

Discrimination Index of Chemistry Teacher's Made-test and Students' Application Ability in Secondary Schools in Ikot Ekpene Local Government Area

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Abstract

The study was aimed at determining the discrimination index of chemistry teacher made test and SS2 student application ability in secondary schools in Ikot Ekpene Local Government Area. To achieve this purpose, three research questions and three hypotheses were stated to guide the study. The descriptive survey design was used in the course of the study. The population comprised 204 SS2 students and 28 chemistry teachers in three public secondary schools in Ikot Ekpene Local Government Area. A total of 155 SS2 students and 20 chemistry teachers were selected for the study using simple random sampling technique. A 50-item developed chemistry Achievement Test (CAT) was used to obtain data used for the study. The instrument was validated by three experts. A reliability coefficient of .89 was realized which the instrument was deemed suitable for use in the study. Mean, Standard Deviation was used to answer the research questions while independent t- test was used to test null hypotheses one and two, while null hypothesis three was tested with One-way Analysis of Variance (ANOVA) at a significant level of 0.05. The result indicated that chemistry teacher made test showed a discrimination index between male and female students of SS2, also between high group and low group while discrimination index was obtained from one of the three schools while a zero-discrimination index was obtained from two of the three secondary schools in Ikot Ekpene Local Government Area. It was recommended among others that chemistry teachers should regularly be refreshed with conference, workshops and seminars to ensure good practice with regards to teacher made test

Keywords: Discrimination index, Application ability, feedback ability, Table of specification, Chemistry teacher

Introduction

Test is seen as a measuring instrument to a teacher as it serves the purpose of measuring students' behaviours in terms of their academic performance; feedback and achievement. As noted by Archibong (2021), test is defined as a systematic procedure for measuring students' performance by structuring standardized sets of questions and subjecting it to evaluation in a given domain. Teacher made test is one of the valuable instruments used by chemistry teacher to assess students understanding of lesson taught in class. Teacher made

test could be constructed to measure differences between bright and dull students. As asserted by Udoh (2003), teacher made test are constructed to discriminate at all times and showing the difference between two groups of students. The discrimination index of a test is a measure of items ability to discriminate between groups of students (that is high group and low group). This means that chemistry teacher made test should be constructed to distinguish between high learner and low learners. The discrimination index of chemistry teacher made test as asserted by Archibong (2021) is expected to differentiate between learners of different groups as classified into male and female, high group and low group, class type, group ability, age group, peers group, left-handed and right-handed students among others.

Discrimination Index of an item could either be positive, negative or zero depending on the teacher's ability in test construction. A positive discrimination is obtained when test items are correctly answered by bright students more than dull students, a negative discrimination index is obtained when dull students answers correctly than the bright students. Accordingly, when bright students and dull students answer questions equally, a zero discrimination is obtained (Udoh 2003).

The discrimination index of a test also provides feedback to the teacher on what students have learnt. According to Buttler and Winge (2015), feedback from teacher made test provides information on students' performance, application abilities, improves student's confidence and academic achievement. According to Usoro and Ogbuanya (2013) academic achievement in school subject is usually designated with a score, Kanno (2004) had earlier asserted that achievement is quantified by means of the students' academic standing in relation to those of other students of the same class. In this research article, the authors posited that academic performance is measured based on scores in achievement test developed and administered by chemistry teachers. As posited by Adika and Adika (2015), students' academic performance consists of scores obtained from teacher made test which represent the learners' level of ability and intelligence.

Application ability is reflected in the third level of the cognitive domain where a learner is expected to apply knowledge of information in a new situation. This entails the ability of the chemistry teachers to construct test items that will enable the students to think and apply knowledge of concepts from one lesson to the other; such test items reveal true understanding of students in a given class (Yoloye 2011).

Types of Teacher Made Test

Teacher made test are categorized based on what they are intended to measure. As stated by Udoh (2003), the various tests in use are based on the test purpose. Teacher made test include the following; achievement test, ability test, aptitude test and intelligence test. However, the most commonly classroom test used by teachers is achievement test, for the purpose of revealing learning outcomes for a particular subject such as chemistry.

Achievement test measures learning that has taken place recently to determine the present level of knowledge in a given domain after teaching and learning have taken place. Achievement test enables chemistry teachers to obtain accurate information about student knowledge and performance in chemistry. Aptitude test is an inborn capacity to do something in future particularly when trained. Intelligence test measures an individual ability to think and solve problems, ability to transfer knowledge and adapt to new experience.

Skills in Test Construction and Table of Specifications

Skills in test construction enable a teacher to construct test with precision. Objectivity and good grunting scale (Silker, 2013). A quality achievement test involves the following steps: defining objectives, stating content to be covered, developing a test blue print, item writing, try-out items and item analysis. The test blue print or table of specification provides a graphic representation of the content of a course and the educational outcomes/objectives. This allows chemistry teachers put together content and statement of objectives when assigning percentage to content and objectives. The test blue print ensures chemistry teachers plan all components of the test before writing the items. It requires the following steps

- a Choosing the domains to be covered
- b Assigning percentage value to each level of the domain
- c Drawing up content to be covered
- d Preparing the table

Chemistry Teacher Made Test and Students Application Ability (Feedback)

Feedback in this work refers to positive or negative application of test by students. Feedback could enhance the student's ability to perform task and determine their own performance. Students are given the opportunity for feedback to determine any performance gap and to improve on areas which they might be expected to be assessed accurately. Feedback shows student's ability, that is their strengths and weakness.

A feedback strategy is needed to reduce the gap and enhance appropriateness of self-assessment. Feedback could be categorized as positive or negative positive. Positive feedback is used to indicate that an expected or desired behaviour was demonstrated while negative feedback indicates that a behaviour was no performed correctly. Positive feedback has favourable effect on motivation and self-efficacy which improves performance and facilitates learning. It goes with a compliment such as well-done while negative feedback consists of criticism such as more effort is required or outrightly "you are wrong". The students used these comments to assess their own performance ability in order provide opportunity for more accurate application ability. Hence, this study was poised to determine if chemistry

teacher made test can discriminate student's application ability in secondary schools in Ikot Ekpene Local Government Area, Akwa Ibom State.

Purpose of the Study

1. Determine the discrimination index in chemistry teacher made test on SS2 students' application ability based on sex
2. Determine the discrimination index in chemistry teacher made test on SS2 students' application ability based on learning rate
3. Determine the discrimination index in chemistry teacher made test on SS2 students' application ability based on school type

Research Questions

1. What is the discrimination index in chemistry teacher made test on SS2 students' application ability based on sex?
2. What is the discrimination index in chemistry teacher made test on SS2 students' application ability based on learning rate?
3. What is the discrimination index in chemistry teacher made test on SS2 students' application ability based on school type?

Research Hypotheses

The following are the hypotheses stated for this study:

1. There is no significant difference in the discrimination index of chemistry teacher made test and SS2 students' application ability based on sex
2. There is no significant difference in the discrimination index of chemistry teacher made test and SS2 students' application ability based on learning rate
3. There is no significant difference in the discrimination index of chemistry teacher made test and SS2 students' application ability based on school type (A, B, and C)

Methodology

Three schools were sampled out of eight public secondary schools in Ikot Ekpene Local Government Area of Akwa Ibom State. The population of 204 SS2 students was drawn from the three sampled schools which constituted 62, 70 and 72 respectively. Using simple random sampling technique, a sample size of 45, 52, and 58 was obtained from each school, making a total of 155 SS2 students. A 50-item chemistry achievement test was developed by the chemistry teachers in the three schools. Ten selected chemistry teachers from the three

schools teamed up to construct the test. This was done to ensure uniformity of standard in planning and writing the items for the test. The test was content validated by three chemistry lecturers from Science Education in the University of Uyo. All necessary corrections made were incorporated into the final copy of the instrument. A trial test was conducted using 30 students who were not part of sample size but were from the parent population and a reliability coefficient of .89 was achieved. From this high coefficient of reliability, the test items were deemed fit for the study. The instrument was administered by the researchers to the respondents in their respective schools to avoid experimental bias. All copies of the instrument were retrieved, making a returned rate of 100 %. This was possible, since the students involved were all careful not to be missed out from the study. The data obtained was analysed using mean and standard deviation for the research questions and independent t-test, and One-way Analysis of Variance (ANOVA) to test the null hypotheses at .05 level of significance. In taking decision for the research questions the following were observed:

1. a positive discrimination was obtained when test items are correctly answered by bright students more than dull students,
2. a negative discrimination index was obtained when dull students answers correctly than the bright students. Accordingly,
3. a zero discrimination was obtained when bright students and dull students answer questions equally

Result

Research Question 1: What is the discrimination index in chemistry teacher made test and SS2 student application ability based on sex?

Table 1: summary of mean difference of the discrimination index in chemistry teacher made test and SS2 students’ application ability based on sex

Variable	sex	n	\bar{X}	SD	Mean diff.
Application Ability based on sex	Male	62	36.68	9.32	5.34
	Female	93	39.02	7.13	

The result in Table 1 indicated the mean score of discrimination index of chemistry teacher made test and SS2 students’ application ability based on sex. As shown in the Table1, the mean score of the male students was 33.68, while female chemistry students’ score was 39.02. This showed that the female students had a high score over the male students. The mean score difference between the male and female students is 5.34. Thus, there was a positive discrimination index in favour of the female students than their male counterpart.

Research Question 2: What is the discrimination index in chemistry teacher made test and SS2 students’ application ability based on learning rate?

Table 2: summary of mean difference of the discriminant index in chemistry teacher made test and SS2 students' application ability based on learning rate

Variable	Learning rate	n	\bar{X}	SD	Mean diff.
Application Ability based on learning rate	high (50-100)	89	40.47	8.62	5.65
	low (1-49)	66	34.82	9.63	

The result in Table 2 indicate the mean score of discrimination index of chemistry teacher male test and SS2 student's application ability based on learning rate. As indicated on the Table 2, the mean score of high groups was 40.47 and that of the low group was 34.82. The result showed that students in the high group had a high score over students in the low group. The mean score difference between the two group is 5.65, thus, the students in the high group were able to answer chemistry teacher test more than the students in the low group. Therefore, chemistry teacher made test showed a positive discrimination index among the students with high learning rate and those with low learning rate.

Research Question 3: What is the discriminant index in chemistry teacher made test and SS2 students' application ability based on school type (A, B and C)?

Table 3: summary of mean difference of the discrimination index in chemistry teacher made test and SS2 students' application ability based on school type (A, B and C)

Variable	schools	n	\bar{X}	SD	Mean diff.
Application Ability based school type	A	45	38.36	7.18	3.92
	B	52	42.28	8,67	
	C	58	38.36	7.13	

The result in Table 3 indicate the mean score of discrimination index of chemistry teacher made test SS2 students application ability based on school type in Ikot Ekpene Local Government Area. As shown in Table 3, the mean score of school A was 38.36, school B was 42.28, while that of school C was 38.36. This showed that SS2 students from school B had a highest mean score than SS2 students from school A and C. The mean difference between the two schools (A and C) was 0, showing that there was zero discrimination index between them, in the other hand, SS2 students from school B had a positive discrimination index more than the other two schools. This implies that the chemistry teachers in school A and C had not been able to construct their regular test to discriminate between their students hence, the result of zero discrimination index. In the other hand, the result indicated that students from school B outperformed students from school A and C as indicated their chemistry teachers had been constructing their regular test to discriminate among the students.

Null Hypothesis 1: There is no significant difference between discrimination index in chemistry teacher made test and SS2 students’ application ability based on sex

Table 4: t-test analysis of discrimination index of chemistry teacher made test and SS2 students’ application ability based on sex

Variable	sex	n	mean	df	t-cal	p-value	Decision
Application Ability based on sex	Male	62	36.68	153	8.58	.023	Sig.
	Female	93	39.02				

Table 4 showed a summary of t-test analysis of the mean responses of SS2 students on discrimination index of chemistry teacher made test and application ability based on sex in Ikot Ekpene Local Government Area. The result presented showed (t-cal = 8.58 @ 153 and p-value of .023) since the calculated p-value .023 is less than the declared probability level of .05. This showed that the null hypothesis which stated that there is no significant difference between discrimination index in chemistry teacher made test and SS2 students’ application ability based on sex is rejected. Deduction from the hypothesis showed that female students had a significant discrimination score than the male students in chemistry teacher made test in Ikot Ekpene Local Government Area.

Null Hypothesis 2: There is no significant difference of discrimination index of chemistry teacher made test and SS2 students’ application ability based on learning rate

Table 5: t-test analysis of discrimination index of chemistry teacher made test and SS2 students’ application ability based on learning rate.

Variable	Learning rate	n	mean	df	t-cal	p-value	decision
Application Ability based on learning rate	high (50-100)	89	40.47	153	15.26	.007	Sig.
	low (1-49)	66	34.82				

The result presented in Table 5 showed (t-cal= 15.26 @ 153 and p-value of .007), since the calculated p-value .007 is less than the declared probability level of .05. This showed that the null hypothesis which stated that there is no significant difference of discrimination index of chemistry teacher made test and students application ability based on learning rate rejected. Deduction from the hypothesis showed that the students in the high group had a significant discrimination score than those in the low group in Ikot Ekpene Local Government Area. Thus, there is significant difference of discrimination index of chemistry teacher made test and SS2 students’ application ability based on learning rate.

Null Hypothesis 3: There is no significant difference of discrimination index of chemistry teacher made test and SS2 students' application ability based on School type.

Table 6: Summary of ANOVA on discrimination index of chemistry teacher made test and SS2 students' application ability based on school type

Variables	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1254.052	2	627.026	2.115	.124
Within Groups	45065.723	152	296.485		
Total	46319.775	154			

Table 6 showed the summary of One-way Analysis of Variance (ANOVA) test for the discrimination index of chemistry teachers in three schools in Ikot Ekpene Local Government Area. The result showed that the calculated (F-value is 2.115, @df of 2 and 152.) Since the F-value is greater than the significant level of 0.05, the null hypothesis which stated that the discrimination index of chemistry teacher made test and SS2 students' application ability based on school type is retained. Thus, there is no significant difference between the discrimination index of chemistry teacher made test and SS2 students in the three schools in Ikot Ekpene Local Government.

Discussion of Findings

Discrimination index of chemistry teacher made test and SS2 students' application ability.

The result in Table 1 showed that the female students had a high score over the male students in SS2 in Ikot Ekpene Local Government Area. The corresponding null hypothesis also indicated that there is significant difference between discrimination index in chemistry teacher made test and SS2 students' application ability based on sex. The result is attributed to the fact that male and female SS2 students did not perform equally in chemistry teacher made test. However, the test showed a positive discrimination between the two groups. The result showed that chemistry teachers have knowledge of test construction procedures. This result is supported with the findings of Magno and Quansah (2013) who stated that most teachers they studied had knowledge in test construction procedures. Therefore, the finding of the study upholds the fact chemistry teachers in secondary schools in Ikot Ekpene Local Government Area are able to construct test that discriminate between male and female SS2 students.

Discrimination index of chemistry teacher made test and SS2 students' application ability based on learning rate.

The result as presented in Table 2 revealed that students in the high group had a high score over students in the low group. The corresponding hypothesis further revealed that there is significant difference in the discrimination index of chemistry teacher made test and SS2 students' application ability based on learning rate. The result is obtained from the fact that students in the high groups performed better than students in the lower group. The result of the study is in agreement with the findings of Archibong (2021) who found that students in high group performed better than students in low group in chemistry test at knowledge and comprehension levels of the cognitive domain. However, the findings of the study imply that students who spend more time in learning perform better than those who spend little or no time in learning. The finding of the study thus, revealed that chemistry teachers in Ikot Ekpene LGA construct and administer tests that do discriminate between bright and dull students, that is; students in the high group and those in the low group as noted in the result.

Discrimination index of chemistry teacher made test and SS2 students' application ability based on school type (A, B, and C)

The result shown in Table 3 indicated that SS2 students in school A and C had a zero-discrimination index while students from school B had a discrimination index between the two schools. This implies that chemistry teacher in school B usually constructed test to discriminate within their students. The corresponding hypothesis was not able to show the discrimination index in terms of significant result. This result could be explained by the fact that the regular test items constructed by chemistry teachers in school A and B may not be based on test blue print and as such were not able to discriminate between the two schools. The finding is in consonance with the findings of Dosumu (2016) who asserted that teacher made test are often constructed hurriedly without referring to the test blue print. Accordingly, Udoh (2013) collaborated this result which implies that such hurriedly made test usually result in zero discrimination. Thus, the findings of the study maintained that chemistry teachers in school A and school C were not able to set their regular test to discriminate, while Chemistry teachers from school B were able to construct their regular class test to discriminate between their students hence, they outperformed students from other two schools in this research study.

Conclusion

From the findings of the study, it is concluded that chemistry teacher made test administered to SS2 student in Ikot Ekpene Local Government Area only discrimination between male and female students, and between students in high group and low group, while a zero discrimination was obtained in school type (A, B and C). Therefore, it is concluded that not all the chemistry teachers in senior secondary schools in Ikot Ekpene Local Government Area have knowledge to construct test items in order to discriminate at all times.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Chemistry teachers should regularly be refreshed through conference, workshops and seminars to ensure good practice with regards to the construction of teacher made test.
2. Chemistry teacher should at all times be encouraged to construct test items based on the test blue print to ensure adequate distribution of questions in order to obtain a positive discrimination index
3. Chemistry teachers should endeavour to carry out a final test on items before administrating to the entire students.

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