

## Assessment of Biology Content Knowledge on Academic Performance among Senior Secondary Schools in Kwara State, Nigeria

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### Abstract

*This study investigated the assessment of biology content knowledge on academic performance among senior secondary schools in Kwara State Nigeria. A descriptive survey research design was adopted, involving a total of 600 senior secondary school students drawn from 24 schools (12 public and 12 private) across the three senatorial districts of the state. Data were collected using structured checklists to assess both curriculum content coverage and students' performance in biology in WAEC from 2011 to 2016. Descriptive statistics such as mean, percentages, and standard deviations were used to answer the research questions, while a paired simple t-test was employed to test for significant difference. The findings revealed that private schools recorded a higher average curriculum content coverage (mean = 1.79) compared to public schools (mean = 1.57). The t-test result indicated a statistically significant difference in the extent of curriculum coverage between public and private school ( $p < 0.05$ ). The study concluded that extensive curriculum coverage significantly influences students' academic performance in biology. Based on these findings, the study recommends Future studies should explore curriculum content coverage and academic performance across other science subject and replicate this research in other state of the federation. School time table should be adjusted to allow sufficient periods or time for biology classes. This study contributes to body of knowledge by empirically establishing the direct relationship between curriculum content coverage and academic performance in the context of Nigerian secondary science education.*

**Keywords:** assessment, academic performance, content knowledge, secondary schools.

### Introduction

At the senior secondary level science is departmentalized into Biology, Chemistry and Physics. Biology which is the study of different forms, their evolution, structures, functions, growth, distribution and taxonomy occupies a unique position in the secondary school science curriculum. It serves as a pre-requisite to the study of other lucrative and challenging professions like; Medicine, Nursing, Pharmacy, Pharmacology, Biochemistry, Agriculture, Microbiology, Geology, Geography, Technological and other applied sciences. The vital role of the study of this discipline in the economic, industrial and public life of the learners and the general humanity cannot be overstressed (Ibe and Ukpai 2013; Akanbi and Kolawole, 2014). Biology curriculum was first introduced in 1977. At that time the duration for secondary school education was five years. The biology teaching was started in class four and in class five the students took the West African School Certificate Examination. In keeping with the dynamics of social change and demands on education, there was the need to broaden the curriculum. The quest for improving the method of teaching and learning of secondary school biology began in 1982 by the Nigerian Education Research Council (NERC, 2005). The Federal Government in collaboration with Esselte (Swedish non-governmental organization) initiated the National Secondary Science and Mathematics Project (NSSMP). They worked hand in hand with the federal government of Nigeria. The basic aim of that project was to inculcate learning through the use of a wide variety of instructional materials. The outcome of this was the emergence of the new biology curriculum in 1985 published by the Federal Ministry of Education. In this 1985 curriculum, many more topics in biology were introduced and the number of years to be spent in secondary school increased from five years to six years. The content of biology curriculum in 1985 was conceptual (i.e. arranged into concepts) and the concepts were: Concept of living; Basic ecological concepts;



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Plant and animal nutrition; Variations and variability; Evolution and Genetics. After a revision in 2007, the biology curriculum content became thematic and it is arranged into four themes which now include: organization of life; the organization at work; the organism and its environment; and continuity of life. The biology curriculum has a spiral arrangement of content. Based on this spiral arrangement, the concepts to be taught are arranged in such a way that topics are repeated yearly, throughout the three years of the course; to cover the 62 units in the biology curriculum. Any repeated concept is discussed in greater complexity and depth as the course matures over the three year period. The contents of the senior secondary school biology curriculum places emphasis on field studies, guided discovery, laboratory techniques and skills. According to the West African Senior Secondary School Certificate Examinations' syllabus (2019/2020), the justifications for inclusion of Biology in the senior secondary school curriculum are as follow: Understanding of the structures and functions of living organisms as well as appreciation of nature; Acquisition of necessary laboratory and fields' skills in order to carry out and evaluate experiments and project in Biology; Acquisition of necessary scientific skills like observing, grouping and interpreting biological data; Acquisition of relevant knowledge in biology needed for future and advanced studies in biological sciences; Acquisition of scientific attitudes for problem solving; Ability to apply biological principles in everyday life in matters that affect personal, social, environmental, community health, and economic problems; Awareness of the existence of interrelationships between biology and other scientific discipline. This implies that when an individual successfully acquired the objectives stated in WAEC syllabus, would facilitate such to be scientific literate with particular reference to Biology. Similarly, (FRN 2014), the objectives of secondary school biology curriculum derived from the National Policy on Education first introduced in 1977 and revised in 1981, 1998, 2004 and 2014 are to acquire: Adequate laboratory and field skills in biology; Meaningful and relevant knowledge in biology; Ability to apply scientific knowledge to every day's life in matters of personal and community health and agriculture; Reasonable and functional scientific attitude.

In spite of the importance and acceptance of Biology among Nigerian students, a huge gap has been observed in the performance at senior secondary school level in public and private secondary schools in examinations such as WAEC and NECO and even in JAMB. It has been observed that the students in private schools are performing better than the students in public schools. A lot of evidence has proven that this observation is factual and there is need to look into the situation. In a study jointly carried out by the Federal Government of Nigeria, UNICEF and UNESCO in 1977 to monitor the Learning achievement of primary school pupils throughout the Federation, it was shown that most of the private Schools had means in the three areas tested higher than the national means and that of their public counterpart. Similarly, Yoloye (1998) while assessing the situation of education in Osun State, compared the quality of education In five states of the federation namely, Lagos, Ogun, Ondo, Osun and Oyo. He compared performance between Urban and rural schools; private and public schools, as well as between male and female primary school pupils. He concluded that while Osun State comes last in almost all the sub-sector analyzed, the only cheering exception is in the private schools where it performed better than other states and indeed exceeded the grand mean. In a study carried out in the U.S. by Lubienski and Lubienski (2006), they compared academic achievement among Charter, private and public schools. One of the major findings from this study showed that private schools scored higher than charter and public schools. In a related study carried out also in the U.S. by Braun, Jenkins and Grigg (2006), they compared the performance of pupils in private and public schools in both reading and mathematics Involving grades 4 and 8, results showed that the private schools performed better than the public schools not only in Reading and mathematics, but also in the two grades (4<sup>th</sup> & 8<sup>th</sup>) involved in the study. Overall, findings indicated that the average private school mean score was higher than the average public school mean score, and that the difference was statistically significant.

The use of examinations to carry out assessment according to Alonge (2013) has been on the increase worldwide with the establishment of examination bodies like WAEC and NECO.

Table showing students' biology performance in WAEC

Year	Total sat	Credit pass A1-C6	% pass
2011/12	1505199	579432	38.50
2012/13	1646150	587044	35.66
2013/14	1648363	852717	51.73
2014/15	1365384	766971	56.17
2015/16	1390234	798246	57.42

Source: statistics section of the WAEC office Yaba, Lagos (2017) uploaded by Olalekan T.B.

The situation was worse in 2009/2010 where only 33.94% of the total population recorded A1- C6 in Biology (WAEC: Kwara State, 2018). From the data presented above, the percentage of candidates that pass biology at credit level and above

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was below 50%. However, the situation differs in private schools where data shows that the percentage of candidates that pass biology at credit level and above was above 50%. Therefore, it is worrisome to note that the biology curriculum being implemented since 1985 still produce students who achieve poorly in biology. According to UNESCO (2012), the underachievement in Biology can be attributed to student related factors, teacher related factors and Physical factors of the learning environment as well as the difficulty of the biology content. Of these groups of factors, the teacher plays a pivotal role in creating conducive learning environments that can enhance student cognitive and affective outcomes. Ekundayo and Alonge (2016), opined that the precarious situation of lack of human and material resources is more evident in public schools than in the private schools and this shows why the private schools tend to perform better than the public schools in public examinations. Owoeye & Yara, (2011) opined that a close look at the schools and what goes on there shows that nothing good can come out of most public schools as they do not have facilities and adequate and appropriate human resources to prepare candidates for West African Examination Council (WAEC) examinations.

Researchers have explored the effects of teachers' qualification (Etukudo, Elijah and Nnaobi, 2003; Landu, 2003), effects of instructional materials and laboratory (Dareng and Agenda 2002), attitude of teachers and students towards the teaching and learning of sciences (Eze, 2003), the effects of peer group (Briggs, 1995) on students' academic performance. Though, these researches are quite revealing, the problem still persists. Hence, there is need for more researches and increased implementation of recommendations. Inadequate content coverage in science subjects is most likely to significantly hinders academic performance of students in Nigeria. Studies consistently show that incomplete curriculum delivery, particularly in challenging areas, leads to poor achievement in standardized exams. This issue is prevalent across different science disciplines, including Biology, Chemistry, and Physics. Umeh (2011) emphasized that incomplete curriculum coverage often due to lack of instructional time, inadequate teacher preparation, and poor infrastructure significantly contributes to underperformance in standardized examinations in science subjects such as Biology, Chemistry, and Physics. Ezeudu & Ezeudu, (2013). Incomplete coverage of the science curriculum, particularly in abstract topics like physics and biology, leads to poor student outcomes in national exams like WAEC and NECO. Ikechuku (2012), in his research on the "Content coverage and students' achievements in secondary school physics in Delta State" revealed that an increase in content taught leads to improved students' achievement in both Ministry-made test and a general improvement in Teacher-made test over that of Ministry-made Physics tests. He further established that if teaching is not content bound, the science teacher would be happy to pick few areas or concepts well known to him and leave other areas of the concept he may consider difficult and tedious. The negligence by teachers to teach the whole of the stipulated content has led to poor achievement in standardized examinations. The theoretical framework adopted in this study is the Input – Process – Output (IPO) Model as it relates to education. The model is a theoretical framework used to explain how educational outcomes are achieved through a structured system of interacting components. It is widely applied in evaluating teaching and learning effectiveness. In the context of this study, curriculum content coverage (input) and teaching practices (process) directly influence student academic performance (output). The IPO model highlights the importance of optimizing both resources and instructional methods to achieve desired educational goals. The study therefore, sought to find out the extent of biology curriculum content coverage and its impact on student academic performance in public and private secondary schools in Kwara State, Nigeria.

While private schools often demonstrate better academic outcomes, the extent to which curriculum content is effectively covered and how this impacts student performance remains unclear. This study, therefore, seeks to investigate the differences in Biology curriculum content coverage between public and private secondary schools in Kwara State and how these differences influence students' academic performance.

### **Aims and Objectives of the Study**

1. Determine the extent to which the biology curriculum content is covered in public and private senior secondary schools in Kwara State
2. Compare the level of biology curriculum content coverage between public and private secondary schools in the study area
3. Examine the relationship between the extent of biology content coverage and students' academic performance in public and private senior secondary schools

### **Research Questions**

1. To what extent is the biology curriculum content covered in public and private secondary schools in Kwara State?
2. How does the extent of biology content coverage influence students' academic performance in public and private secondary schools?

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### Research Hypothesis

1. There is no significant difference in the extent of biology curriculum content coverage between public and private secondary schools in Kwara State?

### Methodology

The design of this study is descriptive survey design. Descriptive survey aims to accurately and systematically describe a population, situation or phenomenon. Random sampling technique was adopted for this study. The sample of this study consisted of eight secondary schools each in the three senatorial districts of Kwara State. The eight schools selected from each senatorial district in a particular local government comprise four public school and four private schools making a total of twenty-four (24) schools. Data were obtained from senior secondary school students offering biology. In each school 25 students were randomly selected and used as a sample representative making a total of 600 students in all. Data used for the study were collected with the aid of check list for student performance in WAEC and a check list to determine the extent to which the curriculum content has been thought. Descriptive statistics such as frequency counts, percentage, mean and standard deviation were used to answer the research questions

### Presentation of Results

#### Research Question 1

**To what extent is the biology curriculum content taught in public and private senior secondary schools in Kwara State**

	Mean score for public school	Mean score for private school
Recognizing living things	2.00	2.00
Classification of living things	1.83	2.00
The cell and its environment	1.83	2.00
Properties and functions of cell	1.75	2.00
Tissue and supporting system	1.67	1.83
Nutrition in animals	1.83	1.92
Basic ecological concept	1.83	2.00
Relevance of biology to agric	1.67	2.00
Reproduction in unicellular	1.75	1.67
Digestive systems	1.50	1.83
Transport system	1.25	1.58
Respiratory systems	1.17	1.58
Excretory system	1.08	1.58
Nutrient cycling in nature	1.17	1.50
Ecological management	1.50	1.50
Conservation of natural resour.	1.42	1.50
Reproduction in vertebrate	1.33	1.58
Reproduction in plants	1.50	2.00
Pollination in plants	1.83	1.92
<b>Average mean</b>	<b>1.57</b>	<b>1.79</b>

The table above showed the mean and standard deviation of the extent the content of biology curriculum is taught in public and private senior secondary schools in Kwara State. From the table, the weighted mean of private schools (1.74) is higher



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than that of public schools (1.65). Hence, the biology curriculum content is fully taught to a greater extent than it is taught in the public schools.

### Research Questions 2

**How does the extent of biology content coverage influence students' academic performance in public and private secondary schools?**

Table Showing Performance of Students in WAEC in Public and Private Schools in Kwara State

Years of exam	Total numbers of result analyzed		Freq/% Credit pass at A1		Freq/% Credit pass at B3-B2		Freq/% Credit pass at C4-C6		Freq/% of failure at D7-F9	
	Pub	Priv	Pub	Priv	Pub	Priv	Pub	Priv	Pub	Priv
2011/2012	500	500	21 (4.2)	146 (29.2)	97 (19.4)	259 (51.8)	282 (56.4)	55 (11.0)	100 (20)	40 (8.0)
2012/2013	400	400	19 (4.8)	140 (35.0)	82 (20.5)	184 (46.0)	218 (54.5)	46 (11.5)	81 (20.3)	30 (7.5)
2013/2014	600	600	21 (3.5)	167 (27.8)	105 (17.5)	322 (53.7)	353 (58.8)	65 (10.8)	121 (20.2)	46 (7.7)
2014/2015	600	600	16 (2.7)	152 (25.3)	90 (15.0)	340 (56.7)	363 (60.5)	55 (9.2)	131 (21.8)	53 (8.8)
2015/2016	600	600	23 (3.8)	138 (23.0)	95 (15.8)	352 (58.7)	367 (61.2)	54 (9.0)	115 (19.2)	56 (9.3)

Source: result obtain from field work in the area of the study

The table above shows the performance of students in WAEC for both public and private schools in Kwara State. The results indicate that students in the private schools perform better than students in public schools. The overall result revealed that for every five hundred, four hundred and six hundred results analyzed for both the public and private schools, those with credit pass at A1 in private schools are more than those in public schools and likewise credit pass at B3-B2. Those with credit pass at C6-C4 are more in public schools than in private schools. Lastly, the table also shows that, the rate of failure is higher in public schools than in private schools.

### Research hypothesis

There is no significant difference in the extent of biology curriculum content coverage between public and private secondary schools in Kwara State?

Paired Simple T-test table

Group	N	Mean	SD	Df	t-crit	t-cal	Decision
Public	19	1.5742	.27534	18	-5.651	0.000023	hypothesis
Private	19	1.7889	.20933				rejected

Source: result of analysis obtained from SPSS.

From the table above, the t-cal, when tested at a 0.05 level of significance showed that there is a significant difference in the extent of biology curriculum content coverage between public and private secondary schools in Kwara State. Hence, the hypothesis was rejected.

### Discussion of Findings

This study revealed that private schools' biology teachers cover more of the biology curriculum content than their counterpart in the public senior secondary schools in each academic term. This therefore, showed that the curriculum content covered has a significant impact on students' performance in biology. Proprietors of schools always try to avoid bottle neck cases when inspectors from the ministry of education come visiting. Meetings are held on weekly bases where emphasis is always laid on submission of notes on weekly bases. In most cases teachers are sanctioned when they fail to comply. As a



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result teachers work hard to make sure that their notes and their students' notes are up to date. This in turn leads to increased content taught. Such disciplines are rear in public schools. As a result, teachers don't always cover the curriculum content as expected which is leading to the poor performance of students in the public schools. This finding is highly supported by recent research. Umeh (2011) emphasized that incomplete curriculum coverage often due to lack of instructional time, inadequate teacher preparation, and poor infrastructure significantly contributes to underperformance in standardized examinations in science subjects such as Biology, Chemistry, and Physics. Ezeudu & Ezeudu, (2013), incomplete coverage of the science curriculum, particularly in abstract topics like physics and biology, leads to poor student outcomes in national exams like WAEC and NECO. This finding is also highly supported by Ikechuku (2012), in his research on the "Content coverage and students' achievements in secondary school physics in Delta State" revealed that an increase in content taught leads to improved students' achievement in both Ministry-made test and a general improvement in Teacher-made test over that of Ministry-made Physics tests. He further established that if teaching is not content bound, the science teacher would be happy to pick few areas or concepts well known to him and leave other areas of the concept he may consider difficult and tedious. The negligence by teachers to teach the whole of the stipulated content has led to poor achievement in standardized examinations. This study therefore, with its analysis and evidence from recent research is able to establish that private schools students perform better in biology than public school students because private schools cover more of the biology curriculum content than the public schools. This assertion is highly supported by table two above which reflect on the level of student's performance in WAEC examination. The table is a testament of an underperformance in public schools compare to high level of performance in private schools. According to Nwokocha & Amadike (2005), academic performance of students is the yardstick for testing educational quality of a nation. Hence, it is expedient to maintain a high performance in internal and mostly external examinations. The result from this research revealed that student in private schools performs excellently well than their counterpart in public schools. Also the claim that students in private schools perform better than those in public school is lastly supported by the result from table 3. The result from the table showed that there is a significant different in mean extent to which curriculum content is covered in public and private schools.

## **Conclusion**

This research fills a research gap by detailing how the depth of biology curriculum coverage specifically influences performance, contributing novel insights into science education at the secondary school level. It draws attention to the urgent need for strict enforcement of curriculum coverage in public schools. It provides quantitative proof that private schools are more effective in completing the biology curriculum within the academic calendar. These insights add to existing literature by offering localized evidence from Kwara State.

In conclusion, this study establishes that curriculum coverage is fundamental determinant of academic success. The findings from this study serve as a call to action for education authorities to strengthen policies and practices that ensure full and effective coverage of the biology curriculum, thereby raising the quality of science education and preparing students more effectively for STEM discipline.

## **Recommendations**

1. The use of the combination of curriculum coverage checklist and WAEC result analysis provides a practical and replicable model for assessing the effectiveness of curriculum implementation Future studies should explore curriculum content coverage and academic performance across other science subject and replicate this research in other state of the federation to draw broader conclusions and inform national policy
2. School time table should be adjusted to allow sufficient periods or time for biology classes. Private schools do lessons after normal school closing hours which offer their teachers time to further cover areas not covered during normal school period.

## **Acknowledgment**

This study is an extract from my (Orioghwo Oghenetega Josiah) master degree thesis. It was a millstone, that couldn't have been possible without the help of the almighty God. I want to quickly appreciate my supervisor at the University of Ibadan, the person of Professor Alice Morenike Olagunju for her unreserved supervision of this work, members of panel at the departmental and even at the external defense who helped to shape and add better insight to this research work that has gone out for publication today. Also, I want to thank my co-author the person Rita Akpobome Oguoko. We are course mate at the University of Benin for our PhD program. It was when we met; the idea of this publication was conceived. Her insight and contribution to ensure this publication is undeniable. Quickly, I want to also say big thank you to members of the body in charge of this publication at the Zamfara International Journal of Education (ZIJE) for their review of this paper and their added insight to ensure that, this paper meet standardize paper for publication.

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