

## **GENDER INFLUENCE ON THE EFFICACY OF MULTIPLE-CHOICE, ALTERNATE RESPONSE AND COMPLETION OBJECTIVE TEST FORMATS ON STUDENTS ACHIEVEMENT IN ECONOMICS**

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### **ABSTRACT**

This study investigated gender influence on the efficacy of multiple-choice, alternate response and completion objective test formats on students' achievement in Economics. It was conducted in Isoko-South Local Government Area of Delta State. The study was guided with four research questions and two null hypotheses. A 3x2 factorial quasi-experimental research design by post-test only was adopted. Economics Achievement Test (EAT) was used as an instrument for data collection. The instrument had content and face validity. Its reliability coefficient 0.87 was determined using Kuder-Richardson formular-20 (KR<sub>20</sub>). The coefficients of equivalent obtained when the scores of student from multiple-choice and alternate response test were correlated was 0.81. A coefficient of 0.81 was obtained for correlation between multiple-choice and completion while 0.86 was obtained when scores from alternate response and completion test were correlated. Thus the instruments were equivalent. The measure showed that the instrument was reliable. Using criterion purposive sampling technique, 410 SS2 students were sampled from three intact classes, each in the five schools. Each of the intact classes was given a particular objective test format (that is, multiple-choice, alternate response and completion objective test formats). The data analyses were done using mean, standard deviation, independent t-test, two way analysis of variance and scheffe test where appropriately. From the study, it was showed that gender significantly influenced the differential effects of objective test formats on students' achievement in Economics. Again, objective test formats significantly affect students' economics achievement, and that there was a significant interaction effect between objective test formats and gender on students' Economics achievement. Sequel to the findings, it was recommended among all that test constructors and teachers should re-examine the type of objective test format they use when assessing their students.

### **INTRODUCTION**

The development of every nation depends on its citizens comprising males and females. Equipping both genders for effective contribution to the nation's development is therefore very necessary in our educational setting. It is believed that people can manage their personal life as well as their professional duties when they are well educated, and Economics as a subject has been proven to be an indispensable tool for the development of the self and the nation as a whole. Economics helps the individual to build up a body of economic principles and equip him with the tools necessary for economic analysis of life activities, which will enable him to understand current issues and problems, live effectively and contributes intelligently to discourse on economic reform and development.

It is in recognition of the importance accorded to Economics as a subject that it is among one of the compulsory elective subjects to be studied at the Senior Secondary Schools in Nigeria, (Federal Republic of Nigeria, 2004). Economics is very useful in understanding other subjects like History, Sociology, Psychology, etc. Economics is inestimable as economic questions touch everybody at all times. Economic knowledge enable one to tackle daily problems as it provides the tools necessary for rational decisions. No wonder Sir Henry Clay in Abedi, (2000) stated that “the knowledge of Economics is at once a practical necessity and a moral obligation.” Economics equips a person with appropriate knowledge needed to formulate theories from which wise decisions can be made. We learn how best to use our limited resources within a minimum waste. It therefore provides a rational guide to individuals, firms and governments in the allocation of scarce resources.

In spite of this high impetus accorded to Economics, some students still perform below expectation. This has continuously bother researchers and educators. Though series of studies have been done on the problems affecting the teaching and learning of Economics, little had been done on the influence of gender on the method of setting questions and possibly the formats used in setting its questions. A lot of research investigations have been conducted on what causes students to perform below expectation. For instance, Anderson (2001) conducted a study on how the collection of demographic information prior to testing, facilitates performance decrease in subjects for which a negative domain performance stereotype exists. Results showed that gender identification is not a strong stimulus that triggers stereotype threat patterns in low-stakes assessments.

Gafoor and Shilna (2014) focused on examining efficacy of concept mapping as a gender fair test to appraise students’ achievement in organic chemistry unit for high schools. The result showed that test format has effect on achievement. The results also revealed interaction between gender and test format on students’ academic achievement. Oppong (2013) conducted a research on how gender influences the students’ performance in essay and multiple choice test in history in three senior high schools in Cape Coast Metropolis. Data were analysed with independent samples t-test and it was found that females performed significantly better than their male counterparts on essay items. However, there was no significant difference on their performance in multiple-choice test.

Oludipe (2012) investigated on the influence of gender on Basic science academic achievement of Junior Secondary students using cooperative learning strategy. It was found that their academic achievement was not gender dependent at the pretest, posttest, and delayed posttest levels. In another dimension, Bolaji (2007) investigated on the influence of gender on the level of students’ confidence in completing their programmes among the undergraduates. It was found that gender did not influence students’ confidence in their ability to complete their bachelor degree’s programme. However it was revealed that female expressed less confidence than their male counterparts in their ability to complete their post graduate programmes.

Mobark (2014) determined the influence of gender on the effect of using cooperative learning strategy on graduate students’ academic performance in educational statistics and educational research method courses. A sample of 32 master’s students’ (18 females and 14 male) who study the educational statistics course, and (24) master’s students’ (13 females and 11 male) who study educational research method course from faculty of education at King Saud University loss used. A quasi-experimental - nonequivalent control-group design with pretest, posttest and delayed posttest was employed in the study. Educational statistics performance

test (ESPT) and educational research method test were used to measure the students' performance, both tests contained 30 multiple choice items. The data collected were analysed using independent t-test statistics which revealed that there was no significant difference in academic performance of male and female students at the pretest, posttest, and delayed posttest levels respectively.

However the issue of gender differences in students' performance in their academics has raised the concern of various researchers. To this effect, many researchers have investigated into several areas such as teachers' characteristics, class size, students' achievement, gender influences in attitude and performance. Teaching students, with so many differences among them, is not an easy job and in almost all the societies and nations, there is no restriction on individuals not to get the education, according to their choices and capabilities. In some fields and subject areas, differences in aptitude, interest, and achievement are gender based. These areas include subjects like mathematics, engineering, computer technology, accountancy, Economics, and business. Thus there may be difference in the ways male and female students achieve in economics.

Constructing economics test may takes essay and/or objective test items that vary in formats which may differently affect the students' achievement in Economics. Hence, the researchers presumed that it is possible that the different objective test item format(s) may be more efficacious on either the male or the female in relation to their achievement in Economics. It is against this uncertain situation that the researchers were compelled to investigate how the effects of multiple-choice, alternate response and completion test on students' achievement in Economics could vary based on gender.

### **Aim and Objective of the Study**

The study aimed on examining the gender influence on the effectiveness of multiple choice, alternate response and completion objective test formats on students' achievement in Economics. Furthermore the study achieved the following objectives of the study;

1. Determined the level to which Economics achievement of students who responded to multiple choice, alternate response and completion test objective test formats differ based on their gender.
2. Examine the gender influence on the effectiveness of objective test formats (multiple-choice, alternate response and completion test) on students' achievement in Economics.
3. Determine the interaction effect between gender and objectives test formats on students' achievement in Economics.

### **Research questions**

To give a frame to this study, the researchers provided the following research questions.

1. What is the difference in the achievements of male and female students who responded to the multiple-choice, alternate responses and completion test objective test formats?
2. What influence does gender has on the effectiveness of the objective test formats (multiple-choice, alternate and completion test) on Economics achievement of students?
3. What is the extent of the interaction effect of gender and objective test formats on Economics achievement of students.

### Hypotheses

The study was further guided by the following hypotheses stated in null form and tested at 0.05 level of significance.

1. The Economics achievement of the male and female students who responded to multiple-choice, alternate and completion objective test item format do not differ significantly.
2. The effectiveness of the objective test formats on students achievement in Economics do not significantly differ based on their gender.
3. There is no significant interaction effect of gender and objective test formats on Economics achievement of the students.

### Methodology

The research adopted a 3x2 factorial quasi-experimental research design by post-test only method. The population of the study consists of 2,895, senior secondary two students in 19 public secondary schools in Isoko-South Local Government Area of Delta state. A purposive criterion sampling technique was used in selecting five (5) Senior Secondary Schools in Isoko-South LGA. The criteria for selection of schools/students include:

1. Schools with at least three streams or arms of senior secondary two level.
2. Schools that have qualified professional graduate Economics teacher as subject teacher in S.S.S 1 classes with a minimum of NCE certificate.
3. Schools which are currently presenting and graduating candidates for Senior Schools Certificate Examination.
4. Exposure to topics contained in the table of specification.

Five schools met the criteria and they formed the sample of the study. Using intact classes, the researcher was able to draw a sample size of 410.

### Instrumentation

Economics Achievement Tests (EAT) were developed by the researchers as the instruments for data collection. The instruments consist of three different objective test formats; multiple-choice, completion and the alternate response formats, with 30 items in each of the objective test formats. The multiple-choice test item format had four options in each item, out of which one is the key option and the rest become the distracter options. With completion test format, students were expected to write the correct answer to each item by filling in the blank spaces.

Test items for the alternate response format have True/False options at the end of each item and students were expected to tick the appropriate word as it concerns each of the questions. The 30 items used covered the main topics taught in SS 1 first term in Delta state, and were adapted from past Senior Secondary School Certificate Examination question paper on Economics.

The instrument was validated by three experts in the field of measurement and evaluation. The experts were required to establish the face and content validity of the instrument. The observations of the experts were incorporated in the final draft of the instruments. Kuder-Richardson Formular 20 was employed to measure the internal consistency reliability of the test scores for the three objective test item formats. Thirty (30) students, taken from the sample not used for the main study were used for the trial testing of the items. The reliability of the instruments were established separately based on the test format using Kuder-Richardson formula 20. In all, the reliability coefficients obtained are 0.87, 0.83 and 0.92 respectively for multiple-choice, alternate responses and then completion objective test item formats respectively. The coefficients obtained indicated that the Economics Achievement

Test constructed using multiple-choice, alternate and completion objective test formats are reliable enough to justify their use for the study.

Moreso, the researchers also established the equivalence of the three different economics test formats using equivalent-form reliability method through Pearson product moment correlation technique. This gave the coefficients of 0.82 when the students' scores on multiple choice and alternate responses were correlated. A coefficient of 0.81 when the students' scores on multiple-choice and completion objective test item formats were correlated. Then finally a coefficient of 0.86 when the students' scores in alternate response and completion objective test item formats were correlated. The coefficients obtained indicated that the different economics achievement tests format are equivalent.

However, the researchers with the help of one research assistant (Economics teacher) recruited from each school visited to administer the instrument, administered copies of the instrument via direct delivery approach to the students. After scoring and collation, the data collected were subjected to mean, standard deviation, independent samples' t-test, two-way analysis of variance and then scheffe test where appropriately. Specifically, the research questions were answered with mean and standard deviation, hypothesis one was tested with independent t-test while the hypotheses 2 and 3 were tested with Two-way Analysis of variance at 0.05 alpha level of significance.

### Results of the Study

The results of the research question one and its corresponding null hypothesis one were presented together in table 1, that of research questions 2 and 3 are presented together in table 2 while that of hypotheses 2 and 3 are also presented in table 3.

**Table 1: independent t-test Analysis, Mean and Standard Deviation Score of Male and Female Students in the Various Objective Test Item Formats**

Test Item Formats	Male			Female			DF	t	Sig.
	N	Mean	SD	N	Mean	SD			
Multiple	63	17.83	3.02	82	13.60	3.96	143	7.04	0.000
Alternate	58	15.57	3.86	81	16.67	2.82	137	-1.94	0.055
Completion	54	11.74	4.36	72	09.92	4.23	124	2.37	0.020
<b>Total</b>	175	15.20	4.49	235	13.53	4.58			

It can be discerned from Table 1 that for multiple choice test format, the male and female t-ratio is 7.041, degree of freedom (df) of 143, p-value of 0.000 (Sig. for 2-tailed), at 95% confidence interval. Since the p-value (Sig.) of 0.000 for 2-tailed test is less than the chosen alpha of 0.05. The alternate response test format for male and female, showed a t-ratio of -1.94 with a p-value of 0.055 which is greater than the chosen alpha of 0.05. However, completion test item format for male and female revealed a t-ratio of 2.37 and a p-value of 0.02 which is less than the chosen level of significance (0.05).

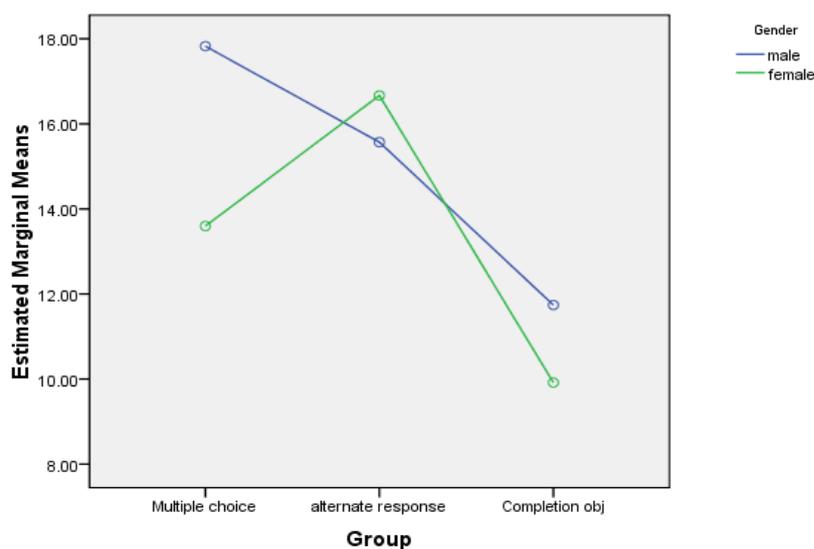
Sequel to the results obtained, it was found that gender difference can affect students' achievement when multiple choice and completion objective test formats were used. However, when male and female performance were compared in alternate response objective test formats, the result showed that gender has no significant influence on students' achievement in Economics. Hence, the results obtained indicated statistically significant influence of gender when multiple choice and completion objective test formats were used but statistically insignificant for alternate response objective test format was used.

**Table 2: Mean and standards deviations on the students' scores based on the objective test formats and gender**

Descriptive Statistics				
Dependent Variable: Economics Scores				
Test formats	Gender	Mean	Std. Deviation	N
Multiple choice	Male	17.8254	3.01897	63
	Female	13.5976	3.96235	82
	Total	15.4345	4.14463	145
alternate response	Male	15.5690	3.86215	58
	Female	16.6667	2.81514	81
	Total	16.2086	3.32421	139
Completion obj	Male	11.7407	4.35754	54
	Female	9.9167	4.22518	72
	Total	10.6984	4.36031	126
Total	Male	15.2000	4.49137	175
	Female	13.5277	4.58098	235
	Total	14.2415	4.61238	410

From Table 2, it is observed that the mean score of male students in multiple choice, alternate response and completion objective test formats were 17.83, 15.57 and 11.74 respectively. Their standard deviations in the same order were 3.02, 3.86 and 4.36 respectively. For the female students the mean scores for multiple choice, alternate response and completion objective test item formats were 13.60, 16.67 and 9.92 respectively, their standard deviation in the same order were 3.96, 2.82 and 4.23 respectively.

In table 2, it is also shown that disregarding gender, the mean scores of the students who responded to multiple choice, alternate response and completion objective test formats are 15.43, 16.21 and 10.70 respectively, while their standard deviations in the same order are 4.14, 3.32, and 4.36 respectively. On the other hand, disregarding the objective test formats, the overall mean scores of the male and female students were 15.20 and 13.53 respectively while their standard deviations were 4.49 and 4.58 respectively. Again a critical look at table 2 revealed that across the different objective test formats the male and female students' achievements in Economics differ hence the objective test format interact with gender to influence the achievement of students in Economics. This is also depicted in figure 1.

**Figure 1: Mean plot on the students' scores in economics showing interaction between objective test formats and gender**

From figure 1, it is seen that the lines representing the male and female mean scores on the three objective test formats are not parallel but intersected at two different points. It is also seen that the line representing the male scores rise to a higher point and then slopes downward while that of the female which started mid-way around 13.00 slopes upward and later downward. Hence, the observed interaction effect between objective test formats and gender.

**Table 3: Summary of Two-way ANOVA for Between Subject Effect in the Various Test Item Formats and Gender**

Source of variable	Sum of Squares	DF	Mean Square	F	Sig.
Corrected Model	3106.20 <sup>a</sup>	5	621.24	44.86	.000
Intercept	80819.55	1	80819.55	5.84	.000
Test formats	2217.12	2	1108.56	80.05	.000
Gender	272.52	1	272.52	19.68	.000
Test formats * Gender	492.68	2	246.34	17.79	.000
Error	5594.89	404	13.85		
Total	91857.00	410			
Corrected Total	8701.10	409			

It is shown in table 3 that the objective test formats significantly influence the achievement of students in Economics. This is because the f-ratio obtained is 80.05 at degrees of freedom of 2 and 404 at 0.0005 level of significance ( $P < 0.05$ ). The F-ratio obtained for gender influence on the efficacy of the objective test formats was 19.68 at degrees of freedom 1 and 404 at 0.0005 ( $P < 0.05$ ) levels. This indicated that, there is a significant gender influence on the efficacy of the objective test item formats on students achievement in Economics.

Again the result revealed that there is a significant interaction effect between gender and the objective test formats on students' achievement in Economics. This is shown on the table 3 where the value of the interaction effect of test item formats and gender had the F-ratio of 17.79 at 2 and 404 degrees of freedom, at  $p = 0.0005$ . The p-value is less than 0.05 chosen alpha.

However, since a significant effect of the objective test format on students academic achievement in Economics was found, determination of the direction of the significant effect using post Hoc multiple comparison test via scheffe test was conducted. The results obtained are presented in table 4.

**Table 4:** Scheffe test for the determination of the direction of significant effect of objective test formats.

Compared group means	Mean difference	P-value
Multiple choice vs alternate response	0.7742	0.217
Multiple choice vs completion objective	4.7361	0.000
Alternate response vs completion objective	5.510	0.000

The significant mean differences were obtained from the comparison of group means between those who responded to multiple choice and completion test groups, and then that

between completion test and alternate response test group means. While the comparison between multiple choice and alternate response test yielded an insignificant mean difference.

## **DISCUSSION OF FINDINGS**

Results in table 1 revealed that for multiple choice objective test the males had a higher mean score than their female counterparts. This was statistically significant when tested with independent t-test. This finding is contrary to the finding of Opong (2013) who observed that there was no statistical difference on the male and female history students' achievement on multiple choice test format. On the other hand, the finding is in line to that of Bolger and Kellaghan cited in Sim Kim and Kiechler (2005). They found that male students had advantage on multiple choice test over their female counterparts.

The finding is quite surprising to the researcher because, the students who are equally exposed to the content are expected to behave alike. However the finding may be attributed to their attitude towards the objective test format used which may be gender sensitive.

It is also observed in table 1 that for alternate response test item, the females had a higher mean scores than their male counterparts. However, when tested with an independent t-test an insignificant mean difference was observed. This finding contradicted that of Opong (2013) who found that a significant difference between the male and female academic achievement in history essay test. The difference in both finding resulted from the use of essay test in the previous study while alternate item response format test was used in the present study.

Furthermore for completion test format, it was found that the male students had a higher mean score than their female counterparts. The mean difference was observed to be a significant one when tested with an independent t-test. This finding differ from that of Samuel and John (2004) who found no significant gender influence on the academic achievement using various test items. However this finding may be that the male students are more prone to supply answer type of questions than the females.

A further investigation shows that the students who were exposed to alternate response item format had the highest mean score followed by the multiple-choice group and then the completion test format. It was also observed that in each item format the male and female students mean achievement differ. When two-way analysis of variance was employed it was observed that there was a significant influence of test formats, gender and interaction effects of (test format and gender) on students' academic achievement in Economics. This finding is in line with that of Machin and McNally (2006) who found gender influence on educational achievement of students. It is also in line the finding of Gafar and Shilna (2014) who found significant influence of interaction effect between gender and test format on students academic achievement. However the finding that the Economics achievement was highest with students exposed to alternate response item format may be due to the fact that it encourages memorization of facts and are highly prone to guessing so, a greater number of students may have scored very high due to guessing correctly. On the other hand the lower achievement on the completion format group may be due to the extent it eliminates guessing among students and requires them to supply their answers/responses by themselves.

## Implications of the Findings

The findings of the study have some implications for teachers, students and Government. This is with regard to examination bodies such as West African Examination Council, National Examination Joint Admission Matriculation Board, and so on. The interesting findings of the study indicated that objective test formats have a significant influence on the mean scores of students' achievement in Economics. This implied that students' achievement can differ based on the test format used. Further implication is that the students achieve higher in select answer type of objective test than in supply-answer type. It was also found that gender influence the achievement of students in the various objective test format used. This implies that to some extent achievement of students is gender dependent.

## RECOMMENDATIONS

Based on the implications of the findings, the researcher made the following recommendations;

- i Test constructors and teachers should re-examine the type of formats they use in setting Economics test.
- ii Multiple choice and alternate response test item formats should be considered more appropriate in setting Economics test.
- iii Seminar and workshops should be organized on a regular basis for classroom teachers and guidance counselor to update their knowledge on the use of appropriate test formats.
- iv Examination bodies such as West African Examination Council Joint Admission Matriculation Board and so on should see the need to reexamine the type of test formats used in determining students' achievement.

## CONCLUSION

From the findings, it was concluded that students achieve better in select-answer objective test format than in supply-answer type. That is the nature of the objective test items significantly affect students' academic achievement in economics. Again the achievement of the students in Economics when the various objective test items are used depend on their gender.

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