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Effect of Changes in Item-Sequence on Students Academic Achievement In Multiple-Choice Test Of Mathematical-Economics In Colleges Of Education, Lagos State Nigeria

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Abstract*— The significant of studying mathematical economics in colleges of education in Nigeria cannot be over emphasis because of the vital role it plays in enhancement of growth and development of the nation. A shortfall in the knowledge of the students in the area would led to failure in dream goal, therefore the need to improve strategies in developing item sequence to minimize students failure in the subject, this called for investigation into the effect of changes in item sequence on students academic achievement in multiple choice test mathematical-economics in colleges of education in Lagos State. Two research questions and two hypotheses guided the study. Repeated measures two-group within subject experimental research design was adopted. The population of this study consisted of all 3420 NCE one economics students 2018/2019 academic season from four Colleges of Education (COE) in Lagos State and 240 from two COE. 130 students from St. Augustine College of Education (Project Time) (70 males and 60 females) and 110 students from Ansar-Ud-Deen College of Education, Isolo (60 male and 50 females) were used as a sample of the study. ''Mathematical-Economics Achievement Test was used as an instrument for data collection consisted of 40 multiple-choice items was developed and subjected to experts for face and content validity. The consensus of the experts' judgment for MEAT yielded 0.94 validity index and 0.863 reliability index. Mean and standard deviation were used to answered research questions while paired samples t-test was used to test hypotheses at confidence level and the findings reveals that students in format A performed better than the student in format B when item sequence changed and male and female students in format A had highest mean scores than their counterpart in format B. It was recommended that, test should be arranged in random version and the lecturers teaching the mathematical economics should Endeavour to present the same item arrangement to all students regardless of the school type.

***Index Terms*— Academic achievement, Item sequence multiple-choice test, mathematical-economics.**

I. INTRODUCTION

Mathematical-economics is the application of mathematical methods to represent theories and analyze problems in economics. By convention, these applied methods are beyond simple geometry, such as differential and integral calculus, difference and differential equations, matrix algebra, mathematical programming, and other computational methods [1]. Proponents of this approach claim that it allows the formulation of theoretical relationships with rigor, generality, and simplicity [2]. Mathematical-economics allows economists to form meaningful, testable propositions about wide-ranging and complex subjects which could less easily be expressed informally. Because of the importance of Mathematical-economics, Federal Government of Nigeria (FGN) in collaboration with National Commission for Colleges of education (NCCE) introducing the course in Nigerian Colleges of Education into Economics curriculum reforms and the establishment of the National Mathematical-Economics Centre (NMEC) to enable our educational system to work towards improving our Science and Technology, implementation of initiatives like the Millennium Development Goals (MDG), National Economic Empowerment and Developmental Strategies (NEEDS) as well as Vision 20-2021.

In the light of the above, this will go a long way to develop rational thinkers that will use their intelligent, knowledge to predict and design positive ideas that will be benefiting generations in the society and the world at large. But, when there is a shortfall of knowledge, underperformance or low achievement in the subject area a nation will continue facing low growth and under-development since the undergraduates' youths are the key engine that predict national development when they acquire sound knowledge [3]. That is why all students gaining admission into colleges of education in Nigeria to study Economics most have credited their Senior Secondary School Certificate Examination (SSCE) in either, West African Senior School Certificate Examination **(**WASSCE**),** National Examinations Council (NECO) or National Business and Technical Examinations Board **(**NABTEB) as the case may along side with their achievement scores in Joint Admissions and Matriculation Board (JAMB) as cut-off points specified by National Commission for Colleges of Education (NCCE) in Nigeria. Despite the efforts made by the instructors and the Large Scale Assessment (LSA) bodies, yet insignificant academic achievement of students continues manifesting low performance in the society [4].

Over the years, poor academic achievement of economics students especially in Mathematical-Economics in Colleges of education in Nasarawa State is a thing of concerned to the educational stakeholders as well parents. The results of students in Mathematical-Economics for the five years academic session 2004-2019 reveals 68.4% have carry over

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(CO) while 31.6% passed the course (Nasarawa State Colleges of Education, Economics Departments Exams and Record, 2004-2019). Not just that, like of interest, poor family background, hash environment, absenteeism and inappropriate teaching method on the side of the lecturers who teaches the Mathematical-Economics [5]. These factors could be as a result of **c**onventional or traditional assessments focusing on the written or oral examination of knowledge can be effective in assessing the student's ability to memorize and redefine the knowledge-based components of the task which are insufficient to measure learning and skills unless traditional assessments are integrated with performance-based assessments [6].

Conventional or traditional assessments focusing on the written or oral examination of knowledge can be effective in assessing the student's ability to memorize and redefine the knowledge-based components of the task which are insufficient to measure learning and skills unless traditional assessments are integrated with performance-based assessments, such as formative assessment, to reflect the achievement of expected standards [7]. Academic achievement according to [8] is the ability to function effectively, respond quickly or perfectly to a given task. Thus to achieve is to accomplish a task successfully with a skill. Achievement describes the level of success in relation to a task that is carried out using a standardized test under planning instruction [9]. He further argued that achievement test could be teacher made test or standardized tests. A standardized achievement tests (SAT) is one in which the procedure, apparatus and scoring have been fixed so that precisely the same testing procedures can be follow at different times in different place. Teacher made tests (TMT) are those achievement tests prepared by classroom teachers either structured (multiple-choice) or unstructured (easy).

More so, Multiple-Choice Test (MCT) usually has dozens of questions or items'' .for each question, the test-taker is supposed to select the best choice a set of four or five options. They are sometime called selected response tests. MCT consist of a stem and several alternative answers. The stem is the opening a problem to be solved, a question asked, or an incomplete statement to be completed. The option are the possible answers that the examinee can choose from, with the correct answers called the key and the incorrect answers called distracters [10]. Multiple-choice or objective response is a form of objective assessment in which respondents are asked to select only correct answers from the choices offered as a list [11]. The MCT achievement is determined by students' ability and gender to some extent. [12] stated that gender is a socially constructed term depicting the system of relations between males and females, and designates behaviours, attitudes, roles, status and other processes that govern relationship among sexes in a given educational, socio-economic and political context. Gender stereotypes influence a number of mediating factors including the importance parents attach to children acquiring skills in different areas and encouragement of involvement in different activities [13.

Consequently, a sequence can be thought of as a list of elements with a particular order ("Sequences2020) Sequences are useful in a number of mathematical disciplines for studying functions, spaces, and other mathematical structures using the convergence properties of sequences. In particular, sequences are the basis for series, which are important in differential equations and analysis. Sequences are also of interest in their own right, and can be studied as patterns or puzzles, such as in the study of prime numbers [14]. There are a number of ways to denote a sequence, some of which are more useful for specific types of sequences. One way to specify a sequence is to list all its elements. For example, the first four odd numbers form the sequence (1, 3, 5, 7). This notation is used for infinite sequences as well. For instance, the infinite sequence of positive odd integers is written as (1, 3, 5, 7, ...). Because notating sequences with ellipsis leads to ambiguity, listing is most useful for customary infinite sequences which can be easily recognized from their first few elements [15]. When there is a changes in Item Sequence in a given tests, test-takers may either gain or lose due to the level of easiness, hardness or randomly as the case may be during the treatment.

This study anchored on two modern measurement theories, which are the Classical Test Theory (CTT) and the Item Response Theory (IRT). These two theories are based on different assumptions and use different statistical approaches. CTT is regarded as the "true score theory." The theory starts from the assumption that systematic effects between responses of examinees are due only to variation in ability of interest. The central model of the CTT is that observed test scores (X) are composed of a true score (T) and an error score (e) where the true and the error scores are independent. The variables are established [16] and best illustrated in the formula: X = T + e. Based on the premise that observed scores are a function of only factors – true scores and measurement error – the theoretical basis for CTT resides in the following formula: X = T + e. This equation represents the three components as discussed above, with T being the hypothetical indicator, X the observed indicator, and e' the amount of disagreement between T and X. IRT is generally regarded as an improvement over CTT. For tasks that can be accomplished using CTT, IRT generally brings greater flexibility and provides more sophisticated information. For test items that are dichotomously scored, there are three IRT models, known as one Parameter Logistic Model (PLM): 1PLM, 2PLM and 3PLM. A primary distinction among the models is the number of parameters used to describe items. The equation of the Item Characteristics Curve (ICC) for IRT models thus:

$$1PLM: P_i(\theta) = \frac{1}{1+e^{-(\theta - b_i)}} \quad eqn(1)$$

$$2PLM: P_i(\theta) = \frac{1}{1+e^{-D a_i(\theta - b_i)}} \quad eqn(2)$$

$$3PLM: P_i(\theta) = C_i + (1 - C_i)\frac{1}{1+e^{-D a_i(\theta - b_i)}} \quad eqn(3)$$

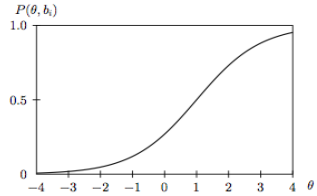
Where: Pi (θ) is the probability of a current response for the i^{th} item; b_i is the difficulty parameter for the i^{th} item; a_i is the discrimination parameter for the i^{th}item; ci is the guessing parameter for the i^{th} item; θ is the ability level; D represents a scaling factor. These theories enable the studying of tests by identifying parameters of item difficulty, item discrimination and the ability of test takers. CTT and IRT analyze items qualitatively, in terms of their content and form, which includes content validity, as well as item-writing procedures and quantitatively, in terms of their statistical properties, which includes the measurement of item difficulty and discrimination.IRT Assumptions are:

Monotonicity – The assumption indicates that as the trait level is increasing, the probability of a correct response also increases,

Unidimensionality – The model assumes that there is one dominant latent trait being measured and that this trait is the driving force for the responses observed for each item in the measure,

Local Independence – Responses given to the separate items in a test are mutually independent given a certain level of ability,

Invariance – We are allowed to estimate the item parameters from any position on the item response curve. Accordingly, we can estimate the parameters of an item from any group of subjects who have answered the item. If the assumptions hold, the differences in observing correct responses between respondents will be due to variation in their latent trait. Item Response Function (IRF) and Item Characteristic Curve (ICC) in Graphic 1.



Graphic 1

IRT models predict respondents' answers to an instrument's items based on their position on the latent trait continuum and the items' characteristics, also known as parameters. Item response function characterizes this association. The underlying assumption is that every response to an item on an instrument provides some inclination about the individual's level of the latent trait or ability. The ability of the person (θ) in simple terms is the probability of endorsing the correct answer for that item. As such, the higher the individual's ability, the higher is the probability of a correct response. This relationship can be depicted graphically and it's known as the Item Characteristic Curve. As is shown in the figure, the curve is S-shaped (Sigmoid/Ogive). The probability of endorsing a correct response monotonically increases as the ability of the respondent becomes higher. It is to be noted that theoretically, ability (θ) ranges from -∞ to +∞, however in applications, it usually ranges between -3 and + 3.

However, several literatures on the effect of changes in item sequence on students academic achievement in multiple choice test explored convergent or divergent findings among the recent studies are; that of [17] effect of changes in item sequence on students achievement in multiple choice Physics test in Taraba State, Nigeria. The finding revealed that there was a significant difference between the students mean achievement score in the format A and format B of the Physic achievement test. The mean differences in the mean achievement scores of the ability level were significant for both format A and B. The difference in the mean achievement score of the high ability students in the two condition was not significant, while there was a significant different in the mean achievement score of moderate and low ability students between the condition. There was no significant difference in the mean achievement score of male and female in the format A of the test while there was a significant difference in the mean achievement score of male in the format A and B and also for the female students. [18] reveal that item arrangement based on ascending order of difficulty has a positive and significant effect on students' performance in mathematics at 0.05 alpha level respectively while item arrangement based on descending order has a positive but insignificant effect on student' performance in mathematics. Finally, item arrangement based on no particular order of difficulty has a positive and significant effect on students' performance.

Another study by [19] investigated the impact of item position in multiple-choice test on student performance at the Basic Education Certificate Examination (BECE) level in Ghana. The finding reveals that for English Language, Mathematics and Science at the BECE level, when item order was altered, the difference in performance was statistically significant. [20] carry out an investigation on Item Sequence on Test Performance: Easy Items First? The finding of the study revealed that the sequence of items affect foreign language learners' performance. That is, those taking easy to difficult test outperforming students taking the difficult to easy test. The gap which the researchers' of this present study filled is effect of changes in item sequence on students academic achievement in multiple choice test Mathematical-economics in colleges of education Nasarawa State**.**

Research Questions

The following research questions guided the study:

To what extent do students mean scores in mathematical-economics in formats A and B compare as equivalent test when multiple-choice test item sequence change?

To what extent does male and female students' response affect their mean score in mathematical-economics in formats A and B when multiple-choice test item sequence change?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

Ho1: There is no significant different in students mean scores in mathematical-economics in formats A and B compare as equivalent test when multiple-choice test item sequence change

Ho2: There is no significant different in male and female students mean score in mathematical-economics in formats A and B when multiple-choice test item sequence change.

II. Material and Methods Design

The researchers made used of repeated measures two-group within subject experimental research design. In this study, the subjects are their own controls because the model assesses how the subject responds to all of the treatments [21]. The treatment is the variable being manipulated whose effect is under investigation. Therefore, the variable in this study is the item sequence. The subjects were dichotomized into two groups (Format A and Format B) and the groups were randomly assigned treatment. The first group was tagged Format A of the Mathematical-Economics Achievement Test (MEAT) first and the second group was tagged Format B first. Its follows the first group answered format B during the second administration while the second group answered format A. The design is symbolically represented in fig1.

Fig1:

GROUP 1	**Treatment A**	**O→**	**Treatment B**	**O**
GROUP 2	**Treatment B**	**O→**	**Treatment A**	**O**

Two-Groups Repeated Measures Design

The study made used of three variables namely: depending variable (students achievement in mathematical-economics), independents variable (item sequence/ format A and B) and moderator variable (gender).

Population and Sample

The population of this study consisted of all 3420 NCE one economics students 2018/2019 academic season from four Colleges of Education and 240 NCE one economics students were used as a sample for this study from two Colleges of education in Lagos State namely: St. Augustine College of Education (Project Time) Lagos which public and Ansar-Ud-Deen College of Education, Isolo which private. The NCE one economics students at this level were assumed to have acquired some basic concepts, knowledge and skills in simple geometry, such as differential and integral calculus, difference and differential equations, matrix algebra, mathematical programming, and other computational methods to enable them answer the pretest with Mathematical-Economics Achievement Test.

Before obtaining the sample size, lottery method of simple random sampling was employed to selected sample size of 240 from two colleges of education thus: 130 economics students from St. Augustine College of Education (Project Time) Lagos (70 males and 60 females) and Ansar-Ud-Deen College of Education, Isolo (60 male and 50 females). Serial numbers of the elements on pieces of papers folded and mixed thoroughly before respondents were asked to pick at once without replacement. This technique gave equal opportunity to the respondents being selected thereby reducing the bias effect that may interfere with the validity and reliability of the study. Format A (group 1) economics students from St. Augustine College of Education (Project Time) Lagos while Format B (group 2) economics students from Ansar-Ud-Deen College of Education, Isolo.

Instrument for Data Collection

The researchers developed an instrument tagged ‘‘Mathematical-Economics Achievement Test (MEAT) consisted of 40 multiple-choice items used as the instruments for data collection and each item was placed on five-option responses mode of A, B, C, D and E. The researchers developed the items (MEAT) after the item analysis of the multiple choice items prepared in first semester of 2018-2019 academic session. According to the item analysis, questions with a degree of discrimination of more than 0.30 were selected in such a way that they would not prejudice the validity of the test were reviewed by year three economics lecturers that were teaching mathematical economics for content validity. Mathematical-Economics Achievement Test (MEAT) format A consist of 40 multiple-choice test items that were arranged based on Random Version (RV) while format B also consist of 40 multiple-choice test items that were arranged from Easy to Hard (EH).

Validity and Reliability of Instrument

Mathematical-Economics Achievement Test (MEAT) was developed and subjected to experts for face and content validity. This was determined through the judgment of three experts, who are knowledgeable in the skills being measured, by checking for appropriateness, comprehensiveness and relevance of the items, clarity of expression and size of print. Two economics lecturers that were teaching Mathematical-economics in the two colleges of Education and one expert’ in educational measurement and evaluation who is knowledgeable in Mathematical-economics from Nasarawa State University Keffi validated the instrument. Items that did not measure what they ought to measure were deleted or modified, while good items were retained. The experts verified if the items were in line with the content and objectives stated in the curriculum of NCE 1 Mathematical-Economics. The consensus of the experts’ judgment for MEAT yielded 0.94 validity index.

The test reliability was estimated using parallel form method and pilot study was conducted on small portion of the population (30 students) who are not part of the sample of this study, the result for the two Mathematical-Economics Achievement Test (MEAT) yielded two sets of scores which were correlated and its gave of equivalence of 0.863 reliability index. The reliability results of MEAT was compared with the guidelines for interpreting alpha coefficients suggested [22] that “$\alpha \geq 0.9$ excellent, ≥ 0.8 good, ≥ 0.7 acceptable, ≥ 0.6 questionable, ≥ 0.5 poor, ≤ 0.5unacceptable”. Therefore, the results of the reliability enabled the researchers to use the instrument for both pretest and posttest, since the correlation was considered high and significant.

Procedure for Data Collection

Two research assistants from the colleges of education were trained by the researchers to assist in administering the instruments and lecturing the topics selected for the study. Each of the research assistants was an economics lecture with years of lecturing experience and yet, the researchers monitor their activities. A week training programme was organized with the research assistants. The training programme was to acquainted the research assistants with how to use the test format in the groups. The following features were addressed during the training: the objectives of the package, topics, contents, duration, lectures’ and students’ activities, methods and how to use test format, administration and scoring. The first administration: Group 1 answered MEAT Version A while Group 2 answered MEAT Version B and on the second administration; Group 1 answered MEAT Version B while Group 2 answered MEAT Version A.

Techniques for data analysis, tests were collected and marked and scored 1 for correct answered after the administration of MEAT, all the total tests marked were over 40 marks. The scores were dichotomized into two ways. Firstly, scores were arranged according to format of items answered. MEAT scores were entered into SPSS using format as the categorical variable. Format A was coded as (1) and format B coded as (2). Secondly, the scores were grouped using formats and gender as categorical variables. The Format A and B scores were separated into male and female accordingly and achievement scores were entered into the SPSS software

using formats and gender as categorical variables. Format was coded as (1) and format B as (2). Mean and standard deviation were used to answered research questions while paired samples t-test was used to test hypotheses at confidence level using SPSS software package version 23 and the results are presented in below tables. See Appendices for details.

III. Results

Research questions/hypotheses

RQ1: To what extent do students mean scores in mathematical-*economics* in formats A and B compare as equivalent test when multiple-choice test item sequence change?

Table 1 descriptive statistics for students in test format A and format B. Students in format A had mean scores of 29.27 with the standard deviation of 4.90 while student in format B had mean scores of 25.70 with the standard deviation of 5.00. This implies that, the scores of students in tests format A and B obtained from MEAT is at variance between the two tests formats when the item sequence changed. See Appendix A for details of descriptive statistics computations.

Ho1: There is no significant different in students mean scores in mathematical-economics in formats A and B compare as equivalent test when multiple-choice test item sequence change.

Table 2 shows paired samples test for students in tests format A and B (t=11.62, df=239, p=0.000 at two-tailed). This shows a significant difference between the two tests format when item sequence changed from either randomly and descending ordered of difficulty, hence Ho1 is rejected and concluded that there is a significant different in students mean scores in mathematical-economics in formats A and B compare as equivalent test when multiple-choice tests item sequence changed. See Appendix B for details of paired samples test statistics computation.

RQ2: To what extent does male and female students' response affect their mean score in mathematical-economics in formats A and B when multiple-choice test item sequence change?

Table 3 descriptive statistics for male and female students in test format A and format B. Male and female students in format A had mean scores of 27.90 and 26.43 with the standard deviations of 4.93 and 487 while Male and female student in format B had mean scores of 25.88 and 24.26 with the standard deviation of 5.13 and 5.09. This implies that, the scores of male and female students in tests format A and B obtained from MEAT is at variance between the two tests formats when the item sequence changed. See Appendix C for details of descriptive statistics computations.

Ho2: There is no significant different in male and female students mean score in mathematical-economics in formats A and B when multiple-choice test item sequence change.

Table 4 shows paired samples test for male and female students in tests format A and B. Male and female students in format A (t=5.64, df=59, p=0.000 at two-tailed) while male and female students in format B (t=3.48, df=49, p=0.001 at two-tailed) . This shows a significant difference between the two tests format when item sequence changed from either randomly and descending ordered of difficulty. Appendix D for details of paired samples test statistics computation.

Table 5 shows pairing mean scores for male is 27.36 and female is26.70 in format A (t=1.01, df=129, p=0.064>0.05). This implies that there is no significant difference between male and female students in format A when multiple-choice test item sequence change. Appendix E for details of paired samples test statistics computation.

Table 6 shows pairing mean scores for male is 25.22 and female is 22.33 in format B (t=3.01, df=109, p=0.004<0.05). This implies that there is no significant difference between male and female students in format A when multiple-choice test item sequence changed, hence Ho2 is rejected and concluded that there is a significant different in male and female students mean scores in mathematical-economics in formats A and B when multiple-choice test item sequence change. Appendix F for details of paired samples test statistics computation.

IV. Discussion

Findings from this study in Table 1 shows descriptive statistics for students in test format A and format B. Students in format A had highest mean scores with the standard deviation than the student in format B. This implies that, the scores of students in tests format A and B obtained from MEAT is at variance between the two tests formats when the item sequence changed. Drawing inferences from Table 2 shows paired samples test for students in tests format A and B. The results shows a significant difference between the two tests format when item sequence changed from either randomly and descending ordered of difficulty, hence Ho1 is rejected and concluded that there is a significant different in students mean scores in mathematical-economics in formats A and B compare as equivalent test when multiple-choice tests item sequence changed. This findings is in agreement with that of [23]revealed that there was a significant difference between the students means achievement score in the format A and format B of the Physic achievement test. In line with the findings of Ayoola,[24],[25] reveal that item arrangement based on ascending order of difficulty has a positive and significant effect students' performance in mathematics while item arrangement based on descending order has a positive but insignificant effect on student' performance in mathematics. Item arrangement based on no particular order of difficulty has a positive and significant effect on students' performance.

Lastly, Table 3 shows descriptive statistics for male and female students in test format A and format B. Male and female students in format A had highest mean scores and the standard deviations than male and female student in format B. This implies that, the scores of male and female students in tests format A and B obtained from MEAT is at variance between the two tests formats when the item sequence changed. findings corroborated with finding of [26] reveals there was no significant difference in the mean achievement score of male and female in the format A of the test while

there was a significant difference in the mean achievement score of male and female in the format A and B. [27] the finding reveals that for English Language, Mathematics and Science at the BECE level, when item order was altered, the difference in performance was statistically significant. [28] finding of the study revealed that the sequence of items affect foreign language learners' performance.

V. CONCLUSION

This study was design to investigate the effect of changes in item sequence on students' academic achievement in multiple choice test Mathematical-economics in colleges of education. It was concluded that arrangement of items of mathematical economics tests is associated with the students' achievement in the subject area. Arrangement of items randomly makes students achieved better than when arrange in descending of difficulty. Thought the descending order item arrangement in mathematical economics achievement test affected both male and female students, the effect on female is more than the male in a practical condition. Sequels to the findings, it was recommended that, mathematical economics achievement test should be arrange in random version and the lecturers teaching the mathematical economics should Endeavour to present the same item arrangement to all students regardless of school type.

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Appendices

Appendix A

Table 1: Descriptive Statistics for Students in Test Format A and B

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Format-A	240	18.00	39.00	29.2750	.31655	4.90404
Format-B	240	18.00	36.00	25.7000	.32284	5.00142
Valid N (listwise)	240					

Appendix B

Table 2: Paired Samples Test for Students in Test Format A and B

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Format-A - Format-B	3.57500	4.76329	.30747	2.96930	4.18070	11.627	239	.000

Appendix C

Table 3: Descriptive Statistics for Male and Female Students in Test Format A and B

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Format-A (Male)	70	18.00	39.00	27.9000	.58982	4.93479
Format-A (Female)	60	18.00	36.00	26.4333	.62904	4.87250
Format-B (Male)	60	18.00	39.00	25.8833	.66302	5.13576
Format-B (Female)	50	18.00	36.00	24.2600	.72100	5.09826
Valid N (listwise)	50					

Appendix D

Table 4: Paired Samples Test for Male and Female Students in Test Format A and B

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Format-A	Male-Female	3.23333	4.43930	.57311	2.08654	4.38012	5.642	59	.000
Format-B	Male-Female	2.88000	5.85066	.82741	1.21726	4.54274	3.481	49	.001

Appendix E

Table 5: Paired Samples Statistics for Male and Female Students in Test Format A

		Mean	N	Std. Dev	Std. Error Mean	t	Df	Sig. (2-tailed)
Pair 1: Format A	Male	27.3667	70	6.19996	.80041	1.013	129	.064
	Female	26.7000	60	5.87814	.75886			

Appendix F

Table 6: Paired Samples Statistics for Male and Female Students in Test Format B

		Mean	N	Std. Dev	Std. Error Mean	t	Df	Sig. (2-tailed)
Pair 1: Format B	Male	25.2267	60	6.2296	.73241	3.013	109	.004
	Female	22.3300	50	5.21814	.65286			

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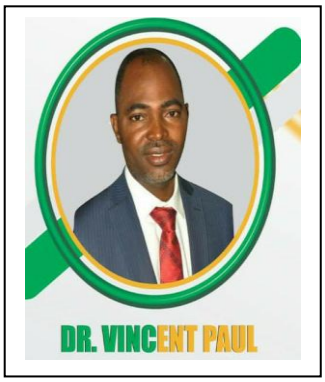

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