COMPARATIVE ANALYSIS OF MATHEMATICS SCORES OF STUDENTSAT SECONDARY SCHOOL LEVEL AND TERTIARY INSTITUTIONS IN JOS, PLATEAU STATE.

Oluwatoyin C. Obadare-Akpata Ph.D
&
Matawal David Bulus
Department of Science & Technology Education
University of Jos, Nigeria.

Abstract

Mathematics is used in everyday life in social, economic, arts, science or technology. However, empirical evidence shows that students rarely achieve good and accepted grades in the subject almost at all levels of learning. Research findings indicate that this low achievement may be attributed to various factors such as inappropriate pedagogy, students' attitude towards learning, lack of motivation for teachers and learners, curriculum content in relation to materials and delivery strategies among other factors. The purpose of this study is to analyse and compare undergraduate students' achievement scores in Elementary Mathematics with their assumed strong O'level foundation. Ex Post Facto Designs and interview were used to source data for this study.Records of results from the 2012 to 2017 of the undergraduate students of University of Jos were used to answer the three research questions and four hypotheses which were raised in this study. The results of 1,500 undergraduate students were sampled from three randomly selected faculties for the study using multistage sampling technique and one hundred students other than those whose results were been selected were interviewed on where their WASSCE and NECO Examinations were written and why. It was discovered that most of the students left their original secondary schools for 'a miracle centre to write their O'levels which led to great grades but they couldn't sustain the tempo as the campus condition is totally different. The findings revealed that their failure in Elementary Mathematics in 100L was as a result of not being well grounded in Mathematics at the secondary school level as it also revealed that students who gained admission with C5 and C6 are really doing better than

those with A1 and A2.Recommendations were made based on the findings of the study.

Keywords: Comparative Analysis, Poor Achievement, Examination Malpractices.

Introduction

The pride of place that education occupies in the lives of people cannot be overemphasized. This is importantly so, because education affords one the opportunity to have a deeper understanding of the world around him and maximally create and utilize openings and opportunities life presents to his greater good. The word Education is believed to have been coined out of the Latin word "Educare" which means "to bring up" or "to use". This clearly indicates that education seeks to bring to light the good qualities in man. Education is seen as a solution to many existing problems, as well as promoting good habits, values and awareness (Kimani, Augustine & Njiagi, 2013). It is in realization of the importance of education in the development of society that United Nations Educational, Scientific and Cultural Organization (UNESCO) was established in 1945. UNESCO's greatest mission has been to contribute to the building of peace, poverty eradication, lasting development and intercultural dialogue. It is the belief of UNESCO that this mission could be achieved through education. This has resulted in it setting education, particularly primary education as not only a basic right of individual, but also compulsory for every child of school age. This, it believes will allow children to reach their fullest potential.

In an era of technological development, the role of Mathematics at all levels of education cannot be over-emphasized. Mathematics gives impetus to development of technologies. Mathematics is not only useful in science and technology alone. Its importance also permeates other aspects of human endeavour such as Business, Law, Arts, Social Sciences (Odili, 2006). Supporting this notion, Anaduaka and Okafor (2013) posited that every individual needs Mathematical knowledge to function intelligently and efficiently in his/her world. In the education sector, Mathematics is considered as an important subject of study at all educational institutions in all countries around the world (Lassa, 2012). In realization of the indispensable role Mathematics plays in the development of society, the world over as aptly captured by Lassa (2012), the National Policy on Education (2004) recommended

Mathematics as one of the core subjects at both the primary and post-primary levels in Nigeria.

In view of the importance of Mathematics and the recommendations of National Policy on Education (NPE), all students at secondary school level are required to register, write and pass Mathematics with at least a credit at the Senior School Certificate Examination (SSCE) at the point of completion in order to stand a chance of gaining admission into any institution of higher learning (FRN, 2014). However, available data over the years have pointed to an abysmal achievement of students in mathematics in both the WAEC and NECO examinations (Anaduaka & Okafor, 2013). According to Utibe and Agwagah (2015), for the period 2000-2004, out of a total number of 4408870 valid results released by NECO, only 1301781 representing 29.53% passed mathematics, while in the period 2005-2009 only 2327535 representing 47.92% passed out of 4857589 of the valid results released.

These performances are believed to vary from one geopolitical zone to the other. Another problem commonly associated with the conduct of SSCE examination is examination malpractice: According to Raji and Okunlola (2017), examination malpractice is one of the vices troubling education system in Nigeria today with no end in sight. As a matter of fact, some of the reasons for the establishment of NECO were the problem of efficient conduct of examinations, prompt release of results and alleged compromise in quality assurance in test administrations in Senior School Certificate Examination (SSCE) by WAEC. Examination malpractice is common in all the educational levels and every part of Nigeria (Eneh & Eneh, 2014). Most students leave their secondary schools as soon as they get promoted into the SS3 for a "Miracle Centre" where their success is guaranteed without effort on the parts of the students. Many go there after one or more attempts in their own schools. The menace ranges from bringing of unauthorized material to examination halls, writing examination by proxy to swapping of examination scripts inside or outside examination hall. Others are collusion between school owners, teachers, students and invigilators among others to compromise the examination process. In 2011, Nigeria was ranked number one in the world's examination malpractice index (Eneh & Eneh, 2014). No wonder it is not surprising to see undergraduate students struggle to pass undergraduate Mathematics, especially the so-called "Almighty" MTH 101 (Elementary Mathematics I). MTH 101 is titled "Elementary Mathematics I", whose content spreads across secondary

school mathematics content. It is compulsory for all first year University of Jos undergraduate students admitted into science-based courses, with the exception of Nursing science students. One would have expected excellent achievement among undergraduates, since it is mandatory that such category of students obtained at least a credit pass in Mathematics at O'level to have gained admission. This places great doubts on the credibility of their grades in Mathematics at O'Level and the examinations in general.

According to Asore (2014), some of the causes of examination malpractices among others are society's expectation/orientation, parents'/inordinate ambition, education institutions' demand, employers demand, general economic ailment/level of income and absence of moral and religious instructions. Others are lack of exemplary leadership, government's laxity, frequent disruption in the school system and teachers' inadequate coverage of syllabus. One critical consequence of examination malpractice is that students tend to present false "excellent" qualification without a commiserate knowledge, skills and experiences required for initial entry into one occupation in the world of work. In order to avoid the menace of examination malpractice, some parents, school administrators, among others engage their wards, pupils/students in extra-lessons, particularly in Mathematics with a view to passing it. One great consequence of the foregoing is what is known today as overschooling.

Oseni (2014) conducteda review study on effect of examination malpractice on Nigerian graduate productivity in the labour market crew. Based on the literature review, it was reported that a gap exists between the certificates obtained by graduates and their productivity at the labour market due to various examination malpractices they engage on while in school. It was recommended amongst others that examination malpractice should be discouraged and agressive campaign undertaken by all stakeholders in the education sector.Oyibe, Uma and Ibina (2015) conducted a study on the causes and effects of examination malpractice in Nigeria on national development. In the study, relevant journals and conference papers as well as writers' personal experiences during examination invigilation served as sources of data. According to the study, some of the causes of examination malpractice amongst which are collusion among candidates, impersonation, inscription, bribery, e.t.c are fear of failure, craze for certificate, pressure from parents on their children/wards to pursue courses they have no aptitude, moral decadence and high premium placed on achievement and certificates

and lack of political will on the part of government to enforce examination malpractice act of 1999.

Duvie and Eluwa (2016) conducted a study on the assessment of management strategies for curbing examination malpractices in secondary schools in Abia State, Nigeria. Stratified sampling technique was used to select a total of 560 teachers, including principals as respondents. The study revealed that pre, during and post examinations strategies such as covering of syllabus by teachers, having adequate number of invigilators in the hall and examiners ensuring that the total number of answer scripts tally with the total number of examinees respectively among others are effective strategies for curbing examination malpractices . It was recommended that stiffer penalties be awarded to culprits as deterrent and implementation of Examination Malpractice Act 33 of 1999 by government. Akinrefon, Bamigbala and Adeniyi (2016) conducted a study to assess the pattern of examination malpractice in higher institutions in Nigeria, their causes, effects and also proffer solutions. The data collected were analyzed using factor analysis and principal component analysis. The analyses across loadings revealed that the major cause of examination malpractices are students believe that those who cheating examinations do better than them, hence the urge to do likewise, lack of proper teaching by teachers, parental involvement and cheating anxiety. Also the findings of the study revealed that severe punishments and moral decadence are the major solutions and effects of examination malpractices. It was recommended that the fight against examination malpractices be stepped up in Nigeria's higher institutions of learning.

However, the undergraduate students' poor performance in Elementary Mathematics prompted the researcher to cross check the background of these students in order to identify some of the students are finding it difficult to do well in the Elementary Mathematics that is offered at the 100L. The O'level foundation results are therefore viewed vis-a-vistheir results to ascertain the suspicion of the rate of examination malpractices even as students are being seen as spending so many years in school without actually gaining enough knowledge that commensurate or prepare the learner for future demand of the society. Records of results from the 2012 to 2017 of the undergraduate students of University of Jos were used to answer the three research questions and the four hypotheses that were raised in this study.

Methods and Procedures

Ex-post Factor research design is basically used in this study. This is an 'after the fact' design in which qualities that pre-existed in a group or some groups of participants before the research are compared on a dependent variable without the research randomly assigning. Three faculties namely Education, Medical Sciences and Natural Sciences were randomly selected from the nine faculties that are science based and primary data were carefully and randomly selected using the faculties where Elementary Mathematics I is being offered as a core course. Though, Department of Nursing is in Faculty of Medical Sciences but the Elementary Mathematics I is not being offered in this department and makes their students to be automatically out of the sample size. Multi-stage sampling techniques were adopted in selecting 100 student from various departments of each faculty and this was done basically on selection of the results for a period of five years.

Therefore, a total number of 300 students were sampled for each year which makes the total number of sampled students to be 1,500. There grades in their SSCE and NECE certificates were recorded, the secondary schools that they attended and their grades in the course that is being considered in this study. Some students had their results from where they have spent the six years of their secondary school period while most of them had their results in different schools where they only attended to write WASSCE and NECO. One hundred students other than those whose results were been selected were interviewed on where their WASSCE and NECO Examinations were written

Research Question

1. What is the prerequisite grade required of students in Mathematics who seek admission into tertiary institutions to study?
2. What is the percentage number of students who wrote their WASSCE and NECO examinations in the secondary schools that they attended for six years?
3. What is the percentage number of students who wrote their WASSCE and NECO examinations in a different centre other than their secondary schools that they attended for six years?

Hypotheses

1. There is no significant difference between the school certificate grades and the grades of the Elementary Mathematics

2. There is no significant difference in the mean scores of the students from the three sampled faculties
3. There is no significant difference among the grades of the sampled students over the period of five years
4. There is no significant difference among the students' achievement grades of those who wrote the SSCE in the secondary schools that they attended and those who did at " miracle centres"

Research Results

Research Question 1

What is the prerequisite grade required of students in Mathematics who seek admission into tertiary institutions to study?

The prerequisite grade in Mathematics for admission is between C6 and A1 and from this table 59 students had C6 while 58, 50, 33, 19,11 had C5, C4, B3, B2, and A1 respectively. This also ascertains that all the registered students were qualified based on their submitted results for the admission process.

Research Question 2

What is the percentage number of students who wrote their WASSCE and NECO examinations in the secondary schools that they attended for six years?

29% and 3% of students that were interviewed wrote their WASSCE and NECO examinations in the secondary schools that they attended for six and three years respectively.

Research Question 3

What is the percentage number of students who wrote their WASSCE and NECO examinations in a different centre other than their secondary schools that they attended for six years?

68% of students wrote their WASSCE and NECO examinations in a different centre other than their secondary schools that they had attended. Among these, !6% had attempted more than twice in their secondary schools before they opted for these centres, 11% went there immediately after their Senior Secondary Two education while remaining 41% went there immediately after their first attempt.

Hypothesis 1

There is no significant difference between the school certificate grades and the grades of the Elementary Mathematics

Table 1: School Cert * EMG Crosstabulation

			EMG					Total
			Fail	D	C	B	A	
sch_cert	C6	Count	59	129	109	45	27	369
		% of Total	3.9%	8.6%	7.3%	3.0%	1.8%	24.6%
	C5	Count	58	185	121	53	25	442
		% of Total	3.9%	12.3%	8.1%	3.5%	1.7%	29.5%
	C4	Count	50	125	89	32	16	312
		of Total	3.3%	8.3%	5.9%	2.1%	1.1%	20.8%
	B3	Count	33	104	66	33	17	253
		% of Total	2.2%	6.9%	4.4%	2.2%	1.1%	16.9%
	B2	Count	19	31	9	11	5	75
		% of Total	1.3%	2.1%	0.6%	0.7%	0.3%	5.0%
	A1	Count	10	20	11	7	1	49
		% of Total	0.7%	1.3%	0.7%	0.5%	0.1%	3.3%
Total		Count	229	594	405	181	91	1500
		% of Total	15.3%	39.6%	27.0%	12.1%	6.1%	100.0 %

From the above table, is it evident that there is significant difference between the grades of the school certificates and that of the EMG. The higher number of students with grade A performed poorly than those with C5 and C6. The grades in the EM are contradictory to that of the school cert. If the students have actually worked hard to earn good grades, they should have been able to sustain the tempo and do well in EM which is just like a revision or diagnostic assessment for a future work.

Hypothesis 2
There is no significant difference in the mean scores of the students from the three sampled faculties

Table 2: Symmetric Measures

Faculty				Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
Education	Interval Interval	by	Pearson's R	-.076	.045	-1.690	.092[c]
	Ordinal Ordinal	by	Spearman Correlation	-.061	.046	-1.357	.176[c]
	N of Valid Cases			500			
Medicine	Interval Interval	by	Pearson's R	-.036	.046	-.796	.426[c]
	Ordinal Ordinal	by	Spearman Correlation	-.043	.046	-.961	.337[c]
	N of Valid Cases			500			
Natural Science	Interval Interval	by	Pearson's R	.008	.046	.183	.855[c]
	Ordinal Ordinal	by	Spearman Correlation	.002	.046	.044	.965[c]
	N of Valid Cases			500			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Chi-Square Tests

Faculty		Value	df	Asymptotic Significance (2-sided)
Education	Pearson Chi-Square	19.252[a]	20	.506
	Likelihood Ratio	20.509	20	.427
	Linear-by-Linear Association	2.846	1	.092
	N of Valid Cases	500		
Medicine	Pearson Chi-Square	22.969[b]	20	.290
	Likelihood Ratio	23.676	20	.257
	Linear-by-Linear Association	.634	1	.426
	N of Valid Cases	500		
Arts	Pearson Chi-Square	11.987[c]	20	.917
	Likelihood Ratio	12.460	20	.899
	Linear-by-Linear Association	.034	1	.855
	N of Valid Cases	500		

a. 9 cells (30.0%) have expected count less than 5. The minimur expected count is .80.
b. 8 cells (26.7%) have expected count less than 5. The minimur expected count is .97.
c. 8 cells (26.7%) have expected count less than 5. The minimur expected count is 1.03.

From the above two tables, it is observed that the students' achievement scores cut across the three faculties without significant difference. That is, their achievements in Elementary Mathematics 1 are not dependent on the faculty in which they are registered.

Hypothesis 3
There is no significant difference among the grades of the sampled students over the period of five years

Table 4: Symmetric Measures

Year				Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
2012/13	Interval Interval	by	Pearson's R	.047	.059	.805	.422[c]
	Ordinal Ordinal	by	Spearman Correlation	.042	.058	.734	.464[c]
	N of Valid Cases			300			
2013/14	Interval Interval	by	Pearson's R	.043	.060	.743	.458[c]
	Ordinal Ordinal	by	Spearman Correlation	.052	.060	.905	.366[c]
	N of Valid Cases			300			
2014/15	Interval Interval	by	Pearson's R	-.013	.064	-.223	.824[c]
	Ordinal Ordinal	by	Spearman Correlation	-.007	.061	-.127	.899[c]
	N of Valid Cases			300			
2015/16	Interval Interval	by	Pearson's R	-.051	.059	-.885	.377[c]
	Ordinal Ordinal	by	Spearman Correlation	-.054	.059	-.934	.351[c]
	N of Valid Cases			300			
2016/17	Interval Interval	by	Pearson's R	.075	.056	1.304	.193[c]
	Ordinal Ordinal	by	Spearman Correlation	.086	.056	1.486	.138[c]
	N of Valid Cases			300			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

From the above table, none of the sessions is significant. This implies that there has not been any significant change in achievement as a result of adequate schooling overschooling. Also, it implies that adequate schooling and overschooling has not really changed between 2012 and 2017.

Hypothesis 4
There is no significant difference in among the students' achievement grades of those who wrote the SSCE in the secondary schools what they attended and those who did at " miracle centres"

Table 5: Processing Summary

Location		Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
Cert. attended school	sch_cert * EMG	1051	100.0%	0	0.0%	1051	100.0%
Cert from special centre	sch_cert * EMG	449	100.0%	0	0.0%	449	100.0%

Symmetric Measures

Location	Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance		
Cert, from special centre	Interval by Interval	Pearson's R	-.061	.032	-1.975	048[c]
	Ordinal by Ordinal	Spearman Correlation	-.062	.032	-2.023	043[c]
	N of Valid Cases	1051				
Cert from attended	Interval by Interval	Pearson's R	.008	.047	.168	.867[c]

school	Ordinal by Ordinal	Spearman Correlation	.009	.048	.180	857[c]
	N of Valid Cases	449				

a. Not assuming the null hypothesis
b. Using the asymptotic standard error assuming the null hypothesis
c. Based on normal approximation.

It is clearly observed here that most students leave their secondary schools where they have studied from Junior to Senior classes for special centres in order to get good grades that will enable them get admission into ertiary institutions. However, their grades from these special centres do not positively influence their achievement in Elementary Mathematics I.

Conclusively, it is evident that there is significant difference between the grades of the school certificates and that of the EMG. Most of the students who had grade A performed poorly than those with C5 and C6. The grades in the EM are contradictory to that of the school certificate. If the students have actually worked hard to earn these good grades as a result of lessons, extramural classes and private home lessons, they should be able to do well in EM which is just like a revision or diagnostic assessment for a future work.

It is equally observed that the students' achievement scores in Elementary Mathematics 1 are not dependent on the faculty in which they are registered.

There has not been any significant change in achievement scores as a result of adequate learning over a period of the five years that were put into consideration. It is clearly observed too that most students leave their secondary schools where they have studied from Junior to Senior classes for special centres in order to get good grades that will enable them gain admission into tertiary institutions. However, their grades from these special centres do not positively influence their achievement in Elementary Mathematics I when the grades were compared and analyzed. The rate of examination malpractices which has affected the learning capacity of students has contributed to students' being in school but without actually gaining enough knowledge that commensurate or prepares the learners for future demand of the society.

References

Akinrefon, A. A. et. al. (2016). On examination malpractice in Nigerian universities: factor analysis definition. *Bulgarian Journal of science and policy, 10(1), 174-190.*

Anaduaka, U.S. & Okafor, C.F. (2013). Poor performance of Nigerian students in mathematics in senior secondary certificate examination (SSCE): What is not working? *Journal of Research in Research in National Development, 11(2), 1-5.*

Asore, E.P. (2014). Examination malpractice: Causes, consequences and probable solutions. Retrieved 1st October, 2018 fromhttps://patriciaglobalissues.wordpress.com/2014/07/17/31/

Duvie, A. N. and Eluwa, B. O. (2016). Assessment of the effectiveness of management strategies for curbing examination malpractices in secondary schools in Nigeria. *European Journal of Educational Studies 2(11), 47-60.*

Ekechukwu, L.E., Eke, D.O. & Onuu, C.C. (2018). Over-schooling and the curriculum in nigeria. *Middle-East Journal of Scentific Research 26(2), 265-277.*

Eneh, A.N. & Eneh, O.C. (2014). The menace of examination malpractice in Nigeria: causes and solutions. *Sustainable Human Development Review, 6(1-4), 53-73.*

Etiubon, R.U. (2012). Overschooling and students' study skills in junior secondary school basic science. *Journal of Education, 5, 83 – 91.*Federal Republic of Nigeria (2014). *National policy on education. Lagos*: NERDC Press.

Ibiam, J., & Aleke, D. I. (2012). Overschooling: a threat to early childhood education. *Journal of Education, 5, 45 – 52.*

Kimani, G.N, Augustine, M.K. & Njiagi, L.W. (2013). Teacher factors influencing students' Academic Achievement. *International Journal of Education and Research, 1(3), 2201-6740.*

Lassa, P.N. (2012). *The teaching of mathematics for Nigerian secondary school, Jos:* Fab Anieh Nigeria Ltd.

Nkang, I.E. & Uwah, C.S. (2013). Over-schooling and secondary school teachers' job performance in Nigeria. *Journal of Education and Practice 4(10), 60-65.*

Odili, G. A. (2006). *Mathematics in Nigeria secondary school: A teaching perspective.* Rex Charles & Patrick Limited.

Onyibe, C. O. et al. (2015). Examination Malpractice in Nigeria: Causes and effects on national development. *Journal of Educational Practice 6(26), 12-17.*

Oseni, A.I. (2014). Effects of examination malpractice on Nigeria graduate productivity in the labour market crew. *Journal of Educational Policy and Enterpreneural Research 1(2), 80-85.*

Raji, I.S. & Okunlola, J.O. (2017). Examination malpractice and quality assurance of senior secondary school certificate examination in Oyo state, Nigeria. *Afro Asian Journal of Social Sciences, 8(2), 1-27.*

Udoh, N.A. Joseph, E.U. & Amajuoyi, I.J. (2014). Graduate overschooling: measurement issues and the Nigerian state. *Advances in Economics and Bussines, 2(3), 127-132.*

Usoro, A.D. & Essien, E.E. (2012). Mechanism for contending overschooling among students of building/wood technology at technical colleges in Nigeria. *American-Eurasian Journal of Scientific Research, 7(1), 41-46.*

Utibe, U.J. & Agwagah, U.N. (2015). A decade of candidates' performance in neco-ssce mathematics in Nigeria. *Journal of Education and Practice, 6(25), 25-29.*