DETERMINING THE DIFFERENCES IN THE DIFFICULTY AND DISCRIMINATING INDICES OF CHEMISTRY COMPLETION AND MATCHING TEST FORMATS

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ABSTRACT

The study is set out to determine the differences in the difficulty and discriminating indices of chemistry completion and matching test items. It was discovered from observation that the matching and completion test formats are not commonly used in chemistry examinations. The reason for this could not be ascertained. Could it be that it does not discriminate well between the dull and brilliant students or the difficulty level could not be determined or the difficulty level is too high or low for effective differentiation to be made within the students or what are the differences in the discrimination and difficulty indices of chemistry completion and matching test formats is what the study is set out to discover.

INTRODUCTION

The importance of test cannot be over emphasized in our society due to the fact that it is used in making diverse decisions in our day to day activities. While some are decisions at the national and international levels that have to do with policies concerning budgets and treaties, energy and pollution, others are about people, individuals or groups.

The teacher, counsellors, school administrators, the psychologists are continuously involved in decision making about people therefore, the role of tests and measurement procedure in this regard is to provide the information that will permit these decision to be informed and appropriate. In other words, a test can be used to differentiate individual performance with designated standard of performance.Some teachers make use of formal measuring tools while others base their assessment on the subjective impression developed through their daily interactions with the students.

A test can be defined as the instrument to measure a sample of behaviour from which a total aspect of the behaviour is inferred (Oladunni 1996). A test can be in objective or essay form. Objective test is the type of test where the student is required to pick the correct option from the options presented to him, while in the essay test, the students are given the opportunity to organize and present his own view points as he feels.

As a result of population explosion in our schools, objective test items including completion and matching tests seem to become very useful and expedient evaluation technique and efficacious instrument to assess large sample of subjects in a wide expense of content area. It was discovered from observation that the matching and completion test formats are not commonly used in chemistry examinations. The reason for this could not be ascertained. Could it be that it does not discriminate well between the dull and brilliant students or the difficulty level could not be determined or the difficulty level is too high or low for effective differentiation to be made within the students or what are the differences in discrimination and difficulty indices of chemistry completion and matching test formats is what the study is set out to discover.

In Nigerian educational system, from primary to university level, it seems test are often constructed and administered by most classroom teachers with little or no concern for the qualities that every measurement procedure should possess. Issues of the level of difficulty of items in their test format or whether their items will help to discriminate positively or negatively between the groups of students in their classes seem to hardly border them.

Aside from the difficulty and discriminating indices of items, every genuine measurement procedures should possess other qualities such as the psychometric properties of validity, reliability etc. In which case, how reliable and valid are these classroom teachers test? Are there any consistencies in the conduct of the test? At the end of the test, are classification usually made as to the number of passes or failures>

These faulty procedures seem sometimes to debar, delay or totally deny the progress of many students. Faulty examination procedures, especially those that do not take any cognizance of the difficulty and discriminating levels are dangerous as brilliant or dull student could be misjudged. However, item analysis could be done to ascertain the worth of test items so that objectives for which the administration of the test is based, part of which is to discriminate between brilliant and dull students could be achieved.

Thus in this study, matching and completion test items will be compared using item analysis. Although possible test analysis includes test reliability, item difficulty, test score variation due to guessing, index of discrimination, item efficiency and item scoring. Only some of these properties would be considered (item difficulty and index of discrimination) with a view of enhancing informed educational decision on test selection and use.
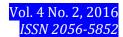
The researcher observed that despite the fact objective test are now widely used in our schools in the federation, some types of objective tests like matching and completion test seems not to be among the commonly used ones especially in chemistry papers. The use of objective test rest on the teachers that sets the question but the big question is weather the questions are too difficult or too simple to construct for the teacher or for the students to answer or probably it does not discriminate between the lower and upper ability students or whatever could be the major reason why these two objective test types are not in common use is what the researcher is set out to discover.

The study is out to provide answers to solve the following questions:
1. What is the distribution of students' performance in matching test?
2. What is the distribution of students in completion test?
3. What is the distribution of students' performance according to sex for completion test format?
4. What is the distribution of students' performance according to sex for matching test format?

The purpose of the study is to determine whether there would be differences in the difficulty and discriminating indices of matching test formats of chemistry achievement test. The study would also determine whether there is difference in the difficulty and discriminating indices of completion test format and also compare the performances of boys and girls in matching and completion test formats of chemistry achievement test.

The research questions that have been raised in this study are:

(1) Is there any significant difference between difficulty indices of matching and completion test formats in chemistry?

(2) Is there any difference between the discriminating indices of matching and completion test formats in chemistry achievement tests?

The following null hypothesis were generated and tested from the above questions to facilitate thorough investigation into the main study.

Ho 1: There is no significant difference between the difficulty indices of matching and completion test items in chemistry achievement test.

Ho 2: There is no significant difference between the discriminating indices of matching and completion test items in chemistry achievement test.

It is expected that this study could contribute to current literature on test construction. It would also provide additional and alternate objective test formats apart from the true/false and multiple choice formats that are regularly used by classroom teachers. The study could arouse the teachers' interest to the psychometric properties of test items. It could enable them to be sensitive to the reliability, validity, difficult and discriminating indices of test items so as to achieve the aims for which tests are set.

It will also help in discriminating well between the dull and brilliant students so as not to misjudge the brilliant ones. This study therefore provide the teachers or any person involved in testing process additional formats that are equally suitable for evaluating students achievement so as to obtain desirable results.

The significance of this study also lies in its potentials to ease test scoring procedure and administration. The curriculum department and continuous assessment units of the ministry of Education, the examining bodies or agencies like Joint Admission and Matriculation Board (JAMB), Nigeria Teachers Institute (NTI) State Primary Education Board or State Universal Basic Education Board SUBEB) and West African Examination Council (WAEC) would find this study as complementary and of relative importance in the conduct of their examination.

The study is limited to Ado Local Government Area of Ekiti State. The content spreads across the O'level chemistry syllabus using the matching and completion test formats.

METHODOLOGY

The research design used in the study is a survey design. This survey research studies both large and small population by selecting and studying samples chosen from the population to discover the relative incidence, distribution and inter-relation of sociological and psychological variables.

The population for the study comprised all chemistry students in senior secondary school. Three (SSIII) in the 14 (fourteen) public secondary schools in Ado-Local Government Area of Ekiti State. The sample comprised 400 SSIII students randomly selected to take part in the study. The 400 were selected using simple random sampling technique Fifty students were randomly selected from each of the eight schools used. Each of the groups (of 50 students) were randomly assigned the two variants formats of the Chemistry Reviewed Questions (CRQ) and the sampling technique is stratified random sampling.

The study group was found to be relatively homogeneous in chemistry such that the result of the study would decline to reflect not only abilities of the subjects, but also the differences in the question formats. The sample did not provide a stewed distribution in form of sex and age.

The instrument used for the study is in two distinct parts. The first part is a 60 items chemistry completion test based on the O'level syllabus. The second and alternative test is also item matching test which is essentially a replica of the 60-item completion test. Both tests are strictly based and spread across O'level chemistry syllabus. The duration of the test is one hour, 30 minutes. All the 60 completion items and 60 items of matching test passed through the on process of item analysis (validation, difficulty, discrimination and item selection. The test format were certified to have contents validities by comparing it using the table of specification and face validities by three experts in chemistry and two specialist in test and measurement and thus found to be standard research instrument suitable for administration.

The reliability of the instrument was ascertained by using Test-re-test and Kinder Richardson formulae 21 (KK 21) to get r = 0.85 and r = 0.77 respectively. The difficulty index of the 60 item completion test and 60 item matching test from pre-test ranged from 0.30 to 0.70.also the discriminating index ranged from 0.00 to 0.97. However, the final form of the questionnaire used reflected the suggestions and recommendations of the panel of review as well as the result of the pre-test stage. The four hundred (400) subjects randomly selected for the study reacted to two variant formats of Chemistry Reviewed Questionnaire (CQR).

Copies of the questionnaire were distributed to the subjects under test conditions. The subjects were not aware of the discrepancy in the question formats. They were allowed to react to the questions and the scripts were collected back after one hour 30minutes when the stop order was given. These were statistically tested with the use of parametric t-test. The t-value was tested at 0.05 levels of significance.

RESULTS AND DISCUSSION

Table 1
Distribution of overall performance in matching test formats

Range	Frequency	Percentage
Above 70	15	3.75
61-70	35	8.75
51-60	95	23.75
41-50	95	23.75
31-40	110	27.5
10-30	50	12.5
Total	**400**	**100**

From the above 15 students scored above 70, representing 3.75% of the sample, 35 students scored between 61-70 presenting 8.75% of the sample, 95 students scored between 51-60 representing 23.75% of the sample, 95 students scored between 41-50 representing 23.75% of the sample while 110 students scored between 31-40 representing 27.5% of the sample while 50 students from the sample scored between 10-30 representing 12.5% of the sample.

Table 2: Distribution of overall performance in completion test formats

Range	Frequency	Percentage
Above 70	18	4.5
61-70	27	6.75
51-60	50	12.5
41-50	110	27.5
31-40	95	23.75
10-30	100	25
Total	400	100

From the table above, 18 students scored above 70 representing 4.5% of the sample use, 27 students scored between 61-70 representing 6.75% of the sample while 50 students scored between 51-60 representings 12.5% of the sample, 110 students scored between 41-50 representing 27.5% of the sample, 95 scored between 31-40 representing 23.75% of the sample while 100 students scored between 10-30 representing 25% of the sample. This shows that completion test format appeared easier for the student to solve than the matching test format

TESTING THE HYPOTHESES
Hypotheses 1

There is no significant difference between the difficulty indices of matching and completion test items in chemistry. The mean and standard deviation of the scores obtained from the discriminating test items was subjected to t-test analysis and the result is as presented in the table 3 below.

Table 3: t – test summary table on difficulty indices between matching and completion test formats in chemistry

Format	N	X	S.D	Df	t calc.	t-table
Marching	400	0.39	0.43	198	1.60	1.98
Completion	400	0.43	0.48			

P >0.05 (Not significant)

The mean difficulty index for the matching test is 0.39 while the mean for difficulty indices for completion test 0.43. The standard deviation for difficulty index for matching and completion test was 0.43 and 0.48 respectively. From this, it could be inferred that the completion test is somehow easier than the matching test.

The mean and standard deviation of the difficulty indices for the matching and completion test format were later applied to t-test analysis. The computed t-value was 1.60 while the table value was 1.98. the table value was more than calculated value, therefore the hypothesis that there is no significant difference between difficulty indices of matching and completion test was not rejected. Hence there is no significant difference between difficulty indices of matching test and that of completion test in chemistry.

Hypothesis 2

There is no significant difference between the discriminating indices of matching and completion test items in chemistry achievement test.

To test this hypothesis, the mean and the discriminating index of matching and completion formats were found to be 33.33 and 2.27 respectively while the standard deviation of discriminating index were 0.38 and 0.29 respectively. The mean and standard deviation of the two test formats in chemistry achievement test were later subjected to t-test analysis and the results are as presented in table 4 below.

Table 4:t-test summary table on discriminating indices between matching and completion test formats in chemistry

Format	N	X	S.D	Df	t calc.	t-table
Marching	400	3.33	0.38	798	1.88	1.98
Completion	400	2.27	0.29			

P > 0.05 (not significant)

The interpretation of the above table is that matching test items could discriminate more between the bright students and the dull ones. The mean suggests this. The discriminating indices were tested for significance level by computing t-value and the t-value was 1.88, the table value was 1.98, the calculated value was statistically not significant hence we accept the null hypothesis that there is no significant difference between the discriminating index of matching and completion test.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that completion test discriminate better than matching test hence, test constructors should endeavour to include both forms of test alongside other forms in examining students in chemistry knowledge.

Based on the findings and conclusion of this study, the following recommendations were made:
1. Due to population explotion in your institutions, both matching and completion test are recommended as very useful and expedient assessment techniques and efficacious instrument to evaluate a large sample of subjects on a wide expanse of course content and process objectives.
2. The examination bodies JAMB, NECO, WAEC, NABTEB, TEDRO etc. and evaluation and standard unit of the ministry of education could use a combination of both types of test instead of the continuous and persistent use of a particular type always.

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