

Assessing Functionality and Roles of Key and Distracters of Students' Response to Multiple Choice Tests Using an Inspection Approach

Dr. Sunday Ughwubetine **Irighweferhe**

Department of Educational Foundations, Faculty of Education,
University of Delta, Agbor, Delta State

Email: sunday.irighweferhe@unidel.edu.ng

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ABSTRACT

This paper examined the functionality and the role of keys and distracters of the response of students in multiple choice test constructed by classroom teachers in Mathematics. The population consists of Junior Secondary school students from Delta and Edo states Nigeria. Thirty multiple choice tests constructed by classroom teachers were administered to a sample of 300 jss2 students, 150 in Edo south senatorial districts and 150 from Delta central senatorial districts of Edo and Delta state respectively. The psychometric property of the instrument was not established as the key and distracters of multiple-choice tests affect the psychometric properties which is one of the major reasons why the research was been carried out. The inspection method was used to find out the functionality of the key and distracters, percentage was also used to analyse the data collected. The results obtained was analysed and it was discovered that 50% of the items have some distracters that are not functioning while 24% have keys that are not functioning. The non-functioning key and distracters have implications for the validity, reliability, objectivity and usability of the multiple-choice tests. Conclusions were drawn and the following recommendations were made: the teacher and other test constructors should be well informed on the rudiment of how to construct multiple choice tests, tests constructed by both teachers and public examination bodies should be subject to trial testing where the emphasis should not only be on the difficult-level and discriminative index but also include an analysis of keys and distracters.

Keywords: Assessing, functioning key, distracters, inspection, multiple choice tests

INTRODUCTION

There are two types of tests based on format of response: the essay type and the objective type. The essay type of test requires the students to provide the answer to the question while the objective type requires student to select answer from alternative or options provided in the question. There are five forms of objective test these are: multiple choice item, matching of item, rank-ordered item, alternative-response item and supply item or complete items. The multiple-choice tests are one of the most widely used forms of test by both classroom teachers and public examination bodies in Nigeria such as: West African Examinations Council (WAEC), National Examination Council of Nigeria (NECO), Joint Admission and Matriculation Board (JAMB), States Ministries of Education Examination Bodies and so on. The multiple-choice tests consist of the stem which is the main question, the options, that is consists of the key which is the correct answer and the distracters or foils which are the incorrect answers. These parts of the multiple-choice tests need to be properly designed for the test to meet up their validity, reliability, objectivity and usability functions or roles.

A test is a device, tool or instrument intended to measure a testee's knowledge, skill, attitude, physical fitness or classification in many other topics. Egbule (2005), defined a test as a set of tasks or a presentation of a standard set of questions to be answered. Irighweferhe (2008) pointed out that tests serve a major purpose in the educational system.

It acts as a medium for selecting students for educational programmes, promoting students from one level to another, diagnosing students' areas of difficulties, predicting the future performance of students, and provision of data for research and counselling purposes.

A test can be classified as an achievement test, aptitude test, intelligence test, personality test, interest test and so on. Achievement test has been defined by various authors: Ipaye (1983) defined an achievement test as an evaluation of past, and present learning by measuring progress that students have made as a result of instruction or training. It is a test designed to measure students' present level of knowledge or skill or performance. From the above definitions, an achievement test can therefore be defined as a course-oriented test that is designed to measure the degree to which students have acquired information or performance skills as a result of organised units of instruction. There are various criteria used in classifying achievement tests. Egbule (2005) and Irighweferhe (2008), identify the following types of achievement tests based on their intended objectives; end-of-course achievement test, achievement test for critical skills, diagnostic achievement test and general achievement tests. Based on their reliability, validity, objectivity and usability achievement test can be classified into standardised and teacher-made tests. Based on the format, achievement tests can be classified as essay-type tests and multiple-choice item test types (Oji, 2011). For this research work, the effectiveness of distracters and keys of multiple-choice tests will be investigated. Jeri (2012) defined a multiple-choice item as a good structure test item in which the testee is required to identify or select the correct option from a given set of alternatives. Therefore, a multiple-choice question or item is one in which the number of options (four/five) is provided from which the testee is required to select the correct option. The multiple-choice tests consist of the stem and the options. The options consist of the key which is the correct answer and the distracters or foils the incorrect answers. Irighweferhe (2008), suggested the following criteria for writing multiple choice tests:

1. **The Stem**

- The stem may be in the form of a question or statement but it must indicate the task being set to the candidates.
- It must also include all the information necessary for an understanding of the purpose of the question.
- Avoid using double negative statements.
- The statement should be clear and brief.
- The test constructor should ensure only one correct key is included.

2. **The Option**

- The option must each bear a correct grammatical relationship to the stem.
- Each option must be stated unambiguously but concisely
- An item must contain only one correct and best answer.
- Each (wrong answer choice) distracter must be plausible and serve to attract some candidates.
- The option should be comparable in length and mode of expression.

- The option should not contain ‘give away’ words in unintentional clues to the correct answer such as always, often, very, only, rarely, never.
- The option should not repeat information which can be more conveniently placed in the stem.
- If the stem requires a testee to choose the ‘best’ or ‘most likely’ response, the option must be compatible with this request and not simply require the testee to choose the correct from the incorrect.
- Responses of the “all of the above” or “none of the above” should be avoided.
- The keyed response must be distributed evenly between the positions.

Multiple choice tests test is one of the major formats of test items commonly used in the school system by the school teacher-made test) and public examination bodies (standardised tests). Most of the teachers in the school system are not test experts and do not know how to construct a test. Osadebe and Kpolovie (2009), Orluwene and Ukwuije (2009) and Irighweferhe (2013) pointed out that the psychometric properties of tests designed by the classroom teachers are not established before administering.

The stem, the key and the distracters play different roles in the construction of multiple-choice tests as it relates to the reliability, validity, objectivity and usability of the test. This has constituted challenges to teachers who are not test experts which in turn has possess challenges in the evaluation and assessment of testees in Nigeria. Most of the teachers constructing test items do not know how to construct test items with distracters that are plausible and serve as attractive to some candidates. Some of the teachers made test items with distracters which give away words that give clues to the correct answers, this has affected the qualities of the test items which has constituted challenges or problems for the teachers, students, school administrators and the evaluation testee in the educational system. This has prompted the researchers to carry out this research to address the problem.

Research Questions

The following research questions were posed to guide the study:

1. How many of the items have all the distracters of the Mathematics multiple choice tests are functioning effectively?
2. How many of the items have some of the distracters in the Mathematics multiple choice tests are not functioning properly?
3. How many of the Mathematics multiple choice tests have the key functioning?
4. How many of the Mathematics multiple choice tests have the key not functioning?

METHODOLOGY

The study implores a descriptive survey design to find out the effectiveness of distracters of a multiple-choice test constructed by a classroom teacher for Mathematics students in junior secondary school. The study was carried out in Delta Central Senatorial districts of Delta and Edo South Senatorial districts of Edo State. The population for the study were Mathematics students in junior secondary school in Edo and Delta State in 2021/2022 academic session. A sample of 300 JSS 2 students were selected for the study. The instrument for the study is 30 items Mathematics multiple choice tests designed by a classroom teacher. The validity and reliability of the instruments were not established as

the non-effectiveness of distracters and key can affect validity and reliability which is one of the main reasons for this research. The instruments were administered to 150 students in Delta and Edo states each. Research questions were answered using inspection methods as suggested by Egbule (2007), Ou (2011) and Front (2018), they opined that the best method to evaluate distracters and the key of the multiple choice tests is by inspection. The inspection method involved grouping the students into two groups: the upper group and the lower group based on their performance.

Research Question 1

How many of the items have all the distracters of the Mathematics multiple choice tests functioning effectively?

Table 1

Items with all the distracters functioning effectively

Items	Functional Keys	Non-Functional Keys	Functional Distracters
2	A	-	B, C, D, E
5	C	-	A, B, D, E
6	C	-	A, B, D, E
8	D	-	A, B, C, E
9	A	-	B, C, D, E
12	D	-	A, B, C, E
14	D	-	A, B, C, E
16	A	-	B, C, D, E
17	A	-	B, C, D, E
19	D	-	A, B, C, E
22	B	-	A, C, D, E
24	D	-	A, B, C, E
26	E	-	A, B, C, D
28	A	-	B, C, D, E
29	C	-	A, B, D, E

From Table 1, 15 out of the 30 items, representing 50% have all distracters functioning.

Research Question 2

How many of the items have some of the distracters in the Mathematics multiple choice tests not functioning properly?

Table 2*Items with some of the distracter not functioning properly*

Items	Functional Keys	Functional Distracters	Non Functional Distracters
1	C	A, B, D	E
3	E	B, C, D	A
4	B	A, D, E	C
6	C	B, E	A, D
7	-	C, D	A, E
10	B	A, D, E	C
11	-	C, D	A, B
13	D	A, C, E	B
15	C	B, D	A, E
18	-	A, C, E	D
20	A	B, C, E	D
21	B	A, D	C, E
23	-	A, C, D	B
25	C	A, B, D	E
30	-	A	C, D, E

From Table 2, 15 out of the 30 items representing 50% have some of the distracter not functioning properly.

Research Question 3

How many of the Mathematics multiple choice tests have the key functioning?

Table 3*Items with the key functioning properly*

Items	Functional Keys	Non-Functional Keys
1	C	-
2	A	-
3	E	-
4	B	-
5	C	-
6	C	-
8	D	-
9	A	-
10	B	-
12	D	-
13	D	-
14	D	-
15	C	-
16	A	-
17	A	-
19	D	-
20	A	-
21	B	-
22	B	-
24	D	-
25	C	-
26	E	-
28	A	-
29	C	-

From Table 3, the key (correct answer) of 24 of the 30 items are functioning properly.

Research Question 4

How many of the Mathematics multiple choice tests have the key not functioning?

Table 4

Items with the key not functioning properly.

Items	Functional Keys	Non-Functional Keys
7	-	B
11	-	E
18	-	B
23	-	E
27	-	D
30	-	B

From Table 4, the key in 6 of the items representing 20% are not functioning properly.

DISCUSSION OF FINDINGS

The study found out that out of the 30 items in the Mathematics Multiple choice tests for the study the key of 24 items are functioning properly representing 80% of the total items while 6 keys are not functioning properly representing 20%. This has implications for the qualities of the psychometric properties of the teacher-made Mathematics multiple choice tests. In the same vein 15 out of 30 items in the multiple-choice test, the distracters are functioning properly representing 50% while the other 15 items the distracters are not functioning which also represents 50% of the items. In the anatomy of multiple-choice tests, the purpose of distracters is to discriminate between those who have achieved the objective be measured and those who did not achieve the objective, that is those who have the knowledge of the task the item requires from the testee and those who do not have the knowledge of the task required from testee of the item. The distracters should be plausible solutions to those students that know the solution to the item and implausible to those students who do not know the solution to the problem. Front (2018) pointed out that the distracter quality will enhance the difficulty level and discriminative power of a test item. Ou (2011) opined that the various components of multiple-choice tests should be explicit and functional. These components are the stem, the key and the distracters. The key and distracters that are not functional need to be removed and replaced or modified for the item to serve the purpose it ought to serve. In modifying the distractor and the key the test constructor should include distracters that have the ability to common errors and misconceptions made by students. The key should be designed not to be susceptible to guessing. Front also suggested that the number of distracters will help to improve the efficiency of the distracters hence he encourages a high number of distracters when constructing multiple choice tests.

CONCLUSION

In conclusion, test constructors should be well informed on the need to understand the various part of multiple-choice tests and the techniques involved in designing a quality

test. The test constructors should know how to design items that are not susceptible to guessing and avoid information that will lead to giveaway answers. The test items should be able to discriminate between the upper and lower group taking the test. The key should be evenly distributed among the items. The key should not be arranged in a way that the answers are in a particular pattern that the testee will easily understand.

RECOMMENDATION

Based on the findings of this study, the following recommendations have been made:

1. The teacher and other test constructors should be well informed on the rudiment of how to construct multiple choice tests.
2. Tests constructed by both teachers and public examination bodies should be subject to trial testing where the emphasis should not only be on the difficult-level and discriminative index but also include an analysis of keys and distracters.
3. Key and distracters found not functioning should remove and replace or modified

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