Analyses of the Efficiency, Effectiveness and Functioning of Distractors in 2022/2023 Examination of Aminu Saleh College of Education, Azare, Bauchi State, Nigeria

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Abstract
The study focused on providing a detailed analysis with respect to distractors of a thirty multiple Choice Questions (MCQs) of GST 221: History and Philosophy of Science. The test measured 300 level undergraduate students' achievement in some specific areas they were taught. After the distractor analysis in respect of functioning, effectiveness and efficiency, it was found that 87 and 98 out of the 120 distractors were found to be functioning and effective respectively. Furthermore, 51.67% was obtained as the mean distractor efficiency and was considered acceptable. In view of the findings it was concluded that majority of distractors analysed in the study were highly functional, effective and efficient. Therefore, recommends among others that distractors having high distraction efficiency should be incorporated into future tests while those flagged to be faulty be revised or replaced.

Keywords: Distractors, analysis, efficiency, effectiveness and functioning

Introduction

Assessment is a means whereby teacher obtains information about knowledge gains, behavioural changes and other aspects of the development of learners (Oguneye, 2002). It involves deliberate effort to measure the effect of the instructional process as well as the overall effect of school learning on the behaviour of students. According to Yakasai (2011) test is the measurement instrument as well a procedure that form the basis for assessment as well as for obtaining the progress or otherwise of the learners. However, not too many teachers are aware of the principles, specific rules and regulations governing construction of the assessment instruments. The principles are left mostly in books and for those in the areas of measurement (theoretically treated in classrooms but practically absent in schools). One powerful technique available to the instructors for the guidance and improvement of assessment instrument is the test item analysis.

Item analysis is a process, where we use to examine response of the student to individual test items or questions to assess the quality of those items and of the test as a whole (Namdeo & Sahoo, 2016). According to Amedahe and Asamoah-Gyimah (2016), it refers to the process of examining students' responses to each item to judge the quality of the items. It is a valuable and powerful technique available to teaching professionals and instructors for the guidance and improvement of instructions. It enables instructors to increase their test construction skills, identify specific areas of course content which need greater emphasis or clarity, and improve other classroom practices. According to Instructional Assessment Resources, IAR (2011), item analysis investigates the performance of items considered individually either in relation to some external criterion or in relation to the remaining items on the test. In addition, item analysis is an efficient tool in identifying the strengths and weaknesses in students, as well as providing guidelines to teachers for preparing good Multiple-Choice Questions (MCQs). MCQ based assessments are very common nowadays, yet not enough stress is laid on the training of teachers on preparing good MCQs.

An item analysis involves many statistics that can provide useful information for determining the validity and improving the quality and accuracy of test items (Kolte, V. 2015). These statistics are used to measure the ability levels of examinees from their responses to each item and they ranged as follows: item difficulty, item discrimination, internal consistency reliability, test item distractor analysis. Thus, this study intends to present this simple analysis tool used for MCQs which can help improve the quality of MCQ based assessments with the aim to find out high-quality test items through distractors analysis.

Distractors according to IAR (2011) are the incorrect options in a MCQs and are considered important in determining the depth and accuracy of the students' knowledge and understanding. In support Hingorjo and Jaleel (2012) asserted that distractors provide feedback on the students' strengths and weaknesses, and help in identifying misconceptions and gaps in learning by means of distractor analysis. Distractor analysis as opined by Excudero, Reyna and Morales (2000) refers to the process of evaluating the performance of incorrect answers vs the correct answer for multiple choice items on a test. It is the process of psychometrically analysing test items to ensure that incorrect answers are performing as they should. It is therefore a means through which performance of the incorrect answers (distractors) are determined in order to make informed decisions for the purpose of improving the validity and reliability of the items and the test as a whole. In distractor analysis, the interest is not on how the test takers select the correct answer, but how the distractors were able to function effectively by drawing the test takers away from the correct answer (Crocker & Algina, cited in Asamoah

& Moses, 2019). The number of times each distractor is selected is noted in order to determine the effectiveness of the distractor.

This was achieved through evaluating MCQs or items of GST 221 for school of undergraduate students of Aminu Saleh College of Education, Azare. The test (GST 221: History and Philosophy of Science) was conducted to 300 level undergraduate students of Aminu Saleh College of Education, Azare, Bauchi State, Nigeria. The purpose of the test was to measure the students' achievement in the course after they have been taught successfully in the following areas; history and philosophy of science. Thirty Multiple-choice items on the areas listed above were constructed by their teachers and in each of the items, five options (A-E) were provided for the students to choose the best option as an answer. The test was administered and scored by the assessors (teachers), following strictly the scoring rubric prepared.

It is against this background; this study intends to implore item distractor analysis in evaluating the items of GST 221 test in ASCOEA for 2022/2023 academic session. Specifically, the research investigated indices of distractors effectiveness, functioning, and efficiency.

Objectives of the Study
The study was guided by the following objectives, to determine the distractor:
1. effectiveness indices of GST 221 test in ASCOEA for 2022/2023 academic session.
2. functioning indices of GST 221 test in ASCOEA for 2022/2023 academic session.
3. efficiency indices of GST 221 test in ASCOEA for 2022/2023 academic session.

Methodology
The study was descriptive, cross-sectional conducted at the General Studies Department, Aminu Saleh College of Education, Azare, Bauchi State. The study recruited item analysis reports of the GST 221: History and Philosophy of Science MCQ exams of 300 level students for 2022/2023 academic session. The examination consisted of 30 (five-option) items that comprised of a stem, one correct answer and four distractors. A total of 505 students took the examination with a total of 30 MCQs and 150 options (i.e.30 correct responses and 120 distractors) were analyzed. Data obtained was entered in MS Excel 2016 and analyzed and score of 505 students was categorized into the high scoring (H) group (top 33%), mid scoring (M) group (middle 34%) and the low scoring (L) group (bottom 33%) respectively, after arranging the scores in descending order.

So out of 505 students, 167 were in H group and 167 in L group; rests (171) were in middle group and not considered in the study. Total 30 MCQs and 120 distractors were analysed and based on this data, various indices like distractor effectiveness, functioning and efficiency were calculated for each item as follows:

i. **Distractor Effectiveness:** A distractor that recorded a negative discrimination index is said to be effective while a distractor that recorded a positive discrimination index is said to be ineffective. In analysing the distractor effectiveness, the concept of upper groups and lower groups were used, but the analysis and expectation differed slightly from the regular item discrimination. Instead of expecting a positive value, we should logically expect a negative value as more students from the lower group should select the distractors. Each distractor can have its own item discrimination value in other to analyse how the distractors work and ultimately refine the effectiveness of the test item

itself. The total number of students in the upper and the lower groups was 167. In the analysis, the discrimination index for each of the options was calculated by subtracting the number of students in the lower group who chose the option from the number of students in the upper group who chose the option. Then the result is divided by the number of students in either group (that is 167)

ii. **Distractor Functioning**: Nonfunctional distractor (NFD) in an item is option (other than key) selected by <5% of students; alternatively, functional distractors (FD) are those selected by 5% or more participants.

iii. **Distractor efficiency (DE):** Distractor efficiency (DE) ranged from 0-100% and was determined on the basis of the number of NFDs in an item. 4 NFD: DE = 0%; 3 NFD: DE = 25%; 2 NFD: DE = 50%; 1 NFD: DE = 75%; 0 NFD: DE = 100%

Results
A total 505 students gave the test consisting 30 MCQs and 120 distractors in the

Table 1: Classification of MCQs according to distractor functioning and distractor effectiveness indices and actions proposed

Cut off points	Paper : GST 221	Interpretation	Action
	Distractors (n=120)		
Distractor functioning			
Distractors selected by 5% or more students	87(72.5%)	Functioning distractors	Store
Distractors selected by <5% of students	33(27.5%)	Non-functioning distractors	Revise or discard
Distractor effectiveness			
Negative discrimination index	98(81.67%)	Effective distractors	Store
Positive discrimination index	22(18.33%)	Ineffective distractors	Revise or discard

Regarding the distractor functioning table1 shows that: Out of 120 distractors in the GST 221, 87(72.5%) were "functioning distractors" i.e. total number of distractors selected by 5% or more students, while 33(27.5%) were "Non-functioning distractors" as each was selected by <5% of students. Regarding the effectiveness of distractors, the table reveals that: 98(81.67%) distractors were found to be effective as they attracted negative discrimination indices. Only 22(18.33%) distractors attracted non-negative discrimination indices (i.e. zero and above) therefore tagged as ineffective distractors.

Table 2: Classification of MCQs according to item efficiency based on distractor functioning

Parameters	Number of Items	Percentage of Distractor Efficiency
	n = 30	100
Items with 0 NFDs	2(6.67%)	100% Efficiency
Items with 1 NFDs	5(16.67%)	75% Efficiency
Items with 2 NFDs	17(56.67%)	50% Efficiency
Items with 3 NFDs	5(16.67%)	25% Efficiency
Items with 4 NFDs	1(3.33%)	0% Efficiency
Overall DE (Mean)		**51.67%**

Table 2 shows that, two items had 100% distractor efficiency as they were found to have all their distractors functioning, 5 items had 75% distractor efficiency as each of the items had only one non-functioning distractor, 17 items had 50% distractor efficiency with each having two non-functioning distractors, 5 items had 25% distractor efficiency as each of the items had three non-functioning distractors, with only one item that had all the four distractors non-functioning having 0% distractor efficiency. The Mean DE was found to be 51.67 % and was considered ideal and acceptable.

Conclusion

Majority of distractors analysed in the study were highly functional, effective and efficient. The distractor efficiency of the paper was good.

Recommendation

1. This study highlights the importance of item analysis hence recommends that items having high distraction efficiency should be incorporated into future tests
2. As part of item analysis, for distractors to be plausible or function meaningfully, they should appeal the uninformed. In this regard, the low achieving students must choose those distractors as compared to the high achieving students. Making inferences from the above analysis, all the ineffective as well as the items that non-functional distractors needed to be revised or replaced with a more effective ones to attract the uninformed and where necessary, the items should have been changed.
3. The study was meant to throw light on the importance of item analysis in renewal of our assessment. It is expected to raise the awareness of other schools and departments to the importance of including item analysis results in the routine exams' evaluation in the academic boards. To achieve this, schools through their respective boards should provide training workshops to the staff members on how to carry out item analysis and interpret the results effectively.

References

Amedahe, F. K., & Asamoah-Gyimah, K. (2016). Introduction to measurement and evaluation (7thed.). Cape Coast: Hampton Press.

Asamoah, D., & Moses, K. K. (2019). Item discrimination and distractor analysis: A technical report on thirty multiple choice core mathematics achievement test items. *International Journal of Research and Scientific Innovation (IJRSI),* 6(9) 23-33.

Excudero, E. B., Reyna, N. L., & Morales, M. R. (2000). The level of difficulty and discrimination power of the basic knowledge and skills examination. *Journal of National Institute for Educational Evaluation, 2*(1), 1-16

Hingorjo, M. R. & Jaleel, F. (2012). Analysis of one-best MCQs: The difficulty index, discrimination index and distractor efficiency. *J Pak Med Assoc. 62*(2), 142-7

Instructional Assessment Resources, IAR (2011). *Item analysis*. University of Texas at Austin.

Kolte, V. (2015). Item analysis of multiple-choice questions in physiology examinations. *Indian J of Basic & Applied Medical Research. 4*(27), 320-6. 27

Namdeo, S. K., & Sahoo, B. (2016). Item analysis of multiple choice questions from an assessment of medical students in Bhubaneswar, India. *International Journal of Research in Medical Sciences, 4(9),*1716

Oguneye, W. (2002). *Continuous assessment: Practice and prospects*. Providence publishers.

Yakasai, M. I., & Maiwada, D. A. (2011). *Essential of educational research and proposal writing.* (Ed), Ahmadu Bello University Press Ltd.