

Distractor analysis of teacher-made multiple-choice test in Math 1B and Math 2B in UM Digos College

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ABSTRACT

This study aimed to perform distractor analysis on teacher made Math 2B MCQ test for the final examination test of UM Digos College. This descriptive study employed to UMDC students who were currently enrolled to MATH 2B course. Based on the findings of the study, the teacher-made test distractors in Math 2B final examination as described in compliance to guidelines, 46% id found to be no error. Moreover, based on the index of effectiveness/discrimination index, more than half of the distractors (53%) formulated are functioning. In the characterization of distractors, 68% is found to identical syntax in the syntactic homogeneity part. In the semantic homogeneity part, particularly in conformity type, 79% is found to be conformed type. Whereas in the named entity type, 69% is found to be identically named entity type. Consequently, most of the students believe that the distractors are homogeneous. In terms of the correct answer, most of it can be found in either choice c or d. The alternatives are free of grammatical errors. However, the alternatives were not logically ordered. Thus, this research recommends that since it was found that 46% of the distractors were not arranged in a logical order, it is recommended that the teachers of UM Digos College, particularly in Mathematics, should make their alternatives of MCQs in a logical order. Secondly, based on the correct options' inventory, 43% of the distributions were on option C, and based on FGD, most of the students believe that the answer is found in either C or D. It is recommended that the teacher should avoid pattern in the correct answer. Since it is important to evaluate and assess distractors' effectiveness, it is recommended that the teachers conduct distractor analysis as part of item analysis not only as compliance to accreditation requirements but as a standard operating procedure. Lastly, for future researchers, it is recommended to conduct the further study using the results presented, and this study must be applied to other subjects and standardized tests in DepEd.

Keywords: *distractor analysis, MCQ test, Math 2B, descriptive, UMDC*



INTRODUCTION

Assessment plays an essential part in instruction for it determines whether the goals of education are being achieved. One of the best forms used in assessing students' performance is the multiple-choice question (MCQ) test type. According to Bandiola (2003), this form is most valuable and widely used in the standardized test due to its flexibility and objectivity in scoring. However, making MCQ test questions is not simply making only one correct key and some incorrect choices. The incorrect options, which are called distractors in an MCQ test, can affect its effectiveness. Poorly made distractors can affect the whole test; either the poor distractors make the MCQ test very easy or very hard compared to the expected level of the test (Waterloo Maple Inc., 2008). Researchers in educational assessments advised the broadening of the functional role of distractors to adapt a new purpose; identifying the nature of student's common misconceptions (Nitko, 2004; Popham, 2000)

A study from Fatima Jinnah Dental College, Karachi, Pakistan, concluded MCQ test items with three distractors work best in discriminating the students. According to Hingorjo and Jaleel (2012), items with two non-functioning distractors make the test easier; non-functioning distractors are better than not having distractors that clearly state their none related to the expected answers. Dufrense et al. (2002) stated that by employing distractor analysis that has been thoroughly designed, the students' misconceptions would be possible to determine. Even though the students answered correctly, it does not follow that the students mastered the lesson. However, there are different reasons students can pick the correct answer; it may be through guessing that can result in "false positives."

In the context of local higher education institutions, particularly UM Digos College, according to instructors, a distractor analysis on any mathematics MCQ type test has not yet been conducted. Also, there is uncertainty whether the following guidelines (must be plausible, must be mutually exclusive, must be in a logical order, rarely use the "all of the above/none of the above" and the number of choices must be 3 to 4) are being met in the making of MCQs, particularly on writing distractors. Nevertheless, these educators acknowledge the importance of conducting a distractor analysis to improve the quality of the MCQs they are using in assessing students' learning. Should a distractor analysis be done, the teachers can use the results in improving the reliability and validity of these results. Thus, this study investigates the construction of distractors of teacher-made MCQ test for Math 2B (Contemporary Mathematics) final examination.

METHOD

In this study, the researchers used the descriptive mixed-method design. Descriptive Analysis is a method used in obtaining information concerning the variables or conditions in a situation before determining what exists. It involves investigation, survey, correlation, and a lot more (Key, 1997). Mixed method research is an approach used to collect quantitative and qualitative data to enhance the forms of data and utilize designs that may involve philosophical assumptions and theoretical frameworks (Creswell, 2014). Vizcara (2003) stated that descriptive research is all about studies that concerned with presenting facts about the nature and status of anything, which includes a group of persons, several objects, a set of conditions, events, and thoughts which are subjected to a study.

In this study, the quantitative part involves the computation/numerical analysis of the Math 2B final examination test results. The qualitative part is exhibited in the characterization of MCQ tests' distractors in mathematics teacher-made tests and was processed through corpus analysis. Likewise, students' perceptions were in the data gathering and will be processed using thematic analysis.

There are two sets of data in this study. The first set is the Math 2B multiple-choice question (MCQ) final examination test gathered from mathematics instructors in UM Digos College, which was used on the second semester S.Y 2015-2016. The data included all the answers of each examinee. Due to the data set's nature, there is no instrument for the data gathering in this part of the study. In the quantitative inquiry, the Microsoft Excel software was used in organizing and analyzing data.

The second data set is the students' perceptions in answering the exams from their instructors in Math 2B final examination, specifically their experience, difficulties, and other insights on the distractors of math tests. Hence, for this part of the study, an interview guide was formulated. This guide was made up of five open-ended questions reflecting students' perception of the teacher-made MCQ test. Three faculty members validated this interview guide in UM Digos College to 3 faculty members validated this interview guidens. The instrument antoation documents are presented in appendix H and D to qualify the perceptions of students on the teachers' construction of distractions.

To address the objectives of the **study, relative frequency was used** to describe the number of students' responses on each item to be subjected for further analysis. Moreover, index of effectiveness was used to examine the effectiveness

of the distractors whether it is functioning or not. According to Kubiszyn and Borich (2000), this is interpreted as a discrimination index in which it tends to discriminate the extent of performing and non-performing students answering the item. In addition, corpus analysis was used to investigate the construction of distractors and the correct answer concerning its syntactic (word construction) and semantic (word meaning) homogeneity. Lastly, thematic analysis was used to process the qualitative data in categorizing students' perceptions on the construction of distractors of teacher-made MCQ questions in Math 2B Final Examination. This was used to investigate patterns or themes based on the data collected from the interview.

RESULTS AND DISCUSSION

Teacher-Made Test in Mathematics Described in Terms of Compliance to Guidelines

The Analysis of the distractors in terms of compliance to guidelines was performed. The data used for this study resulted from the analysis of each item of a 35 item Math 2B final examination test. The distribution of the errors committed according to guidelines is shown in the pie graph in Figure 2. Results revealed that almost half of the distribution (46%) shows no error. However, 40% of distractors failed in terms of being arranged in a logical order, 8% failed according to the plausibility of distractors (that is, each of the alternatives must be similar in length and avoid unnecessary distractors), and 6% were found to be not-mutually exclusive from the other choices.

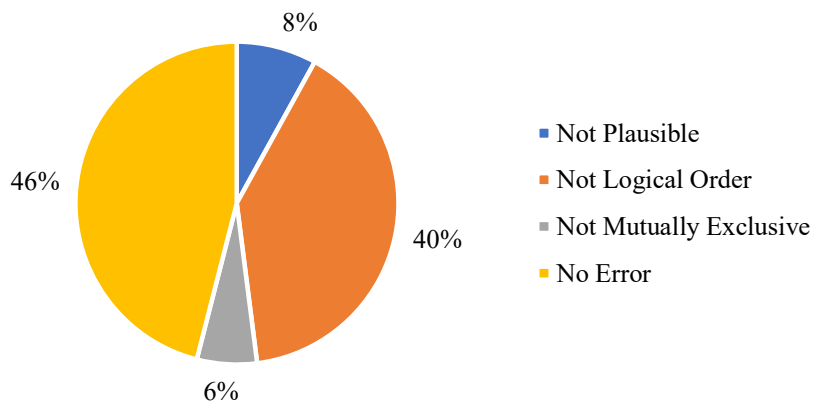


Figure 2. *MCQ of Teacher-Made Test in Mathematics Described in terms of Compliance to Guidelines*

Distractors' Effectiveness Assessed Based on Students' Response Distribution

The Analysis of the distractors' effectiveness was performed through index effectiveness. The data used for this study was the results from the 37 students who took the 35 items Math 2B examination test. The distribution of the results of an index of effectiveness based on students' response distribution is shown in a pie graph in Figure 3. Results revealed that more than half of the distribution (53%) of the distractors are identified as functioning (F), followed by the 34%, which comprise the distractors that should be discarded (D), and 13% indicates the distractors that should be revised (R). As Kubiszyn and Borich (2000) cited, the distractors must be attractive to low-performing students; otherwise, if the distractors are non-functioning, they will attract performing students, leading to faulty assessment.

Distractors are considered functioning if the index of effectiveness (IE) is negative (-). The distractors are also discarded when IE is 0, and distractors are to be revised when IE is positive or greater than 0. The Math 2B may be assessed from the results to determine items with deficiency about distractors that are subjected for improvement.

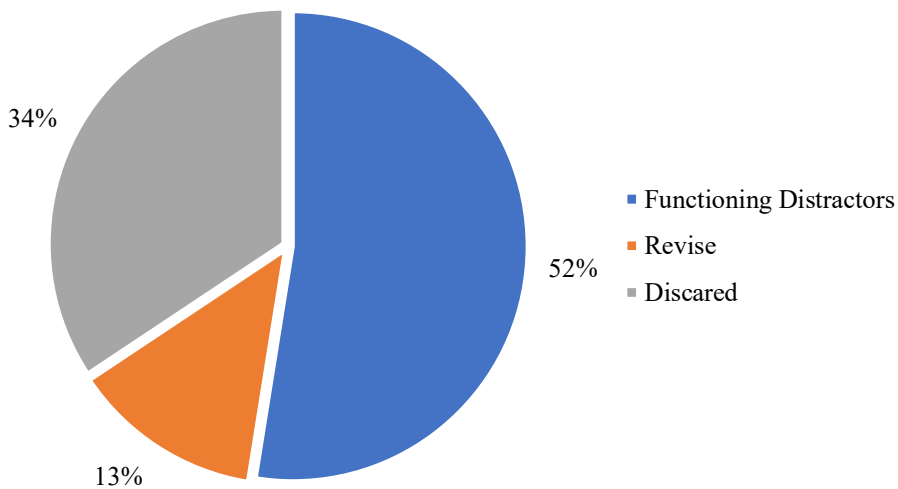


Figure 3. *Distribution of Distractors' Effectiveness Based on Students' Response Distribution*

Distractor Formulation Based on Homogeneity

The distractor formulation was evaluated through performing corpus analysis on the distractors. The data was used from the 35 items Math 2B final examination MCQ Test. The result is found in Appendix G.

In terms of the synthetic homogeneity, Table 1 shows that the highest frequency of synthetic homogeneity annotated manually is the identical syntax (68%) which means that most of the distractors share the same chunk, which means that the distractors shared at least a partially identical chunk with that of the correct answer. Only a few were annotated as globally identical syntax (6%), and the least was different syntax (3%). According to Pho et al. (2015), syntax homogeneity must share at least partially identical syntax as that of the correct answer. Hence, the distractors are syntactically homogenous.

Table 1. *Results of Manual Annotations*

Manual Annotation	Frequency	Relative Frequency (%)
SYNTACTIC		
Partially Syntax	69	68%
Partially Identical Syntax	24	24%
Global Identical Syntax	3	3%
TOTAL	6	6%
SEMANTIC		
Conform Type	81	79%
Non-conform Type	11	11%
Unknown Conformity	10	10%
TOTAL	102	100%
SEMANTIC		
Identical Named Entity Type	70	69%
Different Named Entity Type	21	21%
Not a Named Entity Type	11	11%
TOTAL	102	100%

In terms of semantic homogeneity, in the semantic conformity part, Table 1 revealed that the highest in the distribution in the conforming type (79%), which means that the distractors conformed to be expected type of answer, followed by the not conform type (11%) and the unknown conformity (10%).

On the other hand, in the semantic named entity type shown in Table 1, 69% are said to be identical named entity type as that of the correct answer, followed by the different named entity type with 21% and the “not a named entity type” with 11%.

To cite a particular case, consider the items of the exam below:

Item #5: Use substitution to solve this problem: Wai Sen scored 85% on part A of the math test and 95% on part B. Her total mark possible for the test was 104. How many marks is each part worth?

- a. Part A: 56 marks; part B: 56 marks
- b. Part A: 48 marks; part B: 48 marks
- c. **Part A: 56 marks; part B: 48 marks**
- d. Part A: 48 marks; part B: 56 marks

Based on the observation among alternatives, the construction of distractor **a** when compared to the correct answer **c** base on syntactic structures are said to be identical syntax. When distractors **b** and **d** are compared to the correct answer **c**, the same result is observed.

Item #1: Which of the following sequences is arithmetic?

- a. 2, 4, 8...
- b. -4,-8,-16...
- c. 1, 5, 9...
- d. 10, 20, 35...

The problem above asks an arithmetic sequence in the semantic conformity part, distractor **a**, distractor **b**. It is possible since the number is arranged in sequence form and corresponds to the expected answer. Thus, distractors **a**, **b**, and **d** are conformed to the correct answer, option **c**.

Item #4: In the arithmetic sequence, 5, 10, 15..., which term has the value of 65?

- a. 10th
- b. 11th
- c. 12th
- d. **13th**

In the semantic named entity type of the problem above, distractor **a** share the same name entity, and it is closely related as that of the correct answer, which is option **d**. Thus, it is said to be an identical named identity type. The same result is observed when distractors **b** and **c** is compared to the correct answer **d**.

Notice that the distractors and the correct answer are syntactically and semantically homogeneous. This case represents an ideal set of distractors since it agrees with the guideline stated by Kubiszyn and Borich (2000) that the distractors must be homogenous.

Thematic Analysis of Students' Perceptions

The students' perceptions on the MCQs in Mathematics in UM Digos College revealed various themes. From the responses gathered during the focused group discussion, thematic analysis was used to process the qualitative data. The themes found were guessing, observing guidelines for constructing distractors, and grammar.

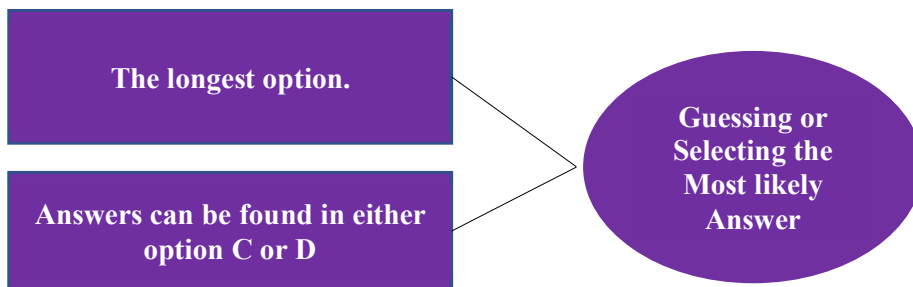


Figure 4. *Guessing or Selecting the Most Likely Answer*

Guessing or Selecting the Most Likely Answer as declared in the figure above from the various data collected with the composite themes. The Longest Option and Answers can be found in either option C or D. Respondents claimed that,

"Sometimes the longest option is the correct answer, and we use the process of elimination to find the answer."

On selecting the correct answer, most of the students believe that sometimes the longest option in the choices is the best answer. Others said that to find the correct answer, the process of elimination and guessing are employed. If the solution arrived is not found in the choices, most of the students conclude that it is wrong on the process they made. There are times that doubt arises if the options have had the correct answer. Also, other respondents said that:

"Most of the answers can be found in either c or d."

Other also noticed that most of the correct answer could be found in either choices c or d. Furthermore, an inventory of the correct answers is shown in Table 2. It was found out that most of the correct answers are found in option "C" with 43%, followed by option "B" with 23%, 17% for the option "A," and 17% for Option "D." This finding corroborates the statement of Burton et al. (1991) that when there is patterns of the correct answer from item to item, clever students, though unprepared, might get the correct answer.

Table 2. *Correct option "Key" inventory*

Correct Option "Key" Inventory	Frequency	Relative Frequency (%)
A	6	17%
B	18	23%
C	15	43%
D	6	17%

Based on the figure presented above about observing the guidelines in constructing distractors, particularly Distractors must be homogenous, Mutually Exclusive, Rare use of All of the Above/none of the above option, Chronological/Logical Order. The respondents claimed that:

"The distractors are distracting, and it is really hard to find the correct answer because the choices are interconnected with each other"

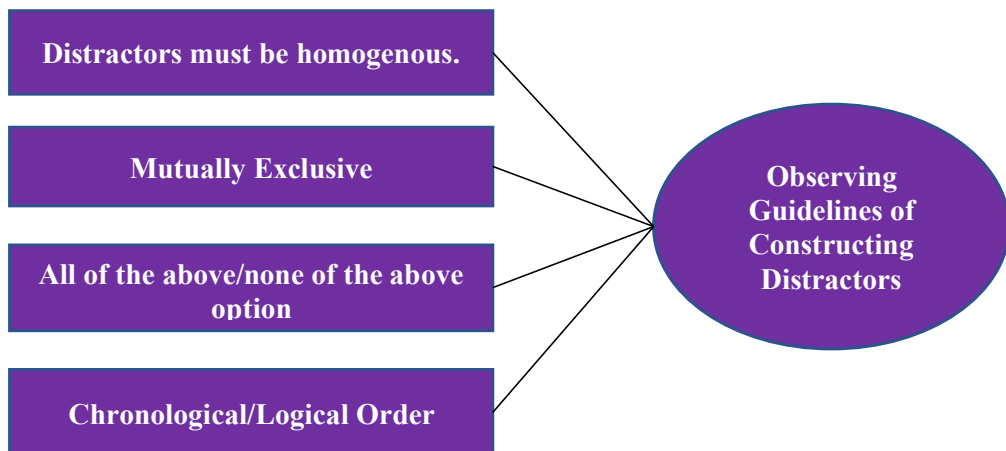


Figure 5. *Observing Guidelines in Constructing Distractors*

Students agree that the distractors are functioning well, and they add up to the test's difficulty. The choices formulated were plausible, and it is interconnected with each other. Sometimes students have difficulty finding the best answer due to the homogeneity of the distractor as that of the best answer. This finding is in line with the statement of Kubiszyn and Borich (2000) that constructing MCQ distractors must be plausible and homogeneous. Some of the respondents have said that:

"Most of the items have one correct answer."

In the Mutually Exclusive part, students believe that there is only one correct answer despite the alternatives' homogeneity. This finding agrees with Haladyna and Downing (1989)'s statement that options must be mutually exclusive; they should not be similar or overlapped with each other. Also, the respondents claimed that:

"I can directly eliminate "all of the above" choices through observing the other option whether it is right or wrong."

The "all of the above" option was used effectively by the teacher in their MCQ test because students believe it is a good distractor. Also, students have a strategy to prove whether it is the best answer by observing the other options. Therefore, due to the nature of "all of the above," students believe that the teacher rarely uses it. This finding is supported by Haladyna and Downing (1989)'s statement that the use of the option "all of the above" should not be used or should be used limitedly. Also, most of the respondents claimed that:

"I observed that the distractors are not in a logical order."

Most of the MCQ item alternatives were not formed in a chronological or logical order. This finding contradicts the guideline stated by Haladyna and Downing (1989) that options must be in a chronological or logical order.

As declared in the figure above, Grammar arrived from the data collected with the composite themes word choice and grammatical errors. Respondents said that:

"The items constructed by the teacher were free from grammatical errors, and the words are understandable."

Students observed that the teacher is aware of using the appropriate words. Most of the test formulated is free from grammatical errors. This finding corroborates Haladyna and Downing (1989) 's statement that the MCQ should use good grammar, punctuation, and spelling consistently.

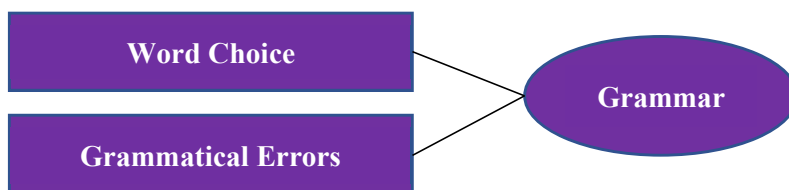


Figure 6. *Grammar as a final theme and its composites*

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, the teacher-made test distractors in Math 2B final examination as described in compliance to guidelines, 46% id found to be no error. Moreover, based on the index of effectiveness/discrimination index, more than half of the distractors (53%) formulated are functioning. In the characterization of distractors, 68% is found to identical syntax in the syntactic homogeneity part. In the semantic homogeneity part, particularly in conformity type, 79% is found to be conformed type. Whereas in the named entity type, 69% is found to be identically named entity type. Consequently, most of the students believe that the distractors are homogeneous. In terms of the correct answer, most of it can be found in either choice c or d. The alternatives are free of grammatical errors. However, the alternatives were not logically ordered.

Thus, this research recommends that since it was found that 46% of the distractors were not arranged in a logical order, it is recommended that the teachers of UM Digos College, particularly in Mathematics, should make their alternatives of MCQs in a logical order. Secondly, based on the correct options' inventory, 43% of the distributions were on option C, and based on FGD, most of the students believe that the answer is found in either C or D. It is recommended that the teacher should avoid pattern in the correct answer. Since it is important to evaluate and assess distractors' effectiveness, it is recommended that the teachers conduct distractor analysis as part of item analysis not only as compliance to accreditation requirements but as a standard operating procedure. Lastly, for future researchers,

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