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GENDER DIFFERENCES IN GUESSING TENDENCIES IN MATHEMATICS

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ABSTRACT: *This paper focus mainly on gender differences in guessing tendencies in mathematics. Despite the inherent advantage of essay or free-response questions in terms of ease of construction, elimination of guessing and development of written skills, multiple choice item format is widely used because it leads to the development of objective assessment questions. Expost-facto survey design was used. A sample of 110 students (56 males and 54 females) was drawn through purposive sampling from selected schools in Delta North Senatorial District of Delta State. Final year (SS III) students of 2012/2013 academic session were used for the study. The 50-item objective test items in May/June, 2010 Mathematics administered by the West African Examination Council (WAEC) was the instrument used for the study. The paper concluded that there is no significant difference in the mean guessing score of male and female students in Mathematics.*

KEYWORDS: Gender, Mathematics, Guessing Tendencies, Essay Question, Objective Question,

INTRODUCTION

Measurement of students' ability in achievement tests is usually done with two item formats namely, essay questions (or free-response questions) and objective questions. Both forms have their merits and shortcomings; hence none is exclusively without the other in state or national examinations in Nigeria. For example, objective test questions (hereafter referred to as multiple choice questions in this paper) are combined with essay test questions in examinations conducted by the West African Examinations Council (WAEC) and the National Examinations Council (NECO). The cognitive and placement Test for final year pupils in primary schools and Junior School Certificate Examination (JSCE)for Junior Secondary Schools in Delta State take both item formats in most of their examinations.

Despite the inherent advantage of essay or free-response questions in terms of ease of construction, elimination of guessing and development of written skills (National Teachers' Institute, 2000), multiple choice item format is widely used because it leads to the development of objective assessment questions (Wikipedia, 2015). According to the author examinees are graded without bias and irrelevant factors such as handwrting and clarity of presentation are immaterial.

A multiple choice item is made up of two parts. These are the stem (the question part) and the distracters or foils), Mordi (2015). This author and others scholars (e.g. George & Naibi, 2014; Ossai, 2010) have stressed the need for stems that are not ambiguous and distracters that are effective. According to George and Naibi (2014) similar options in some relevant contents cause challenges to test-takers because the options are apparently correct.

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The score obtainable by a test-taker from a set of multiple choice questions can be algebraically represented as Xo = Xmf± Xc, where Xmf represents the true score, Xo the observed score and Xc is the error component (Ubulom & Amini, 2012). The error component, Xc can be systematic or random. Whether systematic or random, the error component is capable of impacting negatively on the validity and reliability of test scores. This researcher focused on the random error component, guessing. Specifically, the thrust of the study is gender differences in guessing tendencies among secondary school students.

Guessing involves an examinee choosing any of the response options at random if he/she has no idea which of them is the correct one (Kubinger, Holocher-Erti, Reif, Hohensinn & Freebort, 2010). As noted earlier, homogeneous options in multiple choice items pose challenges to test-takers. When some options appear to be ineffective or irrelevant in a given context examinees can achieve high scores through random guessing. Nenty (1986) noted that guessing is a source of multidimensionality in a multiple choice format as it brings in another dimension, that is, the ability to guess. Taking a mathematics item, for example, a poorly constructed stem or options or an item in which a testee has no mastery of the concept, the ability to guess may be a factor. Any test score obtained through guessing is not a true reflection of the test-taker's ability.

Researches and reports (e.g. Bolger & Kellanghan, 1990; Beller & Gafni, 2000; Ossai, 2014) indicate that males do better than females in multiple choice test items Schrader and Ansley (2006) conducted a study on 'Sex Differences in the Tendency to Omit Items on Multiple-Choice Test". The study employed a sample of 430,000 Iowa students in the 3rd, 7th and 11th grades who took the ITBS or ITED during 1980 – 1981, 1985 – 1986, 1990 – 1991, 1995 – 1996 and 2000 – 2001. Using two multivariate analysis of variance (MANOVAs), the data study showed that differential tendencies to omit between the sexes did not have significant impact on mean score differences in achievement between the sexes in the past 20 years.

Sinai and Ben-Shakhar (1991) conducted a study on "Gender Differences in Multiple Choice Tests: The Role of Differential Guessing Tendencies" using two samples of ninth graders and applicants to Israeli Universities. The test batteries administered clearly showed male advantage, but the tendency to omit items was greater in females. Correction for guessing reduced the advantage of males over females. The study concluded that even though gender differences in guessing tendencies clearly exist, they account for a small proportion of the gender differences in multiple-choice tests.

Similarly, Baldiga (2012) in a study on "Gender Differences in Willingness to Guess" used an experimental test that consisted of practice questions from the SAT II subject tests. The size of the penalty imposed for a wrong answer was varied. The study showed that all test-takers answered every question when there was no penalty for a wrong answer, but women answered significantly fewer questions than men when there was a small penalty for a wrong answer.

The foregoing studies indicated that males guess more in multiple choice items. Perhaps, one of the reasons for this situation is that males are more daring and willing to take risks compared to females.

Statement of the Problem

Measurement involves assigning numerical values to attributes in a systematic manner. This exercise requires precision. The process of formative evaluation will be enhanced if a teacher

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knows the strengths and weakness of his/her learners. A situation whereby other abilities, in particular guessing, account for the performance of learners does not augur well in measurement.

This paper presumes that guessing tendencies among test-takers exist. Which of the test-takers (in terms of gender) is more likely to guess in multiple-choice test items. This is the problem of the study.

Research Questions

The following research questions guided the study:

1. What is the mean guessing score of male students?

2. What is the mean guessing score of female students?

Hypothesis:

The following null hypothesis was tested at $\propto = .05$ level of significance.

1. There is no significant difference between the mean guessing score of make and female students.

METHODOLOGY

The expost-facto survey design was used. A sample of 110 students (56 males and 54 females) was drawn through purposive sampling from selected schools in Delta North Senatorial District of Delta State. Final year (SS III) students of 2012/2013 academic session were used for the study. The 50-item objective test items in May/June, 2010 Mathematics administered by the West African Examination Council (WAEC) was the instrument used for the study.

Mathematics questions were deemed to have been valid. A measure of stability over time was established through test-retest method yielding a reliability index of 0.93. Respondents were made to answer the 50-item questions scored dichotomously. Correction formula (FS = R – W (C – 1) in which FS = formula score, R = number of right answers, W = number of wrong answers and C = number of choice per item was applied to all the scores. Items omitted did not count against any candidate. The mean was used to answer the research questions while the only null hypothesis was tested at $\propto = 0.05$ level of significance using t-test.

RESULTS

Research Question 1 and 2

1. What is the mean guessing score of male students?

2. What is the mean guessing score of female students?

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Table 1: showing mean guessing score of male and female students

Gender	N	$\bar{x}$
Male	56	9.64
Female	54	10.57

Table 1 shows that the overall mean guessing score of male students is 9.64 while that of female students is 10.57; this indicates that females guessed more than the males. The extent of the difference in mean guessing scores is tested in the following null hypothesis.

Ho: There is no significant difference between the mean guessing score of male and female students.

Table 2: showing t-test analysis of students mean guessing score

Variable	N	$\bar{x}$	SD	Df	t-cal	t-cri	Decision
Male	56	9.64	1.81	108	3.099	1.96	Rejected
Female	54	10.57	1.28				(Sig)

$P < 0.05$

Table 2 shows that the t-calculated value of 3.099 is greater than the t-critical value of 1.96; hence, the hypothesis of no significant difference was rejected. Consequently, there is a significant difference in the mean guessing score of the students.

Discussion of Result

The result from this study indicates that there is no significant difference in the mean guessing score of male and female students in Mathematics. This result is contrary to the studies carried out by Sinai and Ben-Shakhar (1991) and Baldiga (2012). Ben-Shakhar's study in 1991 showed that the advantage of males over females reduced when correction for guessing was applied. This implied that males achieved most of their scores through guessing. Baldiga (2012) discovered that men answered more questions when there was a penalty for a wrong answer while women attempted fewer questions.

This researcher is inclined to reason that the result of this study may have been influenced by the fact that the subjects for the study were not pre-informed of the use of correction for guessing. The trend may change, perharps, if students are made to be cautious of guessing in their responses.

CONCLUSION

This study has shown that females guess more than the males when test-takers are not informed to guard against guessing.

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APPENDIX I

S/N	GENDER	OBSERRVED SCORE	FORMULA SCORE	GUESS
1	M	19	9	10
2	F	18	7	11
3	M	18	7	11
4	M	20	10	10
5	M	14	2	12
6	F	19	9	10
7	F	13	1	12
8	M	13	1	12
9	F	18	7	11
10	M	12	0	12
11	M	23	14	9
12	M	21	10	11
13	M	25	17	8
14	M	31	25	6
15	M	23	14	9
16	F	25	17	8
17	F	11	0	11
18	F	30	23	7
19	F	25	17	8
20	F	18	7	11
21	M	22	13	9
22	F	15	3	12
23	M	13	1	12
24	M	11	0	11
25	M	9	0	9
26	M	10	0	10
27	F	10	0	10
28	M	14	2	12
29	M	8	0	8
30	F	16	5	11
31	F	13	1	12
32	M	22	13	9
33	M	25	17	8
34	M	15	3	12
35	M	12	0	12
36	M	18	7	11
37	M	21	10	11
38	M	38	34	4
39	M	15	3	12
40	M	26	18	8
41	F	19	9	10
42	F	18	7	11
43	F	15	3	12
44	F	10	0	10

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45	F	16	5	11
46	F	12	0	12
47	F	9	0	9
48	F	16	5	11
49	F	15	3	12
50	F	20	10	10
51	F	8	0	8
52	F	14	2	12
53	F	20	10	10
54	F	12	0	12
55	F	16	5	11
56	F	12	0	12
57	F	21	10	11
58	F	20	10	10
59	F	17	6	11
60	F	18	7	11
61	F	17	6	11
62	M	25	17	8
63	F	14	2	12
64	M	27	19	8
65	M	33	27	6
66	F	22	13	9
67	M	28	21	7
68	M	27	19	8
69	M	28	21	7
70	M	24	15	11
71	M	24	15	11
72	M	19	9	10
73	F	22	13	9
74	F	18	7	11
75	F	22	13	9
76	F	25	17	8
77	M	19	9	10
78	F	22	13	9
79	M	16	5	11
80	F	16	5	11
81	F	21	10	11
82	F	21	10	11
83	M	19	9	10
84	M	18	7	11
85	M	19	9	10
86	F	22	13	9
87	M	24	15	9
88	M	24	15	9
89	M	19	9	10
90	M	12	0	12
91	M	10	0	10

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92	F	13	1	12
93	F	13	1	12
94	M	14	2	12
95	F	11	0	11
96	M	10	0	10
97	F	14	2	12
98	F	17	6	11
99	M	24	15	9
100	M	20	10	10
101	F	21	10	11
102	M	28	21	7
103	M	26	18	8
104	F	18	7	11
105	F	20	10	10
106	M	24	15	9
107	M	23	14	9
108	F	21	10	11
109	M	18	7	11
110	M	22	13	9

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