

## **ANALYSIS OF STUDENTS' ACHIEVEMENT IN ANALYTICAL CHEMISTRY AMONG THE UNIVERSITY STUDENTS IN NIGERIA.**

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### **Abstract**

The study is on investigating the student's performance in the four categories of courses in analytical Chemistry among the University students' in Nigeria. . Specifically, the study sought to find the order and the difficulty level of the four categories. The sample consisted of 200 students drawn from four Universities in the South West of Nigeria. Finding revealed that University students' knowledge in analytical chemistry was relatively equal, low (below average) and inadequate. The implication is that young chemistry graduates would not be able teach effectively and expose students to practical-laboratory exercise. This will invariably lead to incompetency and inadequate of the young graduate to face the challenges of modern day needs. It could be recommended that chemistry teachers should be encourage and enlighten to create awareness through instructional package to educate chemistry students on the usefulness of analytical skills possession in real life solution.

**KEY WORDS:** Analysis of Students' Achievement in Analytical Chemistry.

## 1.1 Introduction

Analytical chemistry is essentially a practical oriented subject which demand proper exhibition of science process, skills acquisition and decision making of existing phenomena in a developing country like Nigeria. It is agglomerate of other studies such as Micro-biology, Bio-chemistry, Computer science, Physics, Electronic, Plant science, Mathematics, and Statistics (Chemometrics). Worsfold, Townshend, and Poole (2005) state that analytical chemistry is a scientific discipline that develops and applies methods, instruments, and strategies to obtains information about the composition and nature of matter in space and time. According to Yuzhi(2003), the objectives of teaching analytical chemistry at the undergraduate level is to:

(i). provide basic understanding of the principles, instrumentation and applications of chemical analysis; (ii) enable students to design, carryout, and interpret measurements within the context of the fundamental technological problem with which they are presented; (iii). give students an overview such that they can choose and utilize suitable chemical procedures on the appropriate analytical technique for specific problem including defining the problem, determining any constraints, choosing the best method, identifying alternatives and comparing the advantages and disadvantages of each method. How successful these objectives are, however, is determined by students' performance on a given task. The performance of students in analytical chemistry at the Tertiary education has been poor and deplorable over the years (Akinleye, 1987; Sommer, 1993, Jimoh, 2007 and Njoku, 2007). The West African Examination Council WAEC (2011), identified weakness among the Nigerian chemistry students as inability to record observations and make logical inferences accurately and to differentiate between the theoretical knowledge from practical observations.

Studies have been carried out in an attempt to establish the causes and probably provide solutions to skills development in analytical chemistry but not much have been achieved (Goni, and Stephen, 2012; Wenzel, 2007). Unwaleke, and Offiah,(2013) reported that there is a significant positive relationship between students' analytical skill possession and their achievement in Chemistry. Seanac (2011) enumerated a number of challenges, which includes inadequate time and course content coverage and lack of qualified manpower with technical expertise in the teaching and learning of analytical chemistry at the undergraduate level. This could affect students' performance in chemistry at the secondary school level.

Research findings tend to suggest that Nigerian chemistry students encounter difficulties in the learning of analytical Chemistry at both the Secondary School and University levels (Onuekwusi, 2011 and Uwaleke, 2013). They reported that teaching method, poor motivation, ill-equipped laboratories, poor students' attitude and student laziness had been the major factors raised. These problems on analytical chemistry include quantitative, qualitative concepts and the use of semi-quantitative concepts such as the moles and ions in solution. Akpan (2008) argued that lack of practical work by Chemistry students has resulted in poor communication and observational skills and the absence of these skills gave rise to students' poor performance.

At the University degree level, the undergraduate learning experiences in chemistry education shows that students are expected to learn some essential areas in analytical Chemistry before graduation. These learning activities include quantitative, qualitative, thermo chemistry and kinetic

concept in Chemistry. Quantitative analysis describes activities that involve acid-base titration, redox titration, precipitation titration and complexometric volumetric analyses. The qualitative concept exposes students on how to identify substances like gases, anions and functional groups. In thermo chemistry, students would be taught on how to determine the heat of solution, heat of combustion, heat of formation and heat of neutralization, while kinetics chemical analysis focuses on the effect of concentration, temperature and catalyst on the rate of chemical reaction. These learning experiences in analytical chemistry need different skills for solving them effectively. Problems on these learning experiences require specific skills in solving each of the concepts respectively. These skills include manipulation of delicate equipment, apparatus and reagents, accurate observations and recording, identification of substances, plotting graph, making deductions, accurate inferences and conclusion, communication skills and decision making skills based on the data collected (Sternberg,2003). Sternberg and Scott (2011) reported that analytical skills is the ability to visualize, articulate , and solve both complex and complicated problem and make decisions that make sense based on available information.

### **1.2 Statement of the Problem**

It was noticed that most often repeated mentioned problems causing students under achievement in Chemistry were inadequate exposure of students to the laboratory experiences by instructors. It was also observed that laboratory space and facilities, equipment and reagents were not adequate for the existing increase number of students in most Nigeria Universities. Azume,(2008) and Orimogunje,(2011) reports shows that majority of the young graduated chemistry students of today could not read the WAEC instructions correctly and prepare required standard solutions accurately not to talk of conducting weekly practical lesson for students at SSCE level. This evidence shows that students' performance in analytical Chemistry at the degree level is not different from what is attainable at the SSCE level. The need therefore arise to analyze the level of students' performance in each categories of analytical chemistry and find out the most difficult concepts so as to provide the necessary solution.

**1.3 Research Question:** What is the performance of undergraduate Chemistry students in the four categories of courses in analytical Chemistry?

**1.4 Research Hypothesis:** There is no significant difference in the academic performance of undergraduate students in the four categories of courses in analytical Chemistry.

### **2.1 Methodology**

The expo-facto research method was adopted and used to collect the existing data from the various chemistry departments in the selected Universities. This enabled the researcher to collect the existing raw data from the chemistry department in the respective selected Universities. A sample of 400 final year Chemistry students was selected in all the four Universities in South-West of Nigeria. The selection of final year chemistry students was based on the fact that they might have carryout sufficient practical activities in the four areas of analytical Chemistry. Besides, they ought to have

got the existing scores in these courses of analytical Chemistry. The researcher consulted the HOD Chemistry, analytical lecturers, Chemistry students and laboratory technicians in the various Universities. The researcher requested for the course contents and existing scores for the four courses in analytical chemistry. The students' scores collected for the four categories of analytical chemistry were subjected to Mean, Percentage, Standard Deviation and ANOVA statistics.

### 3.1 Results and Discussion

Table1: Comparison of Student's Achievement in Analytical Chemistry

Categories	N	Mean	% Mean	SD
QTTT	200	46.49	27.44	23.25
QLTT	200	44.01	25.98	22.01
TMOC	200	40.99	24.19	20.50
KNTC	200	37.94	22.39	18.97

Table1 showed that the mean percentage of the students in the four categories of analytical chemistry were 27.44, 25.98, 24.19, and 22.39 respectively. This implies that the knowledge of students in the four area of analytical chemistry was relatively equal and low. That is, students' scores in each category of analytical chemistry is less than fifty percent. Based on the above table, It was also observed that undergraduate chemistry students find quantitative analysis easier than those in qualitative, thermo chemistry and kinetics chemistry analysis in that order.

Table2: AVOVA showing the students' performance in the four categories of analytical chemistry

Source of variation	Df	Sum of squares	Means square	F <sub>cal</sub>	F <sub>tab</sub>
Between	3	8244.070	2748.02	6.54	1.26
Within	597	250700.43	419.93		
Total variance	600	354707.18			

Significant P < 0.05

Table 2 Showed that the F value calculated (6.54) are greater than the F table value (1.26). The null hypothesis is not accepted. Though, the performance of students in the three aspect of analytical chemistry is below average. This indicated that students' had difficulties in analytical chemistry most especially in kinetic and Thermo chemical analysis.

### 3.2 Discussion of the Findings

The result of the finding of this study shows that there is significant difference in the academic performance of students in the four aspect of analytical chemistry. Table 1 revealed the increase performance of students from QTTT, QLTT, TMOC and KMTC respectively. This study is in agreement with that of Onuekwusi, (2011) and Uwaleke,(2013) who found that students exhibited difficulties in practical chemistry at both senior secondary school and University levels . The finding also shows that the poor performance of student in thermo chemistry and kinetics chemical analysis might have been due to the fact that teachers do not have the adequate knowledge and skills to implement this aspect of chemistry curriculum. This is in agreement with the findings of Offiah

and Akinsola (2009) who reported that students' poor achievement in Chemistry was due to poor teaching method and students' attitude towards Chemistry teaching.

### 3.3 Conclusion

Based on the finding of the results, it could therefore be concluded that University students' knowledge in analytical chemistry is relatively equal, low (below average) and inadequate. The highest difficulties were recorded in KNCT and TMOC while little difficulties were recorded on QLTT and QTTT respectively. This could be the major reason for poor achievement in Chemistry found among secondary school students in Nigeria and particularly in South West of Nigeria. The implication of this is that if the young graduate had possess some necessary skills in analytical chemistry that enable them to develop in the area of creativity in science. This might have reduces the issues of unemployment among the Nigeria graduates.

### Recommendations

It could therefore be recommended that chemistry teacher should be encourage and enlighten to create an awareness through instructional package to educate chemistry students on the usefulness of analytical skills possession in real life situation. Besides, the educational sectors of Federal Government of Nigeria should introduce and implement on how to equip the Nigeria University laboratories in order to meet the new technological development and advancement as in developed countries.

### References

- Akinleye, B.A. (1987). Why students failed the Practical Chemistry Examination at the Ordinary Level. *Journal of the Science Teachers' Association of Nigeria*. 25(2)22-31
- Akpan, E.V.U. (2008). Analysis of Classroom Interaction of Senior Secondary School Chemistry Teachers *Journal of Science Teachers' Association of Nigeria*. 43 (1&2), 16 -22
- Azumi, A.S. (2008). Interactive approach to effective teaching of practical Chemistry. *Journal of Science Teachers' Association of Nigeria*. 32(2), 16-20
- Jimoh, A.T. (2007). Comparison of Students' Achievement in the four categories of Questions in Analytical Chemistry at the Degree level. *Ilorin Journal of Education*. 27, 38 – 43
- Njoku, Z.C. (2007). Comparison of Students' achievement in the three categories of questions in SSCE.
- Offiah, F.C. & Akusoba, E.U. (2009). Effectiveness of metacognitive learning cycle to science instruction for secondary school students. *Journal of Technological and Mathematics* 1,(1), 23-30.
- Worsford. P; Townshend .A and poole. C (2005). Encyclopedia of analytical science 2<sup>nd</sup> Edition, Elsevier ltd. USA.

Sommer, L. (1993). Problems of Teaching Undergraduate Analytical Chemistry, *fresenius j. anal. chem.*, (347), 29-31.

Yuzhi. W, (2003). Using problem-based learning in Teaching Analytical Chemistry. *The china papers*, 28-33

Wenzel, T.J.(2007). Collaborative and Project –Based learning in Analytical Chemistry, *ACS symposium series*, 970 (5), 54-68.

SEANAC, Harmonization of Analytical Chemistry Curricula – A working document report prepared by the SEANAC Committee and the SACL Analytical Division Steering Committee, held 12-13<sup>th</sup> August, Workshop at Birchwood Hotel, Kempton Park, Johannesburg; 2011.

Goni,A.D; Stephen .S.H. (2012).Analysis of University students' knowledge and exposure to Analytical Chemistry: *International Journal of Emerging Sciences* 2 (3), 416-432.

Onuekwusi, C,N.(2011):Test development competence of chemistry teachers in owerri Educational Zone of Imo State. *Unizik Journal of STM Education*. Department Science Education, Nnamdi Azikiwe University Awka.Ifevic Publisher Limited Oba Anambra State Nigeria.

Orimogunje, T.(2011): Effects of Mathemagenic Activities on Students' Learning Outcomes in Senior Secondary School Chemistry. Unpublished Ph.D Thesis, University of Ado Ekiti, Ekiti State, Nigeria.

Sternberg,R.J (2003): Giftedness according to the theory of successful intelligence. In N. colangelo & G. Davis (Eds), *Handbook of Gifted Education* (88-99). Boston MA: Allyn and Bacon.

Sternberg, R.J.& Scott, B.K.(2011): *the Cambridge Handbook of Intelligence*. New York. NY. Cambridge University Press.

Uwaleke, C.C.(2013) Analytical skill as a correlate of Chemistry Achievement Among Senior Secondary School Students in Anambra State. Unpublished Master Degree Thesis presented to the Department of Science Education, Nnamdi Azikwe University, Awka.

Uwaleke, C.C. & Offiah, F.C.(2013):The relationship between Senior Secondary School Students Analytical Skill their Achievement in Chemistry in Anambra State. *International Journal of Engineering Science Invention*.2,(7),44-5s7.