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GENDER DIFFERENCE IN PERFORMANCE IN FOUR SCIENCE SUBJECTS IN BORNO STATE COLLEGES OF EDUCATION

BY

[1]ADAM, Mohammed, [2]KIME, Mallam Mustapha and [3]WALI, Hassan Mohammed

[1]mohd_allamin@yahoo.com, [2]kimengoirambe@gmail.com [3]lawanwali0234@gmail.com

[1&3]School of Education, [2]School of Social Sciences,

Umar Ibn Ibrahim El-Kanemi College of Education, Science and Technology, Bama, Borno State.

ABSTRACT

Purpose: This study examines Gender Difference in Science Subjects Performance in Borno State Colleges of Education with particular reference to Umar Ibn Ibrahim El-Kanemi College of Education, Science and Technology, Bama. The objective of the study is to find out; whether or not there exists gender difference in performance in Biology, Chemistry, Mathematics and Physics for three consecutive sessions.

Methodology: Because of its suitability, the study adopted ex-post facto research design. The data for the study were collected from two independent groups (male and female) for three different sessions (2010/2011, 2011/2012 and 2012/2013). The instrument used for data collection is the Students Result Proforma designed by the researcher. Through the proforma the researcher collected the NCE 1, 2 and 3 students' CGPA. Inferential statistics (i.e. t-test) was used to analyse the data. The analysed data was presented in tables which are expressed in differences between means, variances and correlated coefficients. Stratified sampling technique was used to select gender and all the four core science subjects. All population within these departments (stratified as male and female) were utilized for the study. The t-test which was calculated at 0.05 level of significance reveals absence of differences in Chemistry and Mathematics.

Findings: However, gender difference was obtained in favour of males in Biology and Physics.

Unique contribution to theory, practice and policy: It was recommended that sensitization on quality science education is necessary especially in all science subjects by government and non-governmental organization to inspire female students to catch up.

Keywords: *Gender, Science subjects, Performance.*

1. BACKGROUND INFORMATION

A nation can be classified as developed through its scientific and technological development. Thus, the world has identified science as an important tool for national development. Oyedeji (2003) observed that it is increasingly becoming difficult for any society to survive, talk less of development without science education. Realizing the importance of science, the Federal Government of Nigeria (FGN, 2004) stipulated in the National Policy on Education that government shall popularize the study of science and the production of adequate number of

scientists to inspire and support national development. Nigerian government in her role to promote science education has established Universities of Science and Technology, Polytechnics, Colleges of Science and Technology at the state and federal levels. Among these Colleges of Education in Borno State are Waka-Biu College of Education and Umar Ibn Ibrahim College of Education, Science and Technology Bama as science based while Kashim Ibrahim College of Education as conventional but offers science programmes. These colleges of Education were established to educate and train people in teaching of science at NCE level. Science programme in Colleges of Education are generally designed to produce knowledgeable, highly motivated, professional and effective classroom teachers in science education (NCCE, 2012). This is with the view of servicing the primary and junior secondary school levels manpower requirement of the education sector.

No nation can aspire to achieve its full developmental potentials unless all its people, men and women, boys and girls are full participants in the process. However, the attitude and values of Nigerian society on females have apparently influenced their (female) performance in Physical Sciences at all levels of education. Nuhu (2002) observed that career stereotyping is a contributory factor in the inadequate production of manpower in the area of Mathematics, Chemistry, Physics and Technical subjects in Nigeria.

According to Freeman (2004), academic performance is a key measure of school success, because high performance in school open doors to further education and to well-paying jobs. Freeman (2004) stressed that, for females to have the same opportunities as males in education and labour market, it is important for them to be equally well prepared academically. Authentic academic performance covers individuals' academic abilities and skills in applying practical abilities (Bourne, 2007). Academic performance refers to indicators or the interpretation of the test result which imply a comparison of sample behaviour. The comparison can be one sample behaviour with another taken at different point in time or with that taken from another students or group of students (Capper, 1996). Stricker, Rock and Bennet (2001) see academic performance as work or function which an individual indicates as his or her abilities, motives, interests and personality traits. Thus, it predicts what an individual will achieve in future. Stricker, Rock and Bennet (2001) stressed that better academic performance at early stages of the school career predicts accomplishments in later stages of career as well as after leaving school.

The issue of gender difference in academic performance at all levels of education has been a great concern to many researchers. A number of studies have been carried out with regard to this phenomenon (Penwell, 2004; Lattery, 2005; Amuda, Ali and Durkwa, 2016; Adam, Wali and Kachalla, 2017). Many reasons have also been advanced for differences in performance in science between males and females. These reasons include differences in significance attached to academic success for male and female; peer and family pressure to do well is stronger for male than for female (Lavin, 1965).

Therefore, this is a study of gender difference in academic performance in science subjects in Borno State Colleges of Education with particular reference to Umar Ibn Ibrahim El-kanemi

College of Education, Science and Technology, Bama. Colleges of Education hold important position in the production of teachers to primary and junior secondary school levels. Despite the Federal Government of Nigeria's (2004) advocacy for adequate manpower in science sector for nation building, female science students in Borno State Colleges of Education are still lagging behind when compared with their male counterparts (NCCE statistical Digest, 2012). Gender inequality is a problem that constitutes major research focus across the globe (UNESCO, 2003). In line with the observation of Lifanda (2005), to move beyond access and number as to ascertain quality education for girls and women, assessing female performance in relation to their male counterparts is necessary. It is against this background that the researcher intends to find out gender difference in science subjects performance in Borno State Colleges of Education, with particular reference to Umar Ibn Ibrahim El-kanemi College of Education, Science and Technology, Bama.

1.1 THEORETICAL FRAMEWORK

This study hinged on psychological theory propounded by Lavin (1965) as cited in Hamman-Tukur (1985). The basic assumption of the theory is that sex-role stereotyping causes the difference in academic performance between males and females. According to the theory, there are three ways through which differences in academic performance between male and female can occur. One of the ways is as a result of differences in significance attached to academic success for male and female. Male academic success is considered more significant than the academic success of female. Family (parents) influences and peer influences to do well on the side of male are higher than that of female.

Another way differences between male and female academic performance occur is the role of society in defining what achievement means to male and female. As a result of contrasting role of male and female in most cultures, where male perform more outdoor activities while female perform more domestic work, they tend to achieve in different areas. Thus, the society's achievement expectation for male and female differ especially in academic areas. For example, Mathematics and Science are more important to males than females. The theory also posits that the role of teachers in achievement of academic success counts. Where female teachers outnumber male teachers, teacher's definition of students' role includes more characteristics of female sex role. Likewise where male teachers outnumber female teachers, teachers' definition of students' role would include more characteristics of male sex role. In either case, one sex would be at disadvantage.

The aforementioned are the ways differences in academic performance occur according to Lavin (1965). Some studies on gender difference also observed that, in peer interaction children reward each other for gender appropriate activities and punish gender conduct considered inappropriate for their gender (Lamb, Easterbrook and Holden, 1980). Eccles (1987) observed that boys are more likely to be praised for academic success and criticized for misbehaviour, whereas girls tend to be praised for tidiness and compliance and criticized for academic failure. The differential pattern of treatment can enhance the perceived self-efficacy of boys and

undermine that of girls. Therefore, this theory presented in this theoretical framework has portrayed why male and female performed differently. Hence, its appropriateness to this study.

2. METHODOLOGY

This study was an ex-post facto research design. It is non experimental research in which it is not possible to manipulate variables or to assign subjects or conditions at random. In this type of design, the independent variable comes to the researcher as it were, readymade. The dependent variable is observed and then "goes back" to the independent variable that presumably influences the dependent variable. Here the data was collected after the event or phenomenon under investigation has taken place hence the name ex-post facto (Kerlinger, 1979; Emaiku, 2006). In this study, gender which was the independent variable has already been assigned to appropriate level (male and female) while the dependent variable which was academic performance has taken place in the name of Cumulative Grade Point Average (CGPA). Hence, the researcher studied academic performance against gender with the view to determine their relationship. Thus, the appropriateness of the design for this study.

The target population for this study consists of science students of Umar Ibn Ibrahim El-Kanemi College of Education Science and Technology Bama. Stratified sampling technique was used to select the gender (male and female) and the four departments namely Biology, Chemistry, Mathematics and Physics because they are the core science subjects. Only students during 2010/11, 2011/12 and 2012/13 sessions were involved in the study because students at this level have sat for all the courses in the programme.

The research instrument used for data collection was Students Result Proforma designed by the researcher. Through the proforma the researcher collected the NCE 1, 2 and 3 students' CGPA (i.e. 1st and 2nd semester GPAs across the three sessions). Using the proforma, the science subjects and the sessions were determined. It also provided information on candidates' number and sex. Academic records were used in obtaining CGPA while registration lists comprising bio-data were used in identifying students' gender.

The collected data was analyzed using inferential statistics (i.e. t-test of independent samples). This statistic was used to analyze the hypotheses raised on the performance of male and female students in the four core science subjects. The data were coded into male and female, where 0 represents female and 1 represents male. The analyzed results were presented in tables showing difference between means, variances and correlated coefficients.

3. DATA ANALYSIS AND RESULTS

Ho_1: There is no significant difference between male and female students' academic performance in Biology

Table 1: Summary of two-sample t-test of male and female students' academic performance in Biology

Session	N		X		SD		DF	T	P	Decision
	M	F	M	F	M	F				
2010/11	205	127	2.17	2.18	.93	.96	330	1.050	>.05	NS
2011/12	189	115	2.57	2.36	1.04	1.00	303	-1.71	>.05	NS
2012/13	254	171	2.20	1.98	1.04	.97	423	-2.13	<.05	S

KEY

S = Significant

NS = Not Significant

Table 1 presents the summary of two-sample t-test of male and female students' academic performance in Biology across the three sessions. The results indicated that there was no significant gender difference in students' performance in Biology at P >.05 during 2010/11 and 2011/12 sessions. Hypothesis one (Ho_1) is therefore accepted. The results however showed significant gender difference in Biology at p <.05 during 2012/13 session. The disparity was in favour of males. Based on this, hypothesis one is rejected.

Ho_2: There is no significant difference between male and female students' academic performance in chemistry.

Table 2: Summary of two-sample t-test of male and female students' academic performance in Chemistry.

Session	N		X		SD		DF	t	P	Decision
	M	F	M	F	M	F				
2010/11	139	45	2.09	1.91	1.07	.92	182	-1.022	>.05	NS

2011/12	82	34	2.83	2.40	0.97	.94	114	-1.548	>.05	NS
2012/13	88	36	2.36	2.08	.99	.97	122	-1.466	>.05	NS

KEY

S = Significant

NS = Not Significant

Table 2 presents the summary of two-sample t-test of male and female students' academic performance in Chemistry across the three sessions. The results indicated that there was no significant gender difference in Chemistry at p > .05 during 2010/11, 2011/12 and 2012/13 sessions. Hypothesis two is therefore accepted with regard to Chemistry performance in the three sessions.

Ho_3: There is no significant difference between male and female students' academic performance in Mathematics.

Table 3: Summary of two-sample t-test of male and female students' academic performance in Mathematics.

Session	N		X		SD		DF	t	P	Decision
	M	F	M	F	M	F				
2010/11	83	7	2.84	2.14	1.02	.78	88	-1.750	>.05	NS
2011/12	79	6	2.51	1.86	1.04	.51	83	-1.514	>.05	NS
2012/13	75	11	2.33	1.65	1.22	.67	84	-1.782	>.05	NS

KEY

S = Significant

NS = Not Significant

Table 3 presents the summary of two-sample t-test of male and female students' academic performance in Mathematics across three sessions. The results showed no significant gender difference in Mathematics at p > .05 during 2010/11, 2011/12 and 2012/13 sessions. Based on this hypothesis three (Ho_3) is accepted.

Ho_4: There is no significant difference between male and female students' academic performance in Physics.

Table 4: Summary of two-sample t-test of male and female students' academic performance in Physics.

Session	N		X		SD		DF	t	P	Decision
	M	F	M	F	M	F				
2010/11	56	15	2.36	2.10	1.11	.84	69	-.841	>.05	NS
2011/12	39	8	2.40	1.47	1.20	.66	45	-2.097	<.05	S
2012/13	40	7	2.70	1.21	1.24	.81	45	-3.212	<.05	S

KEY

S = Significant

NS = Not Significant

Table 4 presents the summary of two-sample t-test of male and female students' academic performance in Physics across the three sessions. The results showed that gender and academic performance did have significant difference in Physics at $p > .05$ in 2010/11 session. The result however showed significant gender difference in Physics at $p < .05$ during 2011/12 and 2012/13 sessions. The disparity was in favour of males. Hypothesis four (Ho_4) is therefore accepted with respect to Physics 2010/11 session while it is rejected with respect to Physics 2011/12 and 2012/13 sessions.

4. DISCUSSION OF FINDINGS

The finding of this study with respect to hypothesis one which states that there is no significant difference between male and female students' academic performance in Biology indicated that male and female students significantly differed in Biology in a session. The differences were in favour of males. It is in agreement with the finding of Kawahara and Ethington (1994) in their study of performance difference on Pharmacy College Admission Test (PCAT), who reported that males performed better than females in Biology. The findings were consistent with NCES (1997) who reported that males scored higher than females with difference of 33 points in Biology examination. The finding is however partly not in line with that of Jebson (2003) who conducted a study among students of Federal Government Colleges of North Eastern Nigeria. The study revealed that females were on the upper hand in JSCE integrated science examination of 1997 and SSCE Biology of 2000. Another study that this finding contradicts is that of Jimoh (2005). The study found that females' performance was better in mounting and staining the correct plant dye in Practical Biology.

The findings of this study according to hypothesis two which states that there is no significant difference between male and female students' academic performance in Chemistry indicated was accepted. The study contradicts findings of Felder et. al. (1995) which reported that males performed better in Chemistry with substantial differences occurring in the percentages of male and female earning "A's". In the same vein, males from urban schools performed better than

females from rural schools (Jimoh 2005). Supporting this finding was the study of Bunyi (2004) where girls outperform boys in Chemistry.

The findings of this study with respect to hypothesis three which states that there is no significant difference between male and female students' academic performance in Mathematics revealed that there was no significant gender difference in Mathematics across the comparisons made at different sessions and different levels. This corroborates the findings of Kalejaiye (1991) who reported no significant gender difference on enjoyment of Mathematics by boys of male schools and girls of female schools. This study also supports the finding of Adebayo and Adeniba (1999) who reported no gender difference in Differential Equation and Abstract Algebra performance among students of Akoka College of Education. However, it contradicts the findings of Wamdeo (2003) who observed that there are differences between the males and females when it comes to mathematical, spatial and verbal abilities.

Hypothesis four which states that there is no significant difference between male and female students' academic performance in Physics revealed significant gender difference in favour of males in the sessions and performance in Physics. At different sessions, gender differences were observed. Differences in favour of males were observed in 2011/12 and 2012/13 sessions. These findings agree with the earlier study conducted by Bell (2007) who investigated 16 year old pupils in United Kingdom and found gender difference in favour of males in Physics. In the same vein, Adeoye and Sotayo (2003) in their investigation of students' achievement showed that males were on the upper hand in Physics achievement test. Another earlier study that this study supported is that of Kleinfeld (2006). The author reported that men scored substantially higher than women in Physics performance.

5. CONCLUSION

Gender differences in performance of NCE students in science subjects was the focus of this study. The results showed that in general there were significant gender performance differences in Biology and Physics. The differences were in favour of males. However, there was no significant gender difference found among Chemistry and Mathematics students. Prior (indigenous) knowledge and attitude the students have brought to school might be the reason why female students fail to keep pace with their male counterparts' performance in science subjects. Therefore, parents and teachers need to encourage and give equal opportunities to their wards irrespective of their sex.

6. RECOMMENDATIONS

Based on the findings of the study the following recommendations were made:

1. Since there is gender gap in favour of male performance in Mathematics and Physics. Government and non-governmental organizations should introduce remuneration packages (such as scholarships) to female students in order to keep pace with their male counterparts.

2. Sensitization on quality science education is necessary especially in all science subjects by government and non-governmental organization to inspire female students to catch up.
3. To enjoy the full benefit of contemporary living, quality Science education is imperative. Therefore, female students should strive to acquire it so as to contribute meaningfully to national development.

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