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Ziller's Probability Model of Test Standardization in The Level of Student's Test-Anxiety and Attitude Towards Learning Mathematics in Ondo State, Nigeria

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Abstract: *The study investigated Ziller's probability model of test standardization on the level of students' test-anxiety and attitude towards learning Mathematics among Senior Secondary School Two (SS 2) students in Ondo State, Nigeria. It employed non-experimental, descriptive survey and correlational research design for the study. The sample comprised 600 SS2 students selected through a multistage sampling procedure across the three senatorial districts in Ondo State. Data were collected using three research instruments and analysis was conducted using both descriptive and inferential statistics with hypotheses tested at 0.05 level of significance. Findings showed that there was high guessing tendency in multiple choice tests and also there were differences among the uncorrected scores in multiple choice, two-tier items and Ziller's standardize multiple-choice test. After applying Ziller's Model, there was a negative influence on students with very low-test anxiety as reflected by a difference of -1.83. In contrast, students with low and moderate anxiety levels showed a positive influence with a difference of 0.22 and 0.16 respectively. However, there was no significant relationship between test anxiety and academic achievement either before or after the Ziller's model application. Similar the relationship between two-tier and academic achievement was not significant before (r= -0.27, P >0.05) and after (r=0.22, P >0.05) applying the model. Additionally, there was no significant relationship between attitude towards Mathematics and academic achievement both before and after (r=0.26, P >0.05). The study concluded that Ziller's model positively influences test-anxiety and attitudes towards Mathematics and recommended its adoption in standardizing test items in Nigeria Secondary Schools*.
Keywords: test standardization, Ziller's probability model, attitude, test-anxiety.

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INTRODUCTION

Attitude towards Mathematics refers to individual's emotional inclination either favourable or negative towards the topic (Mcleed, 1992) while Zan and Martino (2007) posited that attitude toward Mathematics is another affective factor that has been studied over years in relation to mathematics. Rushtom (2006) argued that the term attitude is a mental or neural state of readiness, organized through experience, exerting a directive or dynamic influence upon individual's response to all objects and situations with which it is related.

Attitudes appeared to be learned in the course of life experience, which make the individual behave in characteristics ways towards persons, objects or issues to which they are related. Teachers and family influence the inclusion and development of moral attitude in students, which in turn appears to affect students' academic performances in Mathematics in schools. Zan & Martino (2007) viewed attitude towards mathematics as a positive or negative emotional disposition towards Mathematics as multidimensional. Hart (1989) described individual's attitude towards Mathematics as the emotions he/she associates with Mathematics, his/her beliefs towards Mathematics and how he/she behaves towards Mathematics. Hannula (2002) opinioned that student attitude towards Mathematics can be classified under the following evaluating processes:

a. The emotions experienced through activities involving Mathematics.
b. Emotions evoked by the concept of Mathematics.
c. Evaluation of the consequences of doing Mathematics
d. Value of Mathematics to one's future goals.

Andrew & Welding (2004) posited that test anxiety is an evaluative physiological state characterised by significant tension, anxiety, and discomfort experienced during or prior to an examination. Selend (2012), Abe and Gbenro (2004), and Abe, Gbore, Owabumoye, and Omotoyinbo (2025) contended that this anxiety imposes considerable obstacles to learning and performance, potentially impairing an individual's capacity to excel and adversely influencing their social, emotional, and behavioural development, as well as their self-perception and attitudes towards school. Conversely, Zeidner (1998) posited that test anxiety comprises a blend of physiological over-arousal, tension, and somatic symptoms, coupled with worry, dread, and fear of failure or catastrophe that manifest before or after testing situations. Asheraft (2002) regarded mathematics anxiety as an emotive variable that impacts students' performance in mathematics. Dreger & Alken (1957) and Fennema & Sherman (1976) posited that the construct encompasses a syndrome of emotional responses to arithmetic and mathematics, characterised by students' adverse reactions to mathematical concepts and assessment methods.

Test standardisation denotes the procedure of developing and conducting a test uniformly to all participants, hence guaranteeing equitable and similar outcomes. This involves using the same

questions, instructions, time limits and scoring procedures for everyone (Owabumoye, 2024) while Batwn and Abdulnabi (2016) argued that the key aspects of test standardization are:

- Consistent question format and content
- Standardized administration
- C0onsistent scoring

while the importance of standardization includes fairness and equity, comparability, reliable results and informed decision-making. Hence, test standardization aims to create a level playing field for all test takers, ensuring that the results accurately reflect their external facts (Abe & Gbore, 2003; Abe, Gbore, Owabumoye & Omotoyinbo, 2025).

Ziller's probability model is a statistics measure that explains the probability of correctly guessing the answer in any testing procedure and it is defined as the ratio of the estimated numbers of guessing made to the estimated number of items for which the correct answer was not definitely known. While Zillers (1957) and Choppin (1975) further confirmed that individual variations in guessing could lead to a contamination of the achievement test score.Ziller (1957) developed a formula for measuring the guessing tendency as correction for guessing. Its derivation according to Ojerinde (1986) and Abe (2005) as:

R= the number of questions on the test a student answer correctly.
W= the number of questions on the test a student answer wrongly.
A= the number of questions on a test a student answers all together

Therefore A= R + W
C= the number of alternatives for each question
K= the number of questions on which the student actually knows the answer,

While the number of questions he chooses to guess at can be represented as A-K.
If each questions has C alternatives by deductive probability reasoning, the chance of getting an answer correctly is 1/C and in this case A-k of 1/C $=(A\text{-}K)/C$, the number of items got correctly by guess work.
Therefore $K+\frac{A\text{-}K}{C}=R$, this is the total number of answer got correctly including guess work.
By simple algebraic transformation CK + R + W – K = CR i.e. A=R+W
CK – K = CR – R- W
K(C – 1) = R(C-1) -W
Divide both sides by C – 1
K = $\frac{R(C\text{-}1)\text{-}W}{C\text{-}1}$
$K=R-\frac{W}{C\text{-}1}$ ---------- (1)
Traditional correction for guessing formula.

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Ziller proposed that if total number of guesses made by a number is G. The probability of a correct response is 1/C and likelihood of correct response is $\frac{C\text{-}1}{C}$, then the total number of guesses (both correct and incorrect) resulting from the guess work can be calculated as

$G = \frac{CW}{C\text{-}1}$ ---------- (2)

However, the tendency to guess is the ratio of the number of correct guesses estimated to have been made divided by the estimates numbers of items of which the correct answer was not definitely known thus

$G(T) = \frac{C\text{-}1}{N + W + \left(\frac{W}{C\text{-}1}\right)}$ ---------- (3)

Thus Ziller's index $G(\not{z}) = \frac{CW}{CW + N(C\text{-}1)}$ ----------(4)

Equation (4) is one of the contributions of the probability theory of solving the problem of guessing in testing. Knapp (1971) used the theory of probability extensively in solving some of the problems of guess work in testing. Although Zillers (1957) was about the earliest person to apply the principle, however, the conditions under which the model can be verified include:

i. If a candidate gets all the answer correctly (i.e. W=0). Then $G(\not{Z}) = 0$
ii. If candidate does not get all the answers right (i.e. W=0). Then $G(\not{Z}) = 1$. Thus, the tendency to guess is at its maximum in this respect.
iii. If a candidate does not omit any item and get all items right (i.e. n= 0 and W=0) then $G(\not{Z})$ is undefined as $G(\not{Z}) = \infty$, thus, the index of the tendency to guess breaks down completely.

Alonge (1990 & 2003) argued that these three conditions might be difficult to achieve in most of our achievement tests particularly in Mathematics. This is simply because, the model does not make room for a testee who worked the test independently and arrived at one of the options given. On the basis of this, it might be difficult to pin down a guesser when he gets all items correctly and no items were omitted.

However, the higher the value of G ($\not{Z}$) as shown in case (iii) above the more frequent a candidate guesses and so the limit of G ($\not{Z}$) as N to Zero is 1

$\lim_{N \to 0} G(\not{Z}) = \lim_{N \to 0} \frac{CW}{CW + (C\text{-}1)}$ ---------- (5)

Alonge (2003) posited that, it might be easy to establish that guessing does not occur in most multiple-choice achievement tests (as shown in the equations (4 & 5) and that guessing varies from one testee to another but as pointed out by Chopping (1975), it is not a phenomenon that is easy to measure. This is because when we observe responses been made to items in a test, we have direct method of telling when any particular responses are the result of a guess work or not. To ask the examinees directly would have been one possible approach but it would be difficult to get reliable data on a large scale.

However, to be able to achieve these conditions it is necessary to talk of nature of the test item and the characteristics test that resort to guesswork whether it is as a result of the testees' inability to solve the test items or because the test items are by design difficult. Thus, the tendency of a testee to guess is a function of the ability of the testee and the difficult level of the test. The problem of this study is anchored on the Ziller's probability model of test standardization in the level of student test anxiety and attitude towards learning Mathematics. Therefore, the study seeks answers to the following general questions as generated by the researchers:

1. What is the guessing tendency level of senior secondary students in Mathematics?
2. What is the difference among the uncorrected student's scores in multiple choice, Two-tier items and Ziller's standardized multiple choice test?
3. What is the influence of Ziller's model of test standardization on levels of students' test-anxiety towards learning of Mathematics?
4. What is the influence of Ziller's model of test standardization on the level of students' attitude towards learning of Mathematics?
5. What is the relationship between students Mathematics test anxiety and achievement before and after the application of Ziller's model of test of standardization?
6. What is the relationship between students' attitude towards learning of Mathematics and academic achievement before and after the application of Ziller's Model of test of standardization?

Hypotheses

The following hypotheses were generated and tested at 0.05 level of significance.

1. There is no significant relationship between test anxiety and academic achievements before and after the application of Ziller's model.
2. There is no significant relationship between attitude and academic achievements before and after the application of Ziller's model.

METHODS

The study employed the non-experimental research design of the descriptive survey type and a correlational research design. The study employed a survey method to capture a large size of sample of population of SS2 students through the use of questionnaire to collect data for generalization purposes, and applied correlation techniques to assess the strength, direction and magnitude of relationship between test scores, test anxiety and attitude towards learning Mathematics before and after applying the Ziller's model of test standardization. The target population for the study consisted of all the 302 public secondary schools in Ondo State that cut across eighteen local government areas in the three (3) senatorial districts of Ondo State (Source: ASUSS, Akoko South West Local Government Yearly Handbook of 2022/2023 Session).

The sample for the study was 600 Senior Secondary School Class Two (SS2) students. The sample was collected through a multistage sampling procedure; first, six (6) local government areas out

of the eighteen local government areas in the three (3) Senatorial districts in Ondo State were selected through simple random sampling technique, second, in each of the six local governments, two (2) pubic secondary schools that are co-educational were randomly selected. In the third stage, in each selected school, fifty (50) students (25 males and 25 females) from the mathematics class of SS2 were selected through stratified and simple random sampling techniques. Three (3) instruments were used for the data collection in the study namely: the Mathematics Test Anxiety Scale (MTAS), the Mathematics Attitudinal Scale (MAS), and the Mathematics Achievement Test (MAT) which comprised multiple choice and two-tier objective test items.

The validity of the MTAS, MAS and MAT was determined by experts in Tests and Measurement/ Mathematics in Bamidele Olumilua University of Education, Science and Technology, Ikere, Ekiti State and experts in Tests and Measurement from Departments of Guidance and Counselling, Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria, also ascertained the face and content validity of the three instruments. Alpha Cronbach was used to determine the reliability of MTAS, MAS and MAT with results showing 0.63, 0.66 and 0.71 coefficients' level of the reliability classification, interpretations and assertions by Macintosh (1974) and Alonge (1989 & 2004) that moderate and substantial reliability coefficient should range between 0.60 and 0.80 hence the instruments were considered reliable enough for the study. The instruments were administered to the subjects in the following order: Mathematics Attitudinal Scale (MAS), Mathematics Test Anxiety Scale (MTAS) and then the Mathematics Achievement Test. Six trained research assistants were used to ensure proper field administration of the instruments. The administered instruments were collected back by hand from the respondents after completion for the purpose of swing data analysis, Ziller's model was used to answer the two last questions and Pearson Product Moment Correlation was used to test the two hypotheses.

RESULTS AND DISCUSSION

Question 1: What is the guessing tendency level of Senior Secondary Students in Mathematics?
Table 1: Average Students' Level of Guessing Tendency

Variable	N	Min	Max	Mean	SD
Two-Tier objectives	600	0.36	1.00	0.92	0.51
Ziller's Guessing Index	600	0.18	1.00	0.96	0.50

Table I shows the minimum and maximum levels of guessing tendency of students on two-tier objective as 0.36 (36%) and 1.00 (100%) respectively. While Ziller's Guessing index was 0.18 (18%) and 1.00 (100%) respectively. The average or mean guessing tendency for two-tier was 0.92 (92%) and that of Ziller's guessing index was 0.96 (96%) while the range of standard deviation was between 0.50 to 0.51 indicating 0.01 (1%) level of variability of guessing tendency between

two-tier objectives and Ziller's index. From the averages, it shows that there was high guessing tendency among the Senior Secondary School students in attempting mathematics multiple choice.

Question Two: What is the difference among uncorrected students' scores in Multiple choice, Two-tier items and Ziller's standardized Multiple choice Test?

In answering this question, the responses to Mathematics Achievement Tests were scored, computed and standardized using two-tier and Ziller's standardized multiple choice test items' scores. Then the average performances of students in Senior Secondary School Mathematics were computed as shown in Table 2.

Table 2: Differences among uncorrected students' scores in multiple choice two-tier items and Ziller's standardized multiple choice test.

Variables	N	Mean	Absolute Differences Average Scores		
			USSMC	TTI	Zillers SMCII
USSMC	600	11.00	0		
TTI	600	3.64	7.36	0	
Zillers SMCII	600	2.33	8.67	1.32	0

Table 2 shows the differences among uncorrected students scores in Multiple Choice (USSMC), Two-tier Items (TTI), Ziller's Standardized Multiple Choice Test items. (Ziller's SMCI). The absolute differences between uncorrected students scores in multiple-choice and Two-tier objective standardized score, uncorrected students score in multiple-choice and Ziller's standardized score were 7.36, 8.67 and 1.32 respectively. This indicates or implies that there were differences among uncorrected students' scores in multiple choice, two-tier items and Ziller's standardized multiple choice test.

Question 3: What is the influence of Ziller's model of test standardization on levels of students' test-anxiety towards learning of Mathematics?

Table 3: Influence of Ziller's model of test standardization on levels of student test-anxiety.

Levels of test-anxiety	Before	After	Influence	Remarks
1.00 – 1.49	6.17 (40)	4.34 (48)	-1.83	Negative
1.50 – 2.49	2.42 (322)	2.64 (303)	+0.22	Positive
2.50 – 3.49	1.28 (199)	1.44 (240)	+0.16	Positive
3.50 - 4.00	4.78 (9)	4.75 (9)	-0.03	Negative

The blue print for level of test anxiety is as shown below:

1.00 – 1.49	Very low test anxieties
1.50 – 2.49	Low test anxiety
2.50 – 3.49	High test anxiety
3.50 - 4.00	Very high test anxiety

Table 3 shows the average performance of student in Ziller's Standardization Mathematics Achievement Test. Forty (40) students fell within 1.00 – 1.409 (very low test anxiety) for Mathematics Test Anxiety Scale (MTAS) administered before the Mathematics Achievement Test with the average performance of 6.17 while 322 fell within 1.50 and 2.49 (low test anxiety) with average performance of 2.42; 199 fell within 2.50 – 3.49 (high test anxiety) with average performance of 1.28 and 9 fell within 3.50 – 4.00 (very high test anxiety) with average performance of 4.78 while for Mathematics Test Anxiety Scale (MTAS) administered after the Mathematics Achievement test. Showed that 48 students fell within the level of 1.00 – 1.49 (very low-test anxiety) with average performance 4.34, 303 fell within 1.50 -2.49 (low test anxiety) with averages performance of 2.64; 240 students fell within 2.50- 3.49 (high test anxiety) with averages performance of 1.44 and 9 fell within 3.50 – 4.00 (very high test anxiety) with average performance of 4.75. Therefore, the influence of Ziller's Model of test standardization on test anxiety levels of 1.00 – 1.49, 1.50- 2.49, 2.50 – 3.49 and 3.50-4.00 were indicated as: -1.83, 0.22, 0.16, and -0.03 respective.

Question 4: What is the influence of Ziller's model of test standardization on the level of students' attitude towards learning of Mathematics?

Table 4: Influence of Ziller's Model of Test Standardization on the level of students attitude towards learning of mathematics.

Levels of Attitude	Ziller's Standardization Average Score per level of attitude			
	Before	After	Influence	Remarks
1.00 – 1.49	1.50 (3)	2.90 (5)	+1.40	Positive
1.50 – 2.49	2.04 (121)	1.41 (128)	-0.64	Negative
2.50 – 3.49	1.95 (399)	2.29 (389)	+0.35	Positive
3.50- 4.00	4.48 (86)	3.97 (78)	-0.51	Negative

The blue print for level of attitude is shown below:

1.00 – 1.49	Very negative attitudes
1.50 – 2.49	Moderately negative attitude
2.50 – 3.49	Moderately positive attitude
3.50- 4.00	Highly positive attitude

Table 4 shows the average performance of the students in Ziller's Standardized Mathematics Achievement Test. Three (3) students fell within the level of 1.00 – 1.49 (very negative attitude) for Mathematics Attitudinal Scale (MAS) administered before the Mathematics Achievement Test with the average performance of 1.50. While 121 students fell within 1.50 – 2.49 (moderate negative attitude) with average performance of 2.04; 390 students fell within 2.50- 3.49 (moderate positive attitude) with average performance of 4.48. Also administered after the Mathematics Achievement Test, five (5) students fell within the level of 1.00 and 1.49 (very negative attitude) with the average performance of 2.90. While 128 students fell within 1.50 – 2.49 (moderate

negative attitude) with average performance of 1.41; 389 fell within 2.50 – 3.49 (moderate positive attitude) with average performance of 2.29 and 78 students fell within 3.50 and 4.00 (highly positive attitude) with average performance of 3.97. Therefore, the influence of Ziller's Model Test Standardization on students' attitude towards learning Mathematics at the levels of 1.00 – 1.49, 1.50- 2.49, 2.50 – 3.49 and 3.50 – 4.00 were: -1.40, -0.64, -0.35 and -0.51 respectively.

Question 5: What is the relationship between students Mathematics anxiety and achievement before and after the application of Ziller's Model of test of standardization?

Table 5: Strength of the relationship between test anxiety and academic achievement before and after the application of Ziller's Model of test standardization.

Variable	Correlation coefficient calculated before and after the application of Ziller's Model	
	Before	After
Direct multiple choice vs. test-anxiety	-0.16 very low and negative	-0.12 very low and negative
Two tier objective standardized scores vs. test anxiety	-0.27 low and negative	-0.22 low and negative
Researchers two tier standardized score vs. test anxiety	-0.27 low and negative	-0.22 low and negative
Ziller's standardaized score vs. test anxiety	-0.18 very low and negative	-0.14 very low and negative

The blue print used to determine the strength of relationship between test anxiety and academic achievement is stated as magnitude:

0.0 - 0.2	Very low
0.3 – 0.4	low
0.5 – 0.6	Moderate
0.7 – 0.8	High
0.9 - 1.0	Very high.

Table 5: Shows very low and negative relationship before and after the application of Ziller's Model in direct multiple choice, likewise, after the Ziller's standardized scores. While low and positive relationship occurred before and after the application of Ziller's model in two tier objective scores, researchers Two tier standardized score and before in Ziller's test standardized scores.

Question 6: What is the relationship between students' attitude towards learning of mathematics and academic achievement before and after the application of Ziller's model of test standardization?

Table 6: Strength of relationship between attitude and academic achievement of students towards learning of mathematics among the senior secondary school students before and after the application of Ziller's model.

Variable	Correlation coefficient before and after the application of Ziller's Model	
	Before	After
Direct multiple choice vs. Attitude	0.17 very low and positive	0.16 very low and positive
Two-tier objective standardized score vs. attitude	0.26 low and position	0.26 low and positive
Researcher two tier standardized score vs. Attitude	0.22 low and positive	o.26 low and positive
Ziller's standardized score vs. Attitude	0.19 very low and positive	0.19 very low and positive

Table 6 shows very low and positive relationship in direct multiple-choice scores and Ziller's standardized score before and after the application of Ziller's model while low and positive relationship exists in two tier objectives, standardized scores and researchers two-tier standardized scores before and after the application of Ziller's model.

Hypothesis Testing.

Hypothesis 1: There is no significant relationship between test anxiety and academic achievements before and after the application of Ziller's model.

Table 7: Correlation coefficient between test anxiety and academic achievement of students in mathematics before and after the application of Ziller's model of standardization.

Variable	Correlation coefficient before and after the application of Ziller's Model	
	Before	After
Direct multiple choice vs. test anxiety	-0.16	-0.12
Two-tier objective standardized score vs. test anxiety	-0.27	-0.22
Researcher two tier standardized score vs. test anxiety	-0.27	-0.22
Ziller's standardized score vs Test Anxiety	-0.18	-0.14

At P < 0.05 critical values of R is 0.345 (failed tests) there was no significant relationship between the test anxiety and academic achievement before and after the application of Ziller's model in variables considered in the Table 7. Hence the hypothesis was upheld at P < 0.05 level of tolerable limit of error.

Hypothesis 2: There is no significant relationship between students' attitude and academic achievement before and after the application of Ziller's model.

Table 8: Correlation coefficient between attitude and academic achievement of students in mathematics before and after the application of Ziller's model for standardization.

Variable	Correlation coefficient before and after the application of Ziller's Model	
	Before	After
Direct multiple choice vs. Attitude	0.17	0.16
Two-tier objective standardized score vs. Attitude	0.26	0.26
Researcher two tier standardized score vs. Attitude	0.22	0.26
Ziller's standardized score vs Attitude	0.19	0.19

At P < 0.05 critical value of R is 0.345. (2 tailed tests). There was no significant relationship between the attitude and academic achievement of students towards learning of mathematics before and after the application of Ziller's model among all the variables illustrated in the table 8. Hence, the hypothesis was upheld at P < 0.05 level of tolerable limit of error.

DISCUSSION

Table 1 showed that, there was high guessing tendency among the senior secondary students in attempting multiple choice tests while in table 2, there was differences among the uncorrected scores in Multiple choice Two-Tier items and Ziller's Standardized Multiple-choice test. These two findings corroborated the studies of Alonge (1990) and Owabumoye (2024).

Table 3 revealed the influence of the Ziller's Model on student's level of test anxiety. The findings showed that after the application of the Ziller's Model, there was a negative influence on test anxiety at the extreme ranges of 1.00 – 1.49 and in 3.50 – 4.00. In contrast, a positive influence was observed within the mid-range scores of 1.50 – 2.49 and 2.50 – 3.49. This distribution of

influence suggests that the Ziller's Model contributed significantly to moderating extreme levels of test anxiety while enhancing favourable responses in the more moderate ranges. The manifestations of both positive and negative influences highlighted the Ziller's Model capacity to refine test measurement and identify nuanced changes in psychological constructs such as anxiety. These outcomes aligned with earlier research by Bechtel (1985), Owabumoye (2024), and Abe, Gbore, Owabumoye & Omotoyinbo (2005) but at variance with Alonge (1989 and 1990).

In Table 4, the influence of Ziller's model on students' attitude towards learning Mathematics was also explored. Positive influences were recorded in the attitude score ranges of 1.00 – 1.49 and conversely, negative influences were identified within the ranges of 1.50 – 2.49, 2.50 – 3.49, and 3.50 – 4.00. These results indicated that Ziller's Model has a mixed but insightful effect on student attitudes, making it a valuable tool for educators seeking to assess and enhance affective learning outcomes. This equally was in line with the studies of Owabumoye (2004) and Abe, et al (2025) but strictly at variance with findings of Alonge (1990).

In Tables 5 and 6, the relationships between test anxiety, attitude, and academic achievement were analysed before and after Ziller's Model was applied. The results in Table 5 indicated very low and negative correlations between test anxiety and academic achievement across multiple scoring systems, including Direct Multiple Choice, Two-Tier Objective Standardized Scores, Researchers' Two-Tier Standardized Scores and Ziller's Standardized Scores.

Table 6 showed very low but positive correlations between students' attitudes and academic achievement using the same scoring methods, signifying a mild but noteworthy association. While Tables 7 and 8 revealed that there was no statistically significant relationship between test anxiety and academic performance, as well as between attitude and academic achievement at the $P \leq 0.05$ level of significance. Thus, the null hypotheses were upheld. These findings support previous studies by Alonge (1990), Alonge & Gbore (2016), Owabumoye (2024), and Abe, Gbore, Owabumoye & Omotoyinbo (2025). This is confirming that while Ziller's model may not yield statistically significant changes in direct academic outcomes, it provides valuable insight into the psychological and attitudinal dimension of students' learning.

CONCLUSION

Ziller's model, significantly influences test anxiety, attitude and academic performance of students towards learning of mathematics; significant relationship does not exist between test anxiety and attitude and academic achievement before and after the application of Ziller's model of test standardization on the secondary school two (SS2) students' mathematics achievement test in Ondo State, Nigeria.

Recommendation

On the basis of these findings, the study recommended the use of Ziller's probability models of test standardization as means of reducing test anxiety at the same time improving or enhancing the attitude of student towards learning of mathematics in secondary schools in Nigeria.

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