

Influence of High-Stakes Tests on Students' Attitude Towards Learning Science in Senior Secondary Schools in Nigeria

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Authorship Contribution Statement

Muhammad: concept and design, drafting manuscript, statistical analysis, technical/material support, data acquisition, data analysis/interpretation.

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Abstract

The problem of students' attitude towards learning in the science arm of secondary schools in Nigeria has been a subject of concern and discuss. This study investigated high-stakes tests as determinants of students' attitude towards learning science in senior secondary schools in Nigeria. Two research questions were raised and answered, and three hypotheses were formulated and tested to guide the study at .05 level of significance. A sample of 6349 students and teachers was utilized for the study. The research instrument used for data collection was the questionnaire titled: High-stakes and Students' Attitude Questionnaire (HSSAQ). The instrument was subjected to face and content validity; Cronbach Alpha reliability analysis which yielded 0.84 coefficient. The data collected were analyzed using descriptive statistics, multiple regression and independent t-test statistics. The results using multiple regression revealed that significant influence exists for the independent variable (high-stakes tests, $r=0.335$, $p<0.05$). The mean difference in the opinions of the respondents regarding high-stakes tests were higher for teachers ($\bar{X}=53.63$, $SD=6.77$) than students ($\bar{X}=52.8904$, $SD=7.55$), $t_{(6347)}=-2.704$, $p>0.05$, $F=1.322$, $p=.250$), however there was no significant difference. In conclusion, high-stakes test factors have significant influence on students' attitude towards learning science in Nigeria. Therefore, it is recommended among others, that teachers and educators need to pay more attention to the effects of high-stakes testing in their schools

Keywords: High-Stakes Tests, Washback Effect, Test Pressure, Test Anxiety, Students' Attitude towards Learning Science

INTRODUCTION

Attitude towards learning science is an essential concept that can also be described as the students' interpretation of knowledge, assessment, laboratory activities and the roles of instructors and students in learning science (Gavin *et al.*, 2019). A learner's attitude relates to all the facets of education. For example, the attitude of a learner towards science will determine the measure of the learner's attractiveness or repulsiveness to science (Sofeme and Hena, 2015). Some research studies have indicated positive correlations between achievement in science courses and positive attitudes toward science (Sofeme and Hena, 2015). Some research journals have also reported attitude and certain characteristics of the classroom environments that include teacher support, use of a variety of teaching strategies, innovative learning activities, and student-centered instructional designs (Gavin *et al.*, 2019). Students who have positive attitudes show increased attention to classroom instruction and participate more in science activities (Jarvis and Pell, 2020).

The investigation of students' attitudes towards studying science has been a substantive feature of the work of the science education research community for more than 40 years (Gavin *et al.*, 2019). Development of positive attitudes towards learning science, which has always been a constituent of science education, is increasingly a subject of concern⁷. Some reasons why students develop more negative attitudes towards science as they move through secondary school include students' interests in a number of non-school activities, more emphasis on test results and not much opportunity for students to enjoy science (Cheung, 2018). It follows therefore, that in order to have better students' understanding and application of science concepts, there is need to determine students' attitude to science subjects, and factors that can influence such attitudes.

The simplest definition for high-stakes testing is, "A test administered and scored in a consistent or standard manner, and that is administered under standardized or controlled conditions that specify where, when, how and for how long students respond to the questions" (Ekoh, 2012). In high-stakes tests, the questions, conditions for administering, scoring procedures, and interpretations are consistent. Globally, high-stakes examinations are very important to all stakeholders in the educational system including the teachers, students, parents, public examining bodies, and policy makers. High-stake examinations, besides being used to gauge the quality of teaching and learning in schools, they also determine the future career of students; teachers are usually assessed based on the number of students who perform well in the exams, and students are placed in different levels and streams, depending on their performance in the exams to (Ekoh, 2012). High stakes tests have also been described as harmonized examinations, the results of which have significant consequences for schools and other stakeholders (parents/guardians, districts, and so on.) (Ekoh, 2012).

A lot of importance is attached to the level of success of candidates in the SSCE. For example, some proprietors of private secondary schools attach promotion and increase in salary of teachers to number of students who do well in the SSCE. Even such schools flaunt their success for all to see. This is because

parents will likely send their children to schools that are known to have high success rate in Senior School Certificate Examination (SSSCE). Also, State Governments that control and manage public secondary schools assess the quality of the school system and teachers by the number of students who have five credits and above in these examinations (Adegoke, 2017). In addition, the Electoral Act and the 1999 Constitution (As Amended in 2004) of the Federal Republic of Nigeria (Section 65 subsection 2a) requires that all candidates for elective position into legislative and executive arm of government shall be educated up to school certificate level (FRN, 2021). That a candidate shall be educated up to school certificate level has been interpreted to mean that he or she must have a minimum of five passes/credits in five Ordinary level papers including English language and Mathematics. This further underscores the importance of SSCE being conducted by the examining bodies.

Studies have discussed the effects of washback (shaping both what is taught and how it is taught) on various aspects of the classroom, which have generally been categorized as follows: curriculum, materials, teaching methods and feelings/attitudes to learning (Abbas and Sarwar, 2018). Generally, the tests are reported to generate ‘an atmosphere of high pressure, anxiety and fear of test results among teachers and students (Fulton, 2016). Teachers feel that the success or failure of their students reflects on them and they speak of pressure to cover the materials for the exam’ (Ozturk and Okan, 2019). The pressure on teachers also encourages them to focus more on specific test subjects (and areas) rather than on curriculum standards, and sometimes guides teachers to participate in inappropriate test preparation. Consequently, the pressure and anxiety from tests also make most students lose interest in other aspects of learning which they do not deem necessary for acing said high-stakes tests (Abbas and Sarwar, 2018).

So far, there is a dearth of research in the area of high-stakes tests and their effects. There have been some similar studies in Arts and Languages in the Western Europe such as United Kingdom (Savile and Hawkey, 2004) and Greece (Tzagari, 2009), and in Asia such as China (Sulatana, 2018). There is, however, scarcity of empirical studies in the area of science subjects and more importantly there is dearth of literature on the aforementioned concepts in the sub-Saharan Africa, especially in Nigeria. It is against this background that this study would examine the influence of high-stakes tests on students’ attitude towards learning science subjects in Nigeria.

Aim and Objectives of the Study

The aim of this study was to assess the influence of high-stakes tests on students’ attitude towards learning science subjects in Nigeria.

The specific objectives of the study include, to:

- i. ascertain the level of high-stakes tests factors (washback effect, test pressure, test anxiety) among science teachers and students in senior secondary schools in Nigeria.
- ii. ascertain the level of students’ attitude towards learning science in senior secondary schools in Nigeria.
- iii. determine the composite influence of high-stakes tests factors (washback effect, test pressure, test anxiety) on students’ attitude to learning science in senior secondary schools in Nigeria.

- iv. determine the relative influence of high-stakes tests factors (washback effect, test pressure, test anxiety) on students' attitude to learning science in senior secondary schools in Nigeria.
- v. examine the significant mean difference between the opinions of teachers and students with regards to high stakes tests factors in senior secondary schools in Nigeria.

Research Questions

The study attempted to find answers to the following questions:

- i. What is the level of high-stakes tests factors (washback effect, test pressure, test anxiety) among science teachers and students in senior secondary schools in Nigeria?
- ii. What is the level of students' attitude towards learning science in senior secondary schools in Nigeria?

Research Hypotheses

This study was guided by the following hypotheses.

H₀1: There will be no significant composite influence of high-stakes tests factors (washback effect, test pressure, test anxiety) on students' attitude to learning science in senior secondary schools in Nigeria.

H₀2: There will be no significant relative influence of high-stakes tests factors (washback effect, test pressure, test anxiety) on students' attitude to learning science in senior secondary schools in Nigeria.

H₀3: There will be no significant mean difference between the opinions of teachers and students with regards to high stakes tests factors in senior secondary schools in Nigeria.

Methodology

This chapter presented the methodology and procedures employed in the study. It contains information about the population of the study, sample and sampling techniques, research instrument, validity of the instrument, reliability of the instrument, administration of the instrument and method of data analysis.

Research Design

The descriptive-survey research design was adopted for this study. This research design is considered appropriate because the study, "Influence of High-Stakes Tests on Students' Attitude Towards Learning Science in Senior Secondary Schools in Nigeria", involved collection of data to factually describe existing phenomena, without any manipulation or randomization (Kerlinger and Lee, 2000). Furthermore, the research design allowed the researcher to obtain a proper picture of the present situation of the particular phenomena under study.

Population of the Study

The targeted population comprised of all Senior Secondary school science teachers and students in Senior Secondary School who registered for the 2021 West African Examinations Council (WAEC) examination.

Sample and Sampling Techniques

A total of 6,720 respondents formed the sample for this study. The study sites were mapped based on the six geo-political zones in Nigeria. Multi-stage sampling technique was used to select participants for this study. In the first stage, simple random sampling technique was used to select one state from each geopolitical zone in Nigeria, giving a total of six (6) states. Abuja, the Federal Capital Territory, was also included as a separate category because of its peculiarities. In the second stage, four (4) local government areas (LGA) were selected from each state to reflect the urban and rural areas, using simple random sampling technique, making a total of 28 LGAs. At the third stage, purposive sampling was used to select ten (10) secondary schools from each LGA, which have participated in high-stakes tests for at least five (5) years, making a total of 280 schools. In the next stage, purposive sampling was also used to select three (3) senior secondary school science teachers who teach science in selected schools, making a total of 1120 teachers. Stratified random sampling technique was used to select 20 science students in senior secondary schools, who have been registered for high-stakes tests (WAEC, NECO, UTME), making a total 5,600 students. In all, a total of 6,720 respondents, consisting of five thousand six hundred science students (5600) and one thousand one hundred and twenty (1,120) science teachers, were used as participants in this study.

Research Instrument

The instrument for this study was a self-developed questionnaire – High-stakes and Students' Attitude Questionnaire (HSSAQ), – which was designed and adapted in line with the research questions and hypotheses that were raised for the study. The instrument was used for all categories of respondents (students and teachers). The questionnaire was divided into five sections; A, B, C, D and E. Section A of the instrument focused on the demographic data of the respondent (that is their gender, age, educational qualification, and so on). Section B elicited information on high-stakes tests with respect to SSS3 students and science teachers while Sections C comprise of items on students' attitude towards learning science. For all sections, the sub-scale was a modified Likert-type scale with four response options rates as follows: Strongly Agree (4), Agree (3), Disagree (2) and Strongly Agree (1). Also, students' and teachers' questionnaire were structured from the aforementioned questionnaire.

Method of Data Analysis

Data collected from the field were clean, coded and inputted into a computer system, for statistical analysis using Statistical Package for Social Sciences (SPSS) software, version 21 for mac iOS. The research questions 1 to 4 were analysed using descriptive statistics of mean (\bar{x}) **score** and standard deviation (SD). Mean was used to describe the data. A criterion mean (\bar{x}) of 2.50 was set for the study. In this case, a mean score of 2.50 and above was adjudged moderate, high and very high as the case may be while a mean score below 2.50 was adjudged low (performance) extent. Standard deviation was used to determine how responses of the respondents varied. Hypotheses 1 to 4 were tested using multiple regression while Hypotheses 5 and 6 were tested using independent sample t-test statistics. An alpha level of 0.05 significance was set for the inferential statistics.

Findings/Results

The purpose of this study was to investigate the influence of high-stakes tests on students’ attitude towards learning science in senior secondary schools, Nigeria. This section presents the results of the analysis of the data collected from all respondents (science students and science teachers) involved in the study. The results are presented on the basis of the research questions and hypotheses formulated for the study. The findings were outlined and discussed accordingly.

The research instrument was dispatched to 6700 respondents with 6349 (94.8%) of the dispatched questionnaire retrieved.

Demographic Profile of the Participants

Status of the Respondents

The study sought information on the status of the respondents. Table 1 presents a summary of the status distribution for all the categories.

Table 1: Demographic Characteristics of Respondents Status

Status	Frequency	%
Students	5501	86.6
Teachers	848	13.4
Total	6349	100.0

Source: Fieldwork, 2021

Out of the 6349 respondents, 5501 respondents representing 86.6% of the sample represented the science students while 848 respondents, which constituted 13.4%, represented the science teachers.

Gender of the Respondents

The study sought information on the gender of the respondents. Table 2 presents a summary of the gender distribution for all the categories of respondents.

Table 2: Demographic Characteristics of Gender * Respondents Status Cross Tabulation

Gender	Students	%	Teachers	%	Total (%)
Male	2710	83.1	553	16.9	3263 (100.0)
					51.4%
Female	2791	90.4	295	9.6	3086 (100.0)
					48.6%
Total	5501	173.5	848	26.5	6349 (100.0)

Source: Fieldwork, 2021

Out of the 6349 respondents, 3263 respondents, representing 51.4% of the sample represented male while 3086 respondents, constituting 48.6%, represented female participants. This slight difference may be as a result of gender stereotypes, which have been reported to be part of the major factors contributing to the gender-gap in the field of science¹. There were however slightly more female science students (2791) than male students (2710), suggesting that there could be an improvement in the number of females opting for science courses from high school level.

Age of Respondents

The study also sought information on the age of the respondents. Table 3 presents a summary of the age distribution for all the categories.

*Table 3 Demographic Characteristics of * Respondents' Age Respondents Cross Tabulation*

Age Group	Students	%	Teachers	%	Total (%)
20 and below	5501	98.8	10	1.2	5511 (100.0) 100%
21 – 30 years	0	0	132	100	132 (100.0) 100%
31 – 40 years	0	0	269	100	269 (100.0) 100%
41 – 50 years	0	0	276	100	276 (100.0) 100%
51 – 60 years	0	0	135	100	135 (100.0) 100%
60 and above	0	0	26	100	26 (100.0) 100%
Total	5501	98.8	848	501.2	6349 (100.0)

Source: Fieldwork, 2021

For the teachers, majority (31.7%) were aged between 31 and 40 years, and those aged between 41 and 50 years (32.5%). The least age range (3.1%) was between 60 and above, with respondents under this age range originating from private schools. This clearly indicated that many teachers were young and energetic with regards to handling infrastructural matters. Although the older teachers are more experienced and more familiar with instructional issues, they might be tired and might lack 21st century skills such as information and communication technology (ICT), which is a very vital component of instruction today. The student-respondents were all within the range of 20 years and below.

Professional Qualifications of Respondents

The study was also interested in finding out the professional qualifications of the respondents (teachers). The data obtained are presented in Table 4 below.

Table 4 Demographic Characteristics of Teachers' Professional Qualifications

Qualification	Frequency	%
HND/PGDE	166	19.6
First Degree	337	39.7
Masters	319	37.6
PhD	26	3.1
Total	848	100.0

Source: Fieldwork, 2021

Table 4 shows that a total of 166 (representing 19.6%) staff-respondents hold HND/PGDE, while 337 respondents (representing 39.7%) have a first-degree qualification. A total number of 319 respondents

(representing 37.6%) have a Master's degree, while only 26 respondents (representing 3.1%) have a PhD. This was a positive gesture that human resources with adequate professional qualifications were involved in teaching in our schools. This could be instrumental to effective instructional dissemination. Evans (1999) had posited that the successful 21st century instructor will need to be very professional, competent, highly trained and a well-motivated individual. Majority of the respondents (39.7%) indicated that first degree was their highest professional qualification while the least indicated qualification (3.1%) were respondents with a PhD. Degree. Hence, this indicated that the respondents had the appropriate academic professional qualifications required to handle the curriculum.

Teaching Experience of Teachers

The study also sought information on the teaching experience of teachers. Table 5 presents a summary of the data obtained.

Table 5: Demographic Characteristics of Teachers' Teaching Experience

Length of Service	Frequency	%
Less than 10 years	270	31.8
10 – 15 years	242	28.5
16 – 20 years	200	23.6
21 – 30 years	124	14.6
31 – 35 years	12	1.5
Total	848	100.0

Source: Fieldwork, 2021

Out of the 848 respondents (science teachers), 270 had less than 10 years of teaching experience, representing 31.8%, 242 had 10 – 15 years teaching experience, representing 28.5%, 200 had 16 – 20 years teaching experience, representing 23.6%, 124 had 21 – 30 years teaching experience, representing 14.6% and 12 had 31 – 35 years of teaching experience, representing 1.5% of the total respondents.

School Types of Respondents

The study sought information on the type of school all respondents were related with. Table 6 presents a summary of the school types of respondents.

Table 6 Demographic Characteristics of Respondents' School Types

School Types	Frequency	%
Public School	3915	61.7
Private School	2434	38.3
Total	6349	100.0

Source: Fieldwork, 2021

Table 6 shows that 3915 respondents were from public schools, representing 61.7% of the total sample, while 2434 respondents (38.3%) were from private schools.

Marital Status of Teachers

The study also obtained information on the marital status of respondents. The data obtained is presented in Table 7 below.

Table 7: Demographic Characteristics of Teachers' Marital Status

Marital Status	Frequency	%
Married	624	73.6
Single	173	20.4
Divorced	51	6.0
Total	848	100.0

Source: Fieldwork, 2021

Table 7 shows that 624 respondents were married, representing 73.6% of the total sample (teachers) used in the study, 173 respondents were single representing 20.4% of the sample and 51 respondents were divorced, representing 6.0% of the total sample.

Research Question 1: What is the level of high-stakes tests factors (washback effect, test pressure, test anxiety) among science teachers and students in senior secondary schools in Nigeria?

Table 8 (a – c) below will be used to answer research question 1.

Table 8a Descriptive Statistics on Washback Effect

Items	N	\bar{x}	Std. Dev.	R
1. Teachers often practice past/old questions with students to help them prepare for high-stakes tests (WAEC, NECO, UTME)	6349	3.4139	.72820	HE
2. Teachers often concentrate on topics that are frequently associated with SSCE/NECO/UTME Examinations	6349	3.2503	.78314	HE
3. Teachers teach students the tips and tricks in answering high-stakes examination questions	6349	3.0606	.81221	HE
4. At this level, teachers' drive to teach is primarily for the sake of students passing final examinations	6349	2.7477	.80266	ME
Average Total	6349	3.118	.782	HE

R: Remarks; VHE: Very High Extent (3.50 and above); HE: High Extent (3.00 – 3.49); ME: Moderate Extent (2.50 – 2.99); LE: Low Extent (Below 2.50)

Source: Fieldwork, 2021

Table 8a showed that each of items 1 to 4 on the level of washback to science teachers and students, influenced by high stakes tests, obtained a mean score above 2.50. The above results implied that the respondents rated the influence of washback effect on science teachers and students as high. The grand mean score was **3.118**, which was above the criterion of **2.50** set for the study, while the standard deviation was **0.782**, indicating that the respondents were not far from the mean and from one another in their

responses. Also, the table revealed that item 1 had the highest mean of **3.4139** while the least mean was that of item 4 with a mean score of **2.7477**. This result implies that the grand mean score of **3.118** indicated that the level of washback effect on science teachers and students in secondary schools in Nigeria is on a high extent. Therefore, the level of washback effect on science teachers and students in secondary schools in Nigeria is on a high extent with the grand mean score of **3.118**.

Table 8b Descriptive Statistics on Test Pressure

Items	N	\bar{x}	Std. Dev.	R
1. High-stakes tests puts teachers under pressure to cover all the topics in the syllabus before examination periods	6349	3.3032	.66785	HE
2. Pressure from high-stakes tests make teachers concentrate on areas/questions that usually come out in SSCE	6349	3.3341	.75812	HE
3. Teachers worry about what students' grades will be	6349	3.3120	.75775	HE
4. Teachers worry about what the school and students' parents will say if they do not perform as expected	6349	3.0499	.80378	HE
5. High-stakes tests are an accurate way to assess what students know	6349	3.3212	.64905	HE
6. Students' high performance in high-stake tests is an indication of good teaching	6349	3.0737	.76752	HE
Average Total	6349	3.232	.734	HE

R: Remarks; VHE: Very High Extent (3.50 and above); HE: High Extent (3.00 – 3.49); ME: Moderate Extent (2.50 – 2.99); LE: Low Extent (Below 2.50)

Source: Fieldwork, 2021

Table 8b showed that each of items 1 to 6 on the level of test pressure to science teachers and students, influenced by high stakes tests, obtained a mean score above 2.50. The above results implied that the respondents rated the influence of test pressure on science teachers and students as high. The grand mean score was **3.232**, which was above the criterion of **2.50** set for the study, while the standard deviation was **0.734**, indicating that the respondents were not far from the mean and from one another in their responses. Also, the table revealed that item 2 had the highest mean of **3.3341** while the least mean was that of item 4 with a mean score of **3.0499**. This result implies that the grand mean score of **3.232** indicated that the level of test pressure on science teachers and students in secondary schools in Nigeria is on a high extent. Therefore, the level of test pressure on science teachers and students in secondary schools in Nigeria is on a high extent with the grand mean score of **3.232**.

Table 8c Descriptive Statistics on Test Anxiety

Items	N	\bar{x}	Std. Dev.	R
1. Teachers feel very anxious about their students' final examinations	6349	3.4324	.75455	HE
2. Teachers often think about the consequences of their students' failure	6349	3.1555	.80283	HE
3. Teachers worry that some students might forget the materials learnt on the day of examination	6349	2.6774	.88121	ME
4. Students find it more difficult to concentrate as the examination gets closer	6349	2.9627	.79718	ME
5. Teachers think students will make careless mistakes when taking the examination	6349	3.1249	.72926	HE
6. High-stakes tests should not be the only assessment tool to measure students' performance	6349	3.3078	.72064	HE
7. Students' high performance in high-stake tests is an indication of good teaching	6349	3.2391	.71321	HE
Average Total	6349	3.129	0.771	HE

R: Remarks; VHE: Very High Extent (3.50 and above); HE: High Extent (3.00 – 3.49); ME: Moderate Extent (2.50 – 2.99); LE: Low Extent (Below 2.50)

Source: Fieldwork, 2021

Table 8c showed that each of items 1 to 7 on the level of test anxiety to science teachers and students, influenced by high stakes tests, obtained a mean score above 2.50. The above results implied that the respondents rated the influence of test anxiety on science teachers and students as high. The grand mean score was **3.129**, which was above the criterion of **2.50** set for the study, while the standard deviation was **0.771**, indicating that the respondents were not far from the mean and from one another in their responses. Also, the table revealed that item 1 had the highest mean of **3.4324** while the least mean was that of item 3 with a mean score of **2.6774**. This result implies that the grand mean score of **3.129** indicated that the level of test anxiety on science teachers and students in secondary schools in Nigeria is on a high extent. Therefore, the level of test anxiety on science teachers and students in secondary schools in Nigeria is on a high extent with the grand mean score of **3.129**.

Thus, the level of washback, test pressure and test anxiety in senior secondary schools in Nigeria is on a high extent.

Research Question 2: What is the level of students' attitude towards learning science in senior secondary schools in Nigeria?

Table 9 will be used to answer research question 2.

Table 9 Descriptive Statistics on Students' Attitude towards Learning Science

Items	N	\bar{x}	Std. Dev.	R
1. Science is very interesting to students	6349	3.2826	.75129	HE
2. Students look forward to science lessons	6349	3.2744	.73850	HE
3. Most students do not like science subjects, and it scares them to have to take it.	6349	2.9409	.89270	ME
4. Most students are always under a terrible pressure in science classes	6349	2.8897	.84334	ME
5. Some students believe they are just not good at Science	6349	2.8849	.88062	ME
6. Science makes students feel secure, and at the same time it is stimulating	6349	2.9663	.72545	ME
7. Science makes students feel uncomfortable, restless, irritable and impatient.	6349	3.0670	.86457	HE
8. Practical work in science is exciting for students	6349	3.0076	.75777	HE
9. Students would like more practical work in science lessons	6349	3.0955	.70745	HE
10. Students learn science better when they do practical work.	6349	3.1370	.72352	HE
11. It makes students nervous to even think about doing a scientific experiment	6349	3.1889	.82339	HE
12. Students like reading science magazines and books.	6349	3.1447	.88997	HE
13. It is exciting for students to learn about new things happening in science	6349	3.0542	.82336	HE
14. Most students would like to study science at university.	6349	3.2341	.78492	HE
15. Students learn about things they are interested in	6349	3.0596	.76500	HE
16. In general, students have a good feeling towards science	6349	3.1515	.81798	HE
Average Total	6349	3.086	.799	HE

R: Remarks; VHE: Very High Extent (3.50 and above); HE: High Extent (3.00 – 3.49); ME: Moderate Extent (2.50 – 2.99); LE: Low Extent (Below 2.50)

Source: Fieldwork, 2021

Table 9 showed that each of items 1 to 16 on the level of students’ attitude towards learning science obtained a mean score above 2.50. The above results implied that the respondents rated the level of students’ attitude towards learning science as high. The grand mean score was **3.086**, which was above the criterion of **2.50** set for the study, while the standard deviation was **0.799**, indicating that the respondents were not far from the mean and from one another in their responses. Also, the table revealed that item 1 had the highest mean of **3.2826** while the least mean was that of item 5 with a mean score of **2.8849**. This result implies that the grand mean score of **3.086** indicated that the level of students’ attitude towards learning science in senior secondary schools in Nigeria is on a high extent. Therefore, the level of students’ attitude towards learning science in senior secondary schools in Nigeria is on a high extent with the grand mean score of **3.086**.

Hypotheses

The hypotheses tested below were used to establish whether the independent variable of high stakes tests has significant relationship with students’ attitude to learning science. This was done using multiple regression and analysis of variance (ANOVA) at .05 level of significance. The correlation matrix of the variables was first presented in a table to reveal the degree of inter-correlation among the factors of the independent variable in the study. The opinions of science teachers and students were equally tested using t-test to know whether there are significant differences or not in the opinions/responses.

Table 10: Correlation Matrix of Independent and Dependent Variables

Independent Variables	Washback	Pressure	Anxiety	Students’ Attitude
Washback Effect	1.00	-.168*	-.075*	-.348*
Test Pressure		1.00	.322*	.475*
Test Anxiety			1.00	.313*
Students’ Attitude				1.00

Regression

H₀1: There will be no significant composite influence of high-stakes tests factors (washback effect, test pressure, test anxiety) on students’ attitude to learning science in senior secondary schools in Nigeria.

Summary of regression on influence of high-stakes tests factors on students’ attitude towards learning science

Table 11a Model Summary

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	Change Statistics				
					R ² Change	F Change	df1	df2	Sig. F Ch.
1	.335	.113	.112	7.40325	.113	804.619	1	6347	.000

a

a. Predictors: (Constant), High-Stakes tests

Table 11b Summary Table of ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig	Remarks
Regression	44099.684	1	44099.684	804.619	.000 ^b	Significant
Residual	347867.504	6347	54.808			
Total	391967.188	6348				

a. Dependent Variable: Students’ Attitude Towards Learning Science

b. Predictors: (Constant), High Stakes Tests

Source: Fieldwork, 2021

Table 11b shows the regression correlation (R) between high-stakes tests and students’ attitude towards learning science in senior secondary schools in Nigeria. The results show that the regression correlation (R) is .335, R square equals .113 and Adjusted R square equals .112. This implied that the combination of high stakes test factors contributed 11.2% to the variation in students’ attitude towards learning science in senior secondary schools in Nigeria.

Further verification using analysis of variance (ANOVA) produced F_(1, 6347) equals 804.619; p<.05. This implied that the linear relationship among the combined variables and students’ attitude towards learning science is significant. This also means that there is a significant composite relationship among the factors of high-stakes tests on students’ attitude towards learning science in senior secondary schools in Nigeria.

H₀2: There will be no significant relative influence of high-stakes tests factors (washback effect, test pressure, test anxiety) on students’ attitude to learning science in senior secondary schools in Nigeria.

Table 12 Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		95.0% Confidence Interval for B		
	B	Std. Error	Beta	t	Lower Bound	Upper Bound	
(Constant)	29.213	.667		43.776	.000	27.905	30.522
High-Stakes tests	.354	.012	.335	28.366	.000	.329	.378

a. Dependent Variable: Students’ Attitude Towards Learning Science

Source: Fieldwork, 2021

Table 12 presents the coefficients that indicate the relationship between the factors high-stakes tests and students’ attitude towards learning science in senior secondary schools in Nigeria. The results show contribution of the variables factors indicated by standardized Beta (B) weights in order of magnitude; high-stakes tests contributed most to students’ attitude towards learning science with **B= 29.213, t= 43.776; p<.05**. The analysis of the result shows that the independent variables of high-stakes tests have significant influence on students’ attitude towards learning science.

H₀3: There will be no significant mean difference between the opinions of teachers and students with regards to high stakes tests factors in senior secondary schools in Nigeria.

The independent sample t-test was used in testing the opinions of teachers and students regarding high-stakes tests in senior secondary schools in Nigeria.

Table 13a Group Statistics on High-Stakes Tests

Respondents’ Status	N	Mean χ	Std. Deviation	Std. Error
Students	5501	52.8904	7.54522	.10173
High Stakes Tests				
Teachers	848	53.6333	6.77440	.23263

Table 13b Summary Table of Independent Sample t-test on High-Stakes Tests

	Levene’s Test		t-test for Equality of Means			Decision	Remarks
	F	Sig.	t	df	Sig. (2-tailed)		
Equal Variances Assumed	1.322	.250	-2.704	6347	.007	Accept	Not sig.
High Stakes Tests							
Equal Variances Not Assumed			-2.926	1195.187	.004		

From table 13 above, the mean difference in the opinions of teachers and students regarding high-stakes tests were higher for teachers (**M=53.6333, SD=6.77440**) than students (**M=52.8904, SD=7.54522**), **t₍₆₃₄₇₎ = -2.704, p>.05**. Levene’s test indicated equal variance assumed (**F=1.322, p=.250**). Thus, it is not significant. The null hypothesis of no significant mean difference in the opinions of teachers and students with regards to high-stakes tests in senior secondary schools in Nigeria is therefore upheld. Thus, there is no significant mean difference in the opinions of teachers and students regarding high-stakes tests in senior secondary schools in Nigeria.

Discussion of Findings

This section presents discussion on the findings of the study with respect to the influence of high-stakes tests on students’ attitude towards learning science in senior secondary schools in Nigeria.

The hypothesis, which sought the significant composite influence of high-stakes test on the attitude of science students towards learning science in senior secondary schools in Nigeria, revealed that there existed a composite influence of all the variables on the attitude of science students towards learning science. From the result of hypothesis one, it was clear that significant composite influence of all the factors of the independent variables on students' attitude existed. This means that the factors of high-stakes tests jointly influence the attitude of science students towards learning science in senior secondary schools. This result is in tandem with a scholar who posited that certain factors, including testing and classroom management elements, have an influence on the way teachers teach and the how students learn (Adegoke, 2017).

The evaluation of hypothesis two, which sought the significant relative influence of the individual independent variable factors on students' attitude towards learning science, revealed a positive result. This means that high-stakes tests factors have particular and individual influences on the attitude of science students towards learning science subjects in senior secondary schools in Nigeria. This is in tandem with scholars who posited that students of this century are the most tested set of students, with said tests influencing the learning circle of students (David, 2016; Adegoke, 2017 and Cheung, 2018). They went further to state that if students are not interested in science, they tend not to make an effort to learn and understand the meaning of concepts being taught to them.

Hypothesis three, which sought the opinions of respondents regarding high-stakes tests in senior secondary schools in Nigeria, revealed that majority of the respondents agreed that high-stakes tests influence teaching and learning in senior secondary schools. From the result of hypothesis three, it was clear that no significant mean difference existed in the opinions of the two groups of respondents regarding high-stakes tests in senior secondary schools in Nigeria. This means that high-stakes tests play a significant role in determining the way teachers teach, and how students learn. This is in agreement with a scholar who posited that high-stakes tests cause instructors to 'teach to the test', focusing mostly on areas that would come out in said tests (examination) and neglecting other aspects of the curriculum (also known as washback) (Wray, 2016). This also confirms a position that both teachers and students experience a lot of stress and pressure as a result of high-stakes tests, explaining that both teachers and students are pressured due to the repercussions of students failing such tests (Fulton, 2016). Whilst another author reported concerns on the impact of testing on students' well-being (Simpson, 2016), another author has described the current emphasis on testing as being out of control and calling today's students "the most tested generation in history", with the many negative consequences looming with potential harm to the educational system (Abeles, 2015). The general consensus of the respondents could therefore be related to the aforementioned posits, since respondents implied that they verily experience washback, anxiety and pressure relating to test preparation.

Conclusion

High-stakes tests are critical to the success and progress of the teaching and learning process in both developed and developing countries, including Nigeria. On the basis of these research findings, the study has proven that the high-stakes tests factors have a strong relationship with students' attitude towards learning science in senior secondary schools in Nigeria. It was observed that science teachers and students in terminal classes concentrate mostly on passing upcoming high-stakes examinations rather than actually

learning course content for career growth. Both science teachers and students in terminal classes were found to also experience a lot of pressure and anxiety resulting from the thought and fear of consequences, if students do not obtain expected scores in high-stakes tests. The prime purpose of high-stakes tests is to provide some level of feedback to all stakeholders in education, so appropriate remedial actions can be taken. To a certain extent, it does this, but a lot needs to be attended to so that the tests do not cause more harm than good to the education system.

Recommendations

High-stakes tests were put in place to make important decisions about students, educators, and schools – i.e., the attempt by federal, state or local government agencies and school administrators to ensure that students are enrolled in effective schools and are being taught by effective teachers. In general, this means that test scores are used to determine punishments, accolades, advancement or compensation for teachers and students. In this regard, and based on the findings highlighted earlier, the researcher wishes to make the following recommendations.

- i. Accountability for educational outcomes should be a shared responsibility of educators, public officials, parents and students. High standards cannot be established and maintained merely by imposing them on students.
- ii. A standardized test may appropriately be used to lead curricular reform, but it should not also be used to make high-stakes decisions about individual students until test users can show that the test measures what the true abilities of students.
- iii. High-stakes decisions such as promotion and graduation should not automatically be made on the basis of a single test score but should be buttressed by other relevant information about the students' knowledge and skills, such as grades, teacher recommendations and extenuating circumstances.
- iv. High-stakes testing programs should routinely include a well-designed evaluation component. Policymakers should monitor both the intended and unintended consequences of high-stakes assessments on students, teachers and educational institutions.

Suggestions for Further Studies

Based on the findings and conclusion of this study, and the fact that the study did not cover all aspects, the following suggestions were made for further studies in the resulting areas.

- i. Determining the effects of high-stakes testing on school owners and parents.
- ii. A research to develop a framework for evaluating the costs versus the benefits of high-stakes testing programs, particularly for alternative and more authentic assessments.

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