TEST ANXIETY AND STUDY BEHAVIOUR AS PREDICTORS OF SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN CHEMISTRY IN ABAKALIKI EDUCATION ZONE, EBONYI STATE

Uwaleke, Esther-Jane Oluchi[1] & Okigbo, Ebele Chinelo[2]
[1,2]Department of Science Education,
Nnamdi Azikiwe University Awka, Anambra State Nigeria
myolybest@gmail.com[1]; ec.okigbo@unizik.edu.ng[2]

Abstract
The study investigated how test anxiety and study behaviour predict Senior Secondary two (SS2) students' achievement in Chemistry in Abakaliki Education Zone of Ebonyi State, Nigeria. The correlation survey design was adopted. Three research questions and three null hypotheses tested at 0.05 alpha levels served as the study's guiding principles. The population of the study was 3,242 SS2 students in 78 public senior secondary schools in the 2022–2023 session. The sample consisted of 348 SS2 students, which were selected using a two-stage sampling procedure. The Chemistry Test Anxiety Scale (CTAS) and Study Behaviour Scale (SBS) were the two instruments used for data collection. Three experts from Nnamdi Azikiwe University's Faculty of Education in Awka validated the instruments, and the Cronbach Alpha technique was used to establish the reliability coefficients, which came out to be 0.72 for CTAS and 0.86 for SBS. The students' promotion results in Chemistry in SS1 in the 2021–2022 session represent their achievement scores in Chemistry. Both linear and multiple regression analysis were used to examine the data that had been gathered. The study's findings showed that chemistry test anxiety and study behaviour individually or jointly do not predict secondary school students' academic achievement in Chemistry. The results suggested, among other things, that school guidance counsellors should focus on helping students with their anxiety related to chemistry tests and their study habits in order to improve their impact on their academic achievement.

Keywords: Test Anxiety, study behaviour, Senior Secondary 2, Achievement in Chemistry.

Introduction
One critical challenge in formal education is to ensure that students achieve high standards in science education and have a favorable attitude toward science. Researchers, educators, and legislators, according to Otor (2017), are concentrating on making sure that science education keeps assisting in preparing future citizens to be scientifically literate and involved with science in their daily lives. Technology and science have completely changed human existence. The outcomes of science education, science and technology, are significant and effective tools for socioeconomic advancement. In order to support the production of a sufficient number of scientists to inspire national development, the Federal Government of Nigeria recognized the importance of science education and included it in the secondary school curriculum in its National Policy on Education (Federal Republic of Nigeria, FRN, 2013).

In Nigeria, chemistry was mandated as a fundamental science subject for all senior secondary school students in order to accomplish this ambitious goal. This is so because studying chemistry lays the groundwork for studying science and technology. It is impossible to overstate the role that chemistry has played in the advancement of science and technology. According to Nadeem (2007), chemistry improves people's ability to think by making them more sensible, inventive, creative, and rational. The foundation of modern existence is provided by chemistry, which also produces raw materials, food, and medicine (Akpan, 2016). Despite the importance of chemistry, Nigerian students' performance in the subject appears to

be lacking. Less than 40% of students passed the West African Senior School Certificate Examination (WASSCE), which is administered by the West African Examination Council (WAEC), for credit level and above (A1–C6), according to the annual reports for May/June 2014–2021. The academic performance of students in Ebonyi State is indicative of the overall low chemistry performance of Nigerian students.

The Centralized Secondary School Examination was introduced by the Ebonyi State government in 2012 in response to the overall low performance of students in chemistry. Its main purpose is to act as a production ground for students, helping them to perform well in public examinations such as the National Examination Council (NECO) and the West African Senior School Certificate Examination (WASSCE), among others. Notwithstanding chemistry's prominence in science and its significance on a global scale, it seems that Nigerian students perform poorly in this subject when they reach senior secondary school. This is supported by the findings of Okonji and Okonji's (2014) report, which demonstrates that students' performance in science—particularly chemistry—has been so low that the number of students taking chemistry at Nigeria's West African Examination Council (WAEC) has been declining annually.

The issue of Nigerian students performing poorly on external exams, particularly in secondary school, has grown concerning to parents, education groups, and successive governments. Researchers' attention has already been drawn to instructional strategies. Recently, focus has shifted to student variables that may improve their active participation in teaching and learning, such as their study habits and test anxiety (learning by doing). The current study was made necessary by evidence of a gap in the secondary school chemistry teaching and learning system that has to be looked into and fixed.

According to Casabarro (2015), anxiety is an affective element that characterizes how afraid one is of a certain thing or circumstance. Uncontrolled anxiousness is a prevalent mental problem that primarily affects young people. However, unwelcome anxiety can hinder students' learning progress and get worse when they can't effectively display their skills, abilities, and competences during the learning process (Eklof & Nyroos, 2015). Chemophobia, according to Eddy (2014), is essentially phobic anxiety related to a fear of chemicals and a dread of chemistry as a subject. Therefore, chemistry anxiety mostly affects a person's worry about the subject of chemistry, anxiety during chemistry-related evaluation scenarios such as exams or assessments, and anxiety and terror when handling chemicals in a laboratory setting. It is one of the learning challenges preventing exceptional students from excelling in the field of chemistry (Edal and Mustafa, 2014). This is due to the fact that a high level of anxiety can induce distractions throughout the evaluation process and hinder students' ability to recall pertinent material, which can lead to lower-than-expected accomplishment (Maloney, 2013).

When students realize that the demands of their academic work exceed their cognitive capacities, anxiety sets in (Gonzalez, Fernandez, & Palani, 2017). Numerous factors can contribute to test anxiety in chemistry, such as negative experiences in the past with science classes, exposure to science-phobic teachers in elementary and secondary education, a lack of role models, racial and gender stereotypes, and popular media portrayals of scientists. According to a Jegede (2013) study, students in both urban and rural areas, regardless of gender, exhibit significant anxiety when learning chemistry.

The way that students study is another influence. One factor that frequently correlates with academic success is study habits (Palani, 2016). Investing a specific, timed, and unbroken period of time to focus on learning is known as study behaviour. Without it, one cannot develop and eventually becomes self-restrictive. Children are sent to school by their parents to learn, and as a result, they are exposed to a variety of situations that shape their behaviour. Learning, then, is a modification of behaviour. Their ability to reason mentally, grow physically, manipulate objects, and acquire interests and values all show signs of this shift. Depending on

the circumstances at home and at school, the adjustment could be simple or challenging. Reading is the capacity to comprehend words found in a document and apply the knowledge gained for one's own personal development, according to study behaviour (Ghulam, 2017).

Therefore, a study routine that include, but is not limited to, the frequency of study sessions, content revision, self-testing, rehearsal of taught material, and studying in a conducive atmosphere can be characterized as study behaviour (Crede and Kuneel, 2016). A student's study habits reveal his learning style, his goals, and his income potential. These could also be chosen with the aid of a person's lifetime study habits. It molds people's personalities, fosters the growth of sound critical thinking, and generates original thought. According to Mahraj and Qamar (2016), one of the most important aspects of student learning that has a significant impact on academic accomplishment is study habits.

Study habits are inclinations toward learning that let students work alone. Study behaviour refers to a student's method of studying, whether it be methodical, effective, or ineffective (Saxena, 2015). According to Saxena's definition, effective study habits lead to successful academic outcomes, while ineffective study habits result in academic failure. According to Cassady (2017), there hasn't been enough focus on figuring out how study habits affect students' academic performance in chemistry and science in Nigeria. While some studies found a poor association between test anxiety, study behaviour, and academic accomplishment, Ajayi and Owadara (2018) also found a high relationship between test anxiety and study behaviour and academic achievement.Huberty (2018), Asma-Tuz, Manzoor (2010), and Muhammad (2010) corroborated each other's findings by reporting that non-cognitive variables—like study habits and test anxiety—are frequently disregarded when analyzing the variables influencing academic achievement in Nigerian secondary schools. This indicates that there hasn't been enough research done on test anxiety and study habits, particularly by Nigerian chemistry teachers, to determine how they affect secondary school students' academic performance.

Hence, the current study would contribute to the investigation of whether test anxiety and study habits are predictive of secondary school students' academic success in Chemistry. Nevertheless, no research has looked into how the two variables' individual and combined predictions affect chemistry achievement. On the strength of the forgoing, it is therefore imperative to determine whether test anxiety and study behaviour predict student’s achievement in Chemistry in Abakaliki Education zone of Ebonyi State, Nigeria.

Purpose of the Study

The purpose of this study was to determine how test anxiety and study behaviour predicts senior secondary school (SS2) students’ academic achievement in Chemistry. Specifically, the study determined the extent to which:

1. Test anxiety predicts Chemistry achievement of secondary school students.
2. Study behaviour predicts Chemistry achievement of secondary school students.
3. Test anxiety and study behaviour jointly predicts Chemistry achievement of secondary school students.

Research Questions

The following research questions guided the study.

1. To what extent does test anxiety predicts academic achievement of secondary school students in Chemistry?
2. To what extent does study behaviour predicts academic achievement of secondary school students in Chemistry?
3. To what extent does test anxiety and study behaviour jointly predict secondary school students’ academic achievement in Chemistry?

Hypotheses

The following null hypotheses tested at 0.05 level of significance.

1. Test anxiety of secondary school students does not significantly predict their academic achievement in Chemistry.
2. The extent of prediction of study behaviour on secondary school students' academic achievement in Chemistry will not be significant
3. Text anxiety and study behaviour jointly does not significantly predict secondary school students' achievement in Chemistry in Abakaliki Education Zone.

Methodology

In this study, the correlational survey design was used. Nworgu (2015) states that the goal of a correlational survey design is to determine the link between two or more variables. Nworgu went on to say that studies using correlational survey design can reveal the strength and direction of a relationship between variables. Since the researcher's goal was to ascertain how study habits and anxiety related to Chemistry tests both independently and jointly influenced secondary school students' academic progress in the subject, correlational research design was chosen for this study. 3,242 SS2 pupils from 78 public senior secondary schools in the Abakaliki Education Zone of Ebonyi state made up the study's population. The researcher used a multi-stage sampling approach to select 348 SS2 pupils from the population.

The first stage involved the use of a simple random sampling technique by balloting in the selection of Abakaliki Education Zone out of the three Education Zones. Random sampling was used because of easy monitoring since the researcher is familiar with the area and also because of the reported poor chemistry achievement in the zone.

In the second phase, four (4) LGAs in the Abakaliki Education Zones—Abakaliki, Ebonyi, Izzi, and Ohaukwu, respectively—were chosen using proportionate sampling methodologies. In the third step, two (2) schools from each of the four (4) LGAs in the Abakaliki Education Zone were chosen using the purposive sample technique. Eight schools were chosen in this manner for the investigation. The sample students ranged in age from 14 to 19 years old, with an average age of 16.5 years.

The Chemistry Test Anxiety Scale (CTAS), the Study Behavior Scale (SBS), and the Chemistry Achievement Proficiency Scale (CAP) are among the instruments used to collect data. These instruments were altered by the researcher. Students' test anxiety was gauged using an adaptation of Sokan (1998)'s Chemistry Test Anxiety Scale (CTAS). This was accomplished by changing certain words (such 2, 9, 14, 17, and 20). The CTAS is a 25-item test that measures test anxiety through statements about the respondent's attitudes concerning the exam. Anxiety disorder is suggested by a high index score (25–34), and the opposite is suggested by a low index (35–100). Students are required to answer to the following four options on a 4-point Likert-type scale: always (A), sometimes (S), rarely (R), and never (N).

The researcher developed the study behavior scale, or SBS, for students. The researcher created a 25-item scale that is split into two halves. The respondents' personal information, including their age, sex, and name of school, is contained in the first section. The items in the second section dealt with things related to their study habits. A ten-point rating system is used, with least and most like me. The outcome of the school semester examination records of the participants was the Chemistry Achievement Profoma (CAP). At the conclusion of three terms in SS2 (the 2020–2021 academic year), the cumulative mean scores in Chemistry were determined. This served as a gauge for the academic success of the pupils. Because the State Ministry of Education moderates the exams that students take in Ebonyi State, the termly examination results are consistent and standardized.

The instruments were validated by three relevant specialists. Using Cronbach Alpha, the instruments' reliability index was determined; internal consistency reliability coefficients for CTAS and SBS were 0.72 and 0.86, respectively. The Cronbach Alpha reliability coefficient has to be used in order to assess the instrument's reliability because its items were polytomously scored. Before they could fill the instruments, the SS2 students were told to put their names on them. This essentially allowed the researchers to compare the Chemistry Achievement Proficiency (CAP) scores of the SS2 students with the CTAS and SBS scores that were acquired. Under close supervision, class teachers acting as research assistants administered and collected the instruments from the children once they had finished them. The acquired data were then gathered for analysis.

Both linear and multiple regression analysis were used to examine the data that had been gathered. To determine the prediction of each variable and the degree to which it predicted accomplishment in chemistry, multiple regression analysis was employed. To test the hypotheses and determine the significance of the joint prediction of the independent variables on the dependent variables (academic accomplishment in Chemistry), an analysis of variance (ANOVA) was employed. Nworgu (2015) provided 3-way grades for evaluating the relationship coefficient, and these are the criteria for interpreting the correlation coefficient. The interpretation is as follows: a relationship is considered high if it is 0.80 or higher, moderate if it is 0.30–0.79, and low if it is 0.30 or lower. The conclusion was that the null hypotheses were accepted if the P-value (sig. value) was less than or equal to 0.05 ($p \leq 0.05$), and rejected otherwise.

Results

Research question 1: To what extent does test anxiety predicts academic achievement of secondary school students in Chemistry?

Table 1: Model summary of test anxiety (TA) as predictor of academic achievement of students in Chemistry in CAP

Variable	R	R^2	Adjusted R^2	B	Beta
TA	.005	.000	.003	63.512	-.005
CAP					

The correlation coefficient (R) and coefficient of determination (R^2) are 0.000 and 0.005, respectively, according to Table 1's results. Text anxiety accounts for 0.000% of students' academic progress in Chemistry, according to Table 1's coefficient of determination of 0.000. Based on Table 1, the regression equation for text anxiety is as follows:

CA() = 62.52.63 - 0.005TEXTANXIETY.

Research Question 2: To what extent does study behaviour predicts academic achievement of secondary school students in Chemistry?

Table 2: Model summary of Study behaviour (SB) as predictor of academic achievement in Chemistry in CAP

Variable	R	R^2	Adjusted R^2	B	Beta
SB	.017	.000	-003	63.274	.054
CAP					

According to Table 2, there is a 0.017 correlation coefficient and a 0.000 associated coefficient of determination (R^2). This coefficient (R^2) shows that 0.000% of the variation in Chemistry achievement was explained by study habits. Put otherwise, study habits may be responsible for 0.000% of the variation in chemistry students' academic success. The following is the regression equation for the study behavior that was obtained from Table 2: CA() = 63.28 + 0.054STUDYBEHAVIOUR

Research Question 3: To what extent does test anxiety and study behaviour jointly predict secondary school students' academic achievement in Chemistry?

Table 3: Model summary of regression analysis of joint test anxiety (TA) and study behaviour (SB) as predictors of students' academic achievement in Chemistry in CAP

Variable	R	R^2	Adjusted R^2	B	Beta
TA, SB CAP	.033	.001	.008	50.853	0.29

According to the findings in Table 3, the correlation coefficient (R) and coefficient of determination (R2) are, respectively, 0.033 and 0.001. The combined effects of text anxiety and study habits account for 0.001% of students' academic progress in Chemistry CAP, according to Table 3's coefficient of determination of 0.001. Based on Table 3, the regression equation for the combined prediction of test anxiety and study behavior is as follows:

CA() = 50.85 + 0.29 TESTANXIETYSTUBEHAVIOUR

Hypothesis 1: Test anxiety of secondary school students does not significantly predict their academic achievement in Chemistry.

Table 4: Regression summary of ANOVA Table for Regression analysis of Test anxiety as Predictor of Students Academic Achievement in Chemistry in CAP

Model	Sum of squares	Df	Mean Square	F	Sig
Regression	2.319	1	2.319	.009	.922
Residual	84630.747	346	244.598		
Total	84633.066	347			

Regression analysis was used to test Hypothesis 1, which is shown in Table 4. According to the table, the related probability value was 0.922 and the obtained F-value was $F(1,346) = 0.009$. When compared to 0.05, this probability value of 0.922 was determined to be significant. As a result, the null hypothesis was not rejected, and it was concluded that test anxiety does not accurately predict secondary school students' academic success in Chemistry.

Hypotheses 2: The extent of prediction of study behaviour on secondary school students' academic achievement in Chemistry will not be significant.

Table 5: Regression summary of ANOVA Table for Regression analysis of Study Behaviour as Predictor of Students Academic Achievement in Chemistry in CAP

Model	Sum of squares	Df	Mean Square	F	Sig
Regression	22.451	1	22.457	.009	.753
Residual	78406.538	346	226.608		
Total	78428.989	347			

In testing hypothesis 2, the regression analysis was also employed. Table 5 displays the outcome, which is $F(1,346) = 0.009$ with a corresponding exact probability value of 0.753. The precise probability value of 0.753 was judged to be not significant, since it exceeded the 0.05 level of significance that was established as the condition for testing the hypothesis. As a result, the null hypothesis was not rejected, and it was concluded that there is no meaningful relationship between study habits and secondary school students' academic success in Chemistry.

Hypothesis 3: Text anxiety and study behaviour jointly does not significantly predict secondary school students' achievement in Chemistry in Abakaliki Education Zone.

Table 6: Regression summary of ANOVA Table for Regression analysis of joint contribution of test anxiety and study behaviour as predictor of Students Academic Achievement in Chemistry in CAP

Model	Sum of squares	Df	Mean Square	F	Sig
Regression	83.699	3	27.900	.125	.945
Residual	76946.264	344	223.681		
Total	77029.963	347			

Regression analysis was performed in order to test hypothesis 3. As can be seen from Table 6's result, the associated probability value was 0.945 and the resultant F-value was $F(3,344) = 0.125$. When compared to 0.05, this probability value of 0.945 was determined to be non-significant. As a result, the null hypothesis was not rejected, and it was concluded that test anxiety and study habits taken together do not accurately predict secondary school students' academic success in Chemistry.

Discussion

The results of this study showed that text anxiety is not a major predictor of secondary school students' academic achievement in Chemistry since it does not explain students' academic achievement in the subject. Similar to acute dread, anxiety is a very unpleasant affective state that might involve sensations of threat, nebulous, objectless fear, tension, and a broad sense of unease. Anxious people exhibit fear and avoidant behavior, which frequently impedes their ability to succeed in both academic and daily contexts. People who experience high levels of anxiety during examinations usually do worse than people who experience low levels of anxiety, particularly when tests are administered in high-stress evaluation environments like post-secondary examinations. This outcome is consistent with research conducted by Muola et al. (2016) in secondary schools in the Nyeri district of Kenya on the

connection between academic achievement and test anxiety. The findings demonstrated a strong correlation between test anxiety and academic achievement. Their findings showed that the degrees of anxiety elicited by various subjects varied in a statistically significant way. The results of this study conflict with those of Sutantoputri (2016), whose research revealed a relationship between academic achievement, anxiety level, and interest, and that high anxiety levels had a detrimental effect on students' reported levels of interest and achievement.

The results showed that study behaviours are not a major predictor of secondary school students' academic ability in Chemistry since they do not explain students' academic achievement in the subject. This work is based on research by Rabia, Mubarak, Tallat, and Nasior (2017), which demonstrated a strong correlation between academic success and study behaviours. Additionally, effective study behaviours improve academic performance, help students succeed in the classroom, and help them reach their educational objectives. This result, however, contradicts that of Ebele and Olofu (2017), who found that study behaviours did not significantly predict students' interest in or success in chemistry. The rationale behind these results may be found in the way that study behaviours fosters the growth of positive study behaviours in students, which in turn increases their engagement and preserves their relationships with peers and teachers. That is, if they encounter any difficulties with their learning of Chemistry, they may always draw on the support of friends and teachers to help pique their interest.

The results of this study showed that there is no significant correlation between students' academic achievement in Chemistry and their combined prediction of test anxiety and study behaviours. Anxiety related to Chemistry tests is a feeling of unease that students encounter when they are studying Chemistry or disciplines relevant to Chemistry. Students' attitudes about learning, particularly in the classroom and other learning environments, are reflected in their study behaviours. Therefore, it's feasible that combining the two ideas will improve the ability to forecast students' academic success.

The study's conclusions provide an overview of the multiple regression analysis that was performed when the predictor variables were all pooled. The current result is consistent with the findings of other earlier studies conducted by Katelyn and Philip (2016), who found that a combination of study behaviours and exam anxiety predicted academic achievement in Chemistry. This conclusion is also consistent with Sutantoputri's (2016) earlier findings, which showed that students' achievement in Chemistry is significantly predicted by the sum of their marks on mock examinations and transition examinations.

Conclusion

Based on the findings presented and discussed in this study, it was concluded that Students academic achievement in Chemistry is not significantly influenced by any of the text anxiety and study behaviours or by the combination of the text anxiety and study behaviours.

Recommendations

From the findings of this study, it was recommended that the school guidance counsellors should work on students Chemistry test anxiety and study behaviours so as to enhance their effect on their academic achievement.

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