research findings for this study, it was recommended that students learning style should be identified and explored frequently by teachers during Chemistry instructions using STAD instructional strategy so as to aid better achievement and motivation in Chemistry among secondary school students.*

**Keywords:** *Convergent and Divergent Learning Styles, Chemistry Achievement, Motivation*

### Introduction

Chemistry is one of the core science subject taught in most secondary schools in Nigeria and a basic requirement for admission into science based programmes in higher institutions of learning. Thus, the ultimate aim of Chemistry in every society is to provide people with knowledge of scientific concepts needed for the fulfillment of socio – economic and cultural needs of the society which are but not limited to mining, medicals, automobiles, textile, cement, glass, Brewery, Petrol and Petrochemical industries, respectively (Bichi, 2015 & Balogun, 2016).

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