

COMPARATIVE ANALYSIS OF UNDERGRADUATE FEMALES AND MALES PERFORMANCES IN SCIENCE AND TECHNOLOGY IN COVENANT UNIVERSITY

O. Fayomi, R. Dare-Abel, O. Adepoju
Covenant University (NIGERIA)

ABSTRACT

The 21st Century has ushered in awareness to female education on Science and Technology Courses in Nigeria. The rate of enrollment in higher institutions especially the private institutions in Nigeria are quite astonishing. This has led to the enquiry on the comparative assessment of the performances of both females and males in Science and Technology Courses. Covenant University Students of College of Science and Technology will be the focus of study. In order to elicit information on the interest and performance of the females and males in Science and technology courses. In addition, Centre for Information and Systems was also consulted for relevant information related to this study. The research work adopted both the primary and the secondary method; the primary method involved the use of questionnaires and interviews. The secondary method included the past performances of the students in terms of academic records and achievements of female students in the Science and Technology. The method of data analysis entailed descriptive and empirical analyses of the data gathered from the respondents. The empirical aspect involved independent sample analysis and regression to determine the nature of the relationship among the variables. The descriptive utilises the frequency and percentage distribution to analyse the responses from the targeted audience. The questions consists of two major parts; the first part seeks to ascertain vital information that patterns to the socio-demographic characteristic of the respondents and the second part focuses on the students' performances in their courses as well as their cumulative grade points since the inception. The adoption of these methods in the analysis is to ascertain whether choice of courses in tertiary institutions is the keen interest of the males and females students or has been influenced by parents or guardians' decision to study. In addition, the adoption of this method helps to validate the importance of Science and Technology to the female world, since the world is at present a global village.

Keywords: Science, Technology, Performance

1.1 INTRODUCTION

In the light of rapid growth and empowerment, the efficacy of science and technology cannot be sideline the beauty of everything in these new/modern age can also be deduce from the advancement of science and technology but the limitation between the males and females in these field are to parallel lines that cannot meet. The comparative analysis of males and females performance in science and technology Covenant University, that what this presentation is all about. We needed to drive home and buttress our point. The university is a established environment to undertake this task.

Covenant University is a private tertiary institution, established years ago, exactly October 2002, since then the institution has continued to improve on its standards with the ultimate vision 10:2022. The choice of Covenant University students is to substantiate the outcome of survey samples conducted by Centre for Democratic Governance in Africa (CDGA) which rated Covenant University as the best private University in Nigeria. Covenant university has a well-equipped standard laboratories and classrooms for all Science and Technology students in Covenant University and also provided a conducive and serene environment for learning and research. Covenant University also won the best performing higher institution of the year award in 2013. This is to show is to emphasise both the quantitative and qualitative nature of this research. Every year an estimated number of 2,000 students are enrolled into the

institution. The enrollment of females to males in the Science and Technology differs; males and more than females in enrolment.

Generally, it has been observed that the number of women in Science and technology globally is low starting from Africa, to Asia, South America, Europe, North America and the rest of the world. The ratio of men to women Nobel laureates in the science category: Physics, Chemistry, Mathematics, Medicine is 5:1 respectively. It is against this backdrop that the study aims to interrogate the reasons for the low level of females' Science and Technology students in Covenant University and in the Nigerian workforce, to male policy contributions towards awareness creation and encouragements from the governments and non-governmental organisations. And in addition to sensitize parents/guardians to encourage their females wards on the advantages of Science and Technology courses.

2.1 LITERATURE REVIEW

The attraction and retention of women is a major concern in science and technology world (Goyal 1996:ITAA, 2000). This concern has, if anything, more acute in recent years, in that the total numbers of women in the professional- level science and technology jobs and science and technology education programs have been declining (Camp, 1997). Recent statistics indicate that women account for only about 20 percent of the United States technology work force and 25 percent in European work force (Maitland, 2001). Moreover, men and women in the science and technology workforce typically hold different types of jobs with th women being under-represented in higher paid positions (council of economic adviser,2002; Igbaria, Pasasuraman and Greenhaus,1997; Meares and Sargent 1997). For these reasons, in order to move more women through the science and technology pipeline and thereby better utilize the entire workforce, it's important to examine the factors determining science and technology-related carrier and satisfaction with this choice among women.

The outcome of various researchers to this gender difference in science and technology major still boils down to the fact the ratio of males to females are two parallel lines with which that of the males exceed the female. In this study we use Nigeria as the case study and the best private university as the yard stick reason been that it's not just the best but also affordable to an average Nigerian. When the researchers launched out for the administering of questionnaires and interview with lectures: the discovery was astonishing, there are more of males than females and even the lectures we have more of the males than females at professional level attending to the academics needs of these young stars. The ratio is 10:1 for the lectures and 7:1 for the students, males to females respectively.

In countries around the world, girls enter key science and technology engineering and mathematics (STEM) major at much lower rate than the boys. For example, only 18% of engineering students in the united states, 19% of engineering students in Europe and 14% of engineering and science students in Japan are females (National science board,2012 ; EURO State 2012,MEXT,2009). Likewise, boys outnumber gir;s in key science and engineering majors in the emerging economics of BRIC countries (Brazil, Russia, India, China- Carnoy et al;2013). For example in Brazil, boys outnumber girls by almost 8 to 1 in electrical engineering and computer science major (INEP, 2013). In Russia, boys outnumber girls by almost 4 to1 in engineering and technology majors. (Gerber and Schaefer, 2004).

The substantial gender gap in science and technology majors translate a substantial gender gap in higher paying science and engineering occupations after students graduate from college. It thus has a significant implication for social inequality (Barres, 2006. Xie and Shauman, 2003). It's also source of economic inefficiency. If girls will be more economically productive in science and technology major (as opposed to non-science and technology occupations) systematically fail to enter science and technology majors (kingdom,2002)

While much research has been done on the source of science and technology gender gap in developed countries, few studies have explored the gap in emerging economics. This has an implication for reducing the worldwide gender gap in science and technology (Prashant Loyalka, Yue Qu, Sean Sylvia, May Maani, Scott Rozelle)

In particular in those emerging economies that produce the largest numbers of scientist and engineers (such as China and India, for example), students must make a crucial and largely irreversible science and technology tracks choice in academic high schools, like wise the Nigerian secondary school. The science and technology or non-science and technology track during high school/secondary school that will prepare them for a science and technology or non-science and technology version of college entrance exam (CEE). (Prashant Loyalka, Yue Qu, Sean Sylvia, May Maani, Scott Rozelle).

Gender differences in average science performance are rather small compared with other basic with other basic skill assessed by international surveys (i.e reading and mathematics) (EACEA/Eurydice, 2010). Yet, it is important to take into account that overall gender averages are influence by males and females students' distribution across different streams or tracks (school programs). In most countries, more females, gender different in science were substantial with in science were substantial with schools or programs, even if they appears attend higher, performing, academically-oriented tracks and schools that do males. As a result in many countries, gender differences in science were substantial within schools or programmes, even if they appeared small overall (OECD, 2007A; EACEA/Eurydice, 2010). In addition, there were gender differences regarding scientific issues, while males were strong at explaining phenomena scientifically. Males also performed substantially better than females when answering physics questions (OECD, 2007A). TIMSS also reports a link between the level of self-confidence in learning science and achievement in the subject (Martin, Mullis and Foy,2008). TIMSS result seems to suggest that attitudes forward science differ between grades and different science subjects. (Martin, Mullis and Foy, 2008). Nobel laureates in the science category: physics, chemistry philosophy/medicine: we discover that men top the list of this greatest height. The ratio of men to women on this list is 5:1 respectively.

3.1 RESEACH METHODS

The study was carried out in Covenant University in Ota, Ogun state Nigeria. It employed a descriptive survey design in its approach. The population target includes male and female students under the college of College of Science and Technology arm of the University. A stratified sampling technique was utilised to obtain the total students on each department while a simple random sampling technique was employed in the process of student selecting the students on each department. The rationale for this technique was to minimise possible bias and to provide a good avenue for probability sampling so as to obtain the optimum reliability of the data retrieved from the field survey. A total number of 250 questionnaires were distributed among the target audience, 198 were retrieved representing a response rate of 79 % dully filled and completed analysed in the current study. The closed ended questionnaire was structured into two main parts to enable the researcher obtain the information needed for a thorough study. The first part relates to the personal data of the respondents which includes; gender, age and respondents current level of study. The second part deals with the measurement variables that explains student performance in various capacities factored into; science learning process, discussion and arguments, projects and assignments, information communication and technology applications, student performance and attendance and were measured on a four point linkert scale. The study employed the descriptive method in analysing the personal characteristics of the target population involving percentage distribution and frequencies. The independent sample T-test, F-Test and Levene's test were utilised to analyse the significant variability of the male and female performances in academic activities in science and technology disciplines.

Table 7: Mean, Standard Dev., Reliability and Correlation Co efficient

Variable	Cronbach Alpha	1	2	3	4	5	6	Mean	SD	Min	Max
SLP	0.901	1						17.33	3.528	6	24
DAG	0.876	.635**	1					10.87	3.926	4	16

PAA	0.804	.619**	.652**	1			11.64	2.555	4	16	
ICTA	0.767	.345**	.234*	.426**	1		11.87	2.71	4	16	
SPERF	0.641	.170*	.238**	.266**	.126	1	14.69	2.762	6	20	
ATTAND	0.736	.126	.111	.233**	.134	.332**	1	3.37	.801	1	4

** Correlation is significant at 0.01 levels; * Correlation is significant at 0.05 levels.

Note: SLP- Science Learning Process; DAG-Discussion and Arguments; PAA- Projects and Assignments; ICTA – ICT Applications; SPERF- Student Performance; ATTAND-Class Attendance.

Table 7 above shows the reliability test, correlation result and statistics for the variability measure of the variable mean, standard deviation and range values. The alpha coefficient indicated the extent of the reliability measure for the scale variables.

3.1.1 Result and Discussion

3.2 Personal Data of Respondents

Table 1 Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	122	61.6	61.6	61.6
Females	76	38.4	38.4	100.0
Total	198	100.0	100.0	

Source; Authors' Survey, 2015

The result of the distribution the gender statistics in table 2 indicates that the male 122 (61.6%) constitute majority percentage of respondent compared with their females counterpart 76 representing 38.4%.

Table 2 Age

	Frequency	Percent	Valid Percent	Cumulative Percent
14-16years	8	4.0	4.0	4.0
17-19years	54	27.3	27.3	31.3
20-21years	98	49.5	49.5	80.8
22-24years	26	13.1	13.1	93.9
25-27years	12	6.1	6.1	100.0
Total	198	100.0	100.0	

The analysis of table 1 shows the personal statistics of the respondents who participated in the survey study. It further reveals that of the total respondents 8 which represents 4% were between the age bracket of 14-16 years, 54(27.3%) were between 17-19 years, 98(49.5%) were within the range of 20-21years , 26(13.1) were within the age of 22-24 while 12(6.1 %) were within the age 25-27 age boundaries.

Table 3 Current level

	Frequency	Percent	Valid Percent	Cumulative Percent
100level	24	12.1	12.1	12.1

200level	10	5.1	5.1	17.2
300level	92	46.5	46.5	63.6
400level	36	18.2	18.2	81.8
500level	36	18.2	18.2	100.0
Total	198	100.0	100.0	

Table3 analysis of the current level of study for the male and female respondents suggests that 24(12.1%) of the total respondents were 100 level students, 10(5.1%) were the 200level students, most of the student 92(46.5%) were in their 300level, the 400level students were 36(18.2) and the 500 level students were also 36(18.2)

Table4 Is the course your area of interest?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	172	86.9	86.9	86.9
No	26	13.1	13.1	100.0
Total	198	100.0	100.0	

The researchers were interested in knowing whether the respondents were actually have personal interest and commitment to the courses they were offered as shown in table 4, it was however observed that 172(86.9%) of the total respondents indicated interest in their course of study while the remaining 26(13.1) prove otherwise. This demonstrates that majority of the students were offered the courses they initially intend to study.

Table 5 Does your parent or guardians have a great influence on your choice of study?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	102	51.5	51.5	51.5
No	96	48.5	48.5	100.0
Total	198	100.0	100.0	

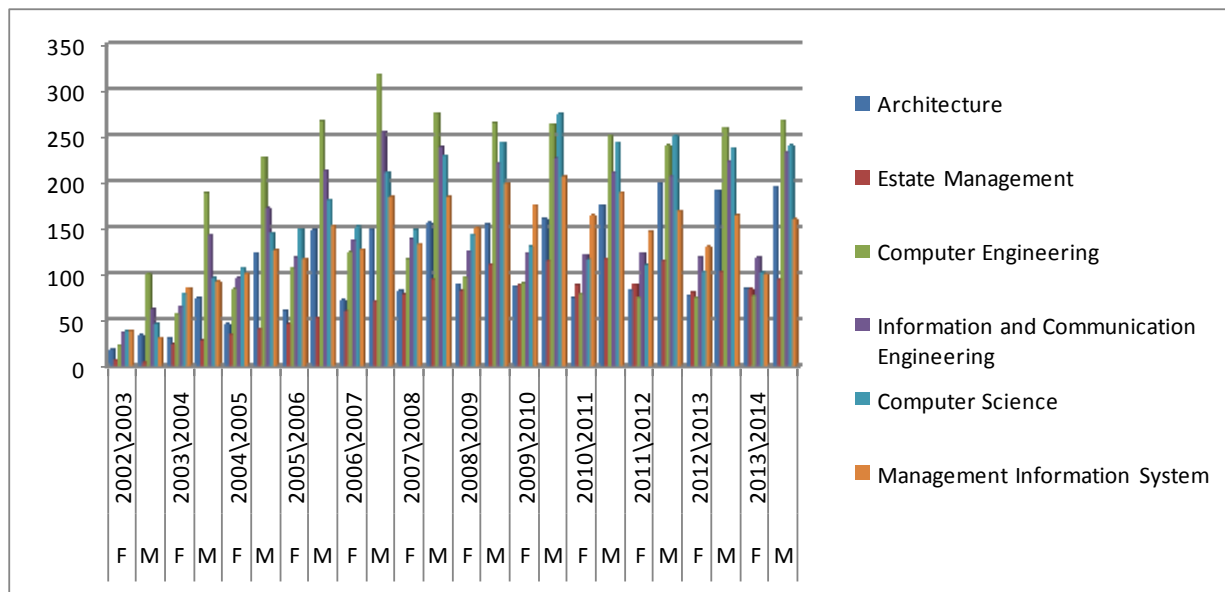
Table t tried to ascertain if there are parents or guardians influences in determining the choice of study for the respondents. The result of the above table shows that 102 representing 51.5% of the respondents accepted there is parents and guardians motivation effect while 96 which constitute 48.5% objected.

Table 6 Is this a road map to your future ambition?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	142	71.7	71.7	71.7
No	30	15.2	15.2	86.9
Undecided	26	13.1	13.1	100.0
Total	198	100.0	100.0	

In table 6,142(71.7%) of the target audience agreed that their present course of study in the actual sense is a road map to their future ambitions, 30(15.2%) had a different opinion while 26(13.1%) were in determinant on the issue.

Figure 1 Male and Female enrolment in selected Science and Technology courses since inception



Source: Covenant University

Figure 1 above indicates Male and female enrolment in science and technology since inception. The above illustration clearly shows that the male student has maintained the highest level of enrolment compared to their female counterparts.

3.2.1 Comparative Analysis of Male and Female students' Performances in Science and Technology

I. Science learning process

Table 3.2.1a Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Science Learning Process	Male	122	17.82	2.470	.224
	Females	76	16.55	4.674	.536

Table 3.2.1b Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Science Learning	Equal variances assumed	39.931	.000	2.490	196	.014	1.267	.509	.263	2.271

Process	Equal variances not assumed			2.181	101.450	.031	1.267	.581	.115	2.419
---------	-----------------------------	--	--	-------	---------	------	-------	------	------	-------

The result of table 3.2.1 shows that on average the reported variability of the male performance assessment in science learning process is higher (Mean= 17.82, Std. Dev. = 2.470) compared with the females (Mean= 16.55, Std. Dev. = 4.674), $t(196) = 2.490$, $P < 0.05$. The estimated effect shows that the difference in male performance is better, therefore indicating significant difference.

II. Discussion and Arguments

Table 3.2.2a Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Discussion and Arguments	Male	122	11.34	2.335	.211
	Females	76	10.11	3.569	.409

Table 3.2.2b Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Discussion and Arguments	Equal variances assumed	22.626	.000	2.954	196	.004	1.239	.419	.412	2.066
	Equal variances not assumed			2.689	115.247	.008	1.239	.461	.326	2.152

The result of table 3.2.2 shows that on average the reported variation of the male students in discussion and argument is higher (Mean= 11.34, Std. Dev. = 2.335) compared with the females (Mean= 10.11, Std. Dev. = 3.569), $t(196) = 2.490$, $P < 0.01$. The estimated effect shows that the larger difference in male performance in discussion and arguments, therefore indicating significant differential effect.

III. Projects and Assignments

Table 3.2.3a Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Projects and Assignments	Male	122	12.02	2.253	.204
	Females	76	11.03	2.889	.331

Table 3.2.3b Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Projects and Assignments	Equal variances assumed	6.947	.009	2.694	196	.008	.990	.368	.265	1.715
	Equal variances not assumed			2.544	130.928	.012	.990	.389	.220	1.760

The result as shown in table 3.2.3 indicates that the reported average variation of the male students in projects and assignment is larger (Mean= 12.02, Std. Dev. = 2.253) compared with the females students (Mean= 11.03, Std. Dev. =2.889), $t(196) = -0.341$, $P < 0.01$. The estimated magnitude effect however shows significant difference in male and female performance in execution of projects and assignments.

IV. Information communication and Technology Application

Table 3.2.4a Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
ICT Applications	Male	122	11.92	2.176	.197
	Females	76	11.79	3.117	.358

Table 3.2.4b Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ICT Applications	Equal variances assumed	7.017	.009	.341	196	.733	.129	.377	-.614	.871

Equal variances not assumed			.315	120.586	.753	.129	.408	-.680	.937
-----------------------------	--	--	------	---------	------	------	------	-------	------

The result as shown in table 3.2.3 indicates that the reported average variation of the male students in projects and assignment is larger (Mean= 11.92, Std. Dev. = 2.176) compared with the females students (Mean= 11.79, Std. Dev. =3.117), $t(196) = -0.341$, $P > 0.01$. The estimated magnitude effect however shows negligible difference in male and female performance in execution of projects and assignments.

V. Student Academic Performance

Table 3.2.5a Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Student Performance rating	Male	122	14.23	2.730	.247
	Females	76	15.42	2.670	.306

Table 3.2.5b Independent Samples Test

	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Student Performance rating	Equal variances assumed	.778	.379	3.012	196	.003	-1.192	.396	-1.972	-.411
	Equal variances not assumed			3.028	161.930	.003	-1.192	.394	-1.969	-.414

The result of table 3.2.5 shows on average the reported variability of the female academic performance is rated higher (Mean= 15.42, Std. Dev. = 2.670) was significantly higher the males (Mean= 14.23, Std. Dev. = 2.730), $t(196) = 3.012$, $P < 0.01$. The estimated magnitude of the effect shows that the difference in female performance is larger, therefore indicating significant effect.

VI. Class Attendance

Table 3.2.6a Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Class Attendance	Male	122	3.21	.874	.079
	Females	76	3.63	.585	.067

Table 3.2.6b Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Class Attendance	Equal variances assumed	12.432	.001	3.688	196	.000	-.418	.113	-.642	-.195
	Equal variances not assumed			4.032	194.945	.000	-.418	.104	-.623	-.214

The result of table 3.2.5 shows on average that the average variability of the female class attendance is significantly higher (Mean= 3.63, Std. Dev. = 0.585) was significantly higher the males (Mean=3.21, Std. Dev. = 0.874), $t(196) = 2.954$, $P < 0.01$. The estimated magnitude of the effect shows that the difference in female performance is larger, therefore indicating significant difference in class attendance.

From the above estimated result of the study it could be observed that on the average the male the variability of the male students' performance indicates a significance difference in the science learning process, discussion and arguments and projects and assignment while the female students on the average showed significant variability in academic performance rating and class attendance. It therefore suggest that while the male students performs better in science learning process such as scientific observation and conduct of experiments, discussion and arguments , projects and assignments, their female counter parts are performs better in class attendance and academic performance such tests examinations and cumulative point averages. However on the average there appears to be no significant difference in the variability of male and female students' performance in information communication and technology applications.

5.1 Recommendation and Conclusion

More young female students should be encouraged to go into science related courses in Nigerian university by their parents and guardians. The young female students should expose to Science and technology driven disciplines in their early education by introducing them to science subjects and practical approach to learning in their secondary school education. In conclusion it has been shown in this present study that there is significant differences in undergraduate males and females performances in Science and Technology with the males having higher performance compared to females. It was also observed that there is high enrolment of males than the females which further implies that the males are more inclined to science and technology discipline and science- oriented activities. This therefore, accounts for the high number of male scientists and engineers in the field today with few interested and personally motivated female counterparts. This paper thus calls for a proper orientation, awareness and sensitisation to drastically minimise this trend that has been noticed in the world of Science and Technology today.

REFERENCES

Goyal, A. (1996) Women in computing: Historical roles, the perpetual glass ceiling, and current opportunities. *IEEE Annals of the History of Computing*, 18, 36-42.

National Science Board (2012) *Science and Engineering indicators*, Washington DC: National science (NSF).

Eurostat (2012) statistics on tertiary students (ISCED 5A) by field of education and sex

Ministry of Education science cultural and technology, Japan (MEXT) (2009) white paper on gender equality 2009.

Carnoy M, Loyalkp, Dorbyakova M, Dossani R, Fromin I, Kuhuns, Wang R.(2013) *University expansion in a changing global economy: Triumph of BRICS?* Palo Alto, CA: Standford University Press.

Prashant Loyalka, Yue Qu, Sean Sylvia, May Maani, Scoff Rozelle (2013), The Consequences of “Absolute” versus “Comparative” advantages for gender gaps in STEM and College access in emerging economics. Rural Action Program (REAP)

Science education in Europe: national policies and practices and research (2011) retrieved from <http://eacea.ec.europa.eu/education/eurydice>, on 2/1/2015.

