Journal of Research Initiatives

Volume 4 | Issue 1 Article 4

9-2018

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Keywords

Gender, entry qualification, academic background, engineering student, performance

CORRELATION EFFECT OF GENDER AND ENTRY QUALIFICATION ON THE PERFORMANCE OF UNDERGRADUATE ENGINEERING STUDENTS IN UNIVERSITIES

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Abstract

Enrollment into engineering disciplines in tertiary institutions has always been identified for gender bias, higher population favoring the masculine. However, reports on the standard ratio of this bias nor the issue of whether it has any significant impact on the academic performance of engineering students (POES) scarcely exist. Meanwhile, Nigerian Universities still enjoy autonomy and their admission policies on entry requirements vary. Hence, this study examined the possible influence of gender and entry qualification (EQ) on POES. Data collected from 491 undergraduate engineering students from two universities were statistically analyzed. The study revealed female to male population ratio of 1:9. The result of the statistical analysis showed that EQ has a significant effect on POES (p0.05). Therefore, a more critical priority must be given to entry qualification and not the gender of the students intending to study engineering during admission and screening. However, female students need to be more encouraged since they can competitively perform as their male counterpart in engineering to reduce the masculine face-value of the profession.

Introduction

Various factors affecting the performance of students is an important element in educational management and quality control. This accounts for why many researchers (Abdul-Raheem, 2012; Martha, 2009; Ogweno et al., 2014; Momoh, 2013; Zembar and Blume, 2009) have always shown their interest on this critical subject area. Engineering disciplines have been identified more significantly across tertiary institutions globally as a career for male genders (Zembar and Blume, 2009; Udousoro, 2012; Ibraheem et al., 2014). This conclusion was drawn as a result of the bias usually observed in the students' enrolment into these colleges for ages. However, this happens naturally without any influence from the universities or colleges of engineering.

It may be due to many social factors among which is the erroneous belief that only men can make a fortune in an engineering-related career which is typically arduous for womenfolk. This remains a myth which tends to project engineers as artisans/craftsmen. Modern engineering as a profession is more of software and automation than hardware. It is more about the process, management, planning and control than life operation. It is more critical on virtual thought and reasoning about the theoretical framework, principles and working mechanisms of machines than hands-on skills or physical handlings of engines (Yusuf, 2015). It may also be connected with poor mathematical reasoning skills in girls. This according to various researchers may be linked to one of several factors such as genetic make-up, differentials in prenatal hormonal development in fetal brain hemispheres or socio-cultural (Zembar and Blume, 2009). The socio-cultural components are discussed as influences from the psyche of parents, society, teachers, and schools.

Gender imbalance is also found in the teaching of Mathematics and Science subjects and existing fact shows that there is no agreed opinion on the cause (Udousoro, 2012). The same author reported low enrolment of female students in sciences (physics and chemistry), engineering and Mathematics-SEM. Indeed, it has been an issue of grave concern to many experts and educational administrators (Abdul-Raheem, 2012; Mutekwe, 2012). Meanwhile, Lasode and Lasode (2009) reported that there is no difference between the performance of male and female Mechanical engineering undergraduate students in the second and third levels of study. He concluded saying that gender does not affect the performance of engineering students and that female can be counseled and encouraged to realize that they can equally excel as their male counterparts in the career. Despite every recommendation and campaign to improve this situation, there seems no meaningful change to date. While lamenting this situation, Beddoes and Borrego (2011) remarked that women are underrepresented in engineering despite decades of efforts.

Sadly, it has been observed that there is always a hesitation to utilize findings from gender-related studies in engineering education (Uden, 2017). This may explain why research in engineering education is of no significant value in the department and colleges of engineering in most Nigerian tertiary institutions. Engineer researchers focus only on the issues affecting the subjects giving no attention to students. This may be critical to the issue of the distinction between lecturers and educationists. Consequently, the actual ratio of this gender enrolment differential among undergraduate engineering students in universities has largely been viewed as inconsequential.

Ideally, engineering science and engineering education are sorts of an interdisciplinary discourse to which engineers who are both researchers and lecturers in the academics cannot be preferential or bias. Interdisciplinarity as works carried out by an individual who draws on more than one discipline (Sandford, 2015) can be complimentary of great advantage to administration and policies in tertiary institutions. Yusuf et al. (2016) have reported a higher population of female students over the male at ratio 3:2 at the secondary level. A subtle inference from this is either an outright withdrawal of female folks from tertiary education generally or erosion of their interest in studying engineering courses specifically. The reason for this setback is yet a mystery as female students have been identified with superior intellectual abilities in certain subjects than their male counterparts (Abdul-Raheem, 2012).

Hence, it may be crucial to determining whether this uneven gender distribution has any influence on the academic performance of engineering undergraduate students. Meanwhile, Yusuf et al. (2016a) have reported a significant correlation between the course of study and performance of engineering undergraduate students. How the observed variation in the cognitive abilities of each gender influences such findings is of great essence to pedagogical analysis in engineering education. Moreover, entry qualifications and requirements for candidates seeking engineering programmes have not been unified in Nigerian tertiary institutions. Engineering students are candidates from different social and academic backgrounds. One does not expect that they perform equally during learning tasks. Despite that the results from West African Examination Council (WAEC), National Examination Council (NECO) and Joint Admission Matriculation Board (JAMB) are still the basis for entry, there are certain internal mechanisms and controls on these requirements that vary from one school to another. The culture of autonomy is still well entrenched among the ivory towers in the country. Has this any impact on the performance of the students? Does the one-sided gender composition of studentship have any influence on entry qualification? The thrusts of this study are focused on these hypotheses. It is

undertaken to identify the standard ratio of the gender differentials as it currently exists within undergraduate engineering studentship in Nigerian Universities as well as the effect of its correlation and that of entry qualification with academic performance.

Methodology

Data for this study were collected through the questionnaires and administered to 491 undergraduate engineering students comprising of both genders selected across all departments from 100-500 level from the Federal University of Agriculture in Abeokuta (FUNAAB) and University of Agriculture Makurdi (UAM). The current academic performance status i.e. CGPA (Cumulative Grade Point Average), as well as responses to other relevant questions, were obtained from the respondents. The conclusion of the finding was based on the interpretation of the output of frequencies and correlation analysis using IBM SPSS version 21 (2012).

Calculation of Entry Qualification

Entry Qualification (EQ) of each respondent was determined by assigning points (5-0) respectively to each of the grades (A-E) obtained in each of the core relevant subjects offered. The general core relevant subjects considered for engineering education are those available by the provision of West African Examination Council (WAEC) and National Examination Council (NECO), namely: *General Mathematics, Further Mathematics, Physics, Chemistry, English Language and Technical Drawing*.

Thereafter, EQ for each respondent was calculated using:

$$EQ = \frac{summation\ of\ Total\ Points\ Obtained}{5 \times number\ of\ core\ subjects\ offered} \times 100 \qquad (1)$$

and then graded as follows:

Excellent: If EQ = 75%& above; ***Very Good:*** if $= 60 - 74\%$; ***Good:*** if $EQ = 55 - 59\%$; ***Credit:*** If EQ =50-54%; and ***Pass:*** If EQ $= 45 - 49\%$

Results

Table 1 Respondent According to Gender

Institution	Gender		Total	Percentage
	Male	Female		
FUNAAB	265	24	289	58.9
UAM	180	22	202	41.1
Total	445	46	491	100

Table 1 shows a population of 8.3% and 10.9% in FUNAAB and UAM respectively for female respondents which only accounts for 9.4% of the overall students sampled for the entire study.

Table 2. Response to what affects academic interest and performance most strongly

	Frequency	Percent	Cumulative Percent
Course of Study	120	25.4	25.4
Acad. Background	253	53.5	78.9
Lecturer in Charge	100	21.1	100.0
Total	473*	100.0	

*No response from the remaining students

Table 2 shows that about 54% of the respondents are of the view that academic background most strongly affects their performance. Table 3 shows the frequency of performance status of the respondents on admission while table 4 shows their Cumulative Grade Point Average (CGPA).

Table 3. Respondents' Entry Qualification on Admission

Grade	Frequency	Percent	Cumulative Percent
Excellent	150	31.0	31.0
Very good	290	59.9	90.9
Good	41	8.5	99.4
Credit	2	0.4	99.8
Pass	1	0.2	100.0
Total	484*	100.0	

*No response from the remaining students

Table 4. Current University Academic Performance (CGPA)

S/N	Class of Results (Current CGPA)	Frequency	Percentage	Cumulative Percent
1	4.5-5.0	31	7.0	7.0
2	3.5-4.49	239	53.7	60.7
3	2.5-3.49	149	33.5	94.2
4	2.0-2.49	24	5.4	99.6
5	Others	2	0.4	100.0
	Total	445*		

*No response from the remaining students

Table 3 shows that about 91% of the respondents are in the topmost academic performance category on admission while this has fallen off to approximately 61% in the University's CGPA shown in table 4. The results of correlation on Table 3 and 4 are shown in Table 5.

Table 5. Correlation of Admission Entry Qualification on University's Performance

		Value	Asymp. Std. Err	Approx. T	Approx. Sig.
Interval-Interval	Pearson's Rank	.168	.048	3.564	.000
Ordinal-Ordinal	Spearman Correlation	.143	.046	3.013	.003
No of Valid Cases		438			

Table 5 shows that a very significant relationship exists between the entry qualifications and performance of the respondents (p=0.000 or 0.003) for Pearson's rank or Spearman Correlation respectively. In contrast, a similar correlation experiment shown in Table 5 and 6 between gender with either of academic performance and entry qualification indicates no influence on both respectively.

Table 6. Correlation of Gender on the University's Performance

		Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Interval-Interval	Pearson's Rank	-.011	.045	-.231	.817
Ordinal-Ordinal	Spearman Correlation	-.007	.047	-.150	.881
No of Valid Cases		444			

Table 7. Correlation of Gender and Entry Qualification

		Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Interval-Interval	Pearson's Rank	-.062	.044	-1.364	.173
Ordinal-Ordinal	Spearman Correlation	-.062	.046	-1.353	.177
No of Valid Cases		482			

Discussion

The population of female undergraduate engineering students is significantly low compared to their male counterpart in the universities. The result from this study revealed a ratio of 1:9 implying the female constituting 10% of the total enrollment of engineering students in the universities. This finding is not far from the 9% previously reported for women pursuing a career in engineering (Zembar and Blume, 2009). This is a reversal of ratio 6:4 reported for the female to male students by Yusuf et al. (2016) in secondary schools in Nigeria. Relating these two reports, enrollment into engineering colleges is a 125% increased for males and an 83% reduced for females against the gender situation at the secondary school level. This indicates poor enrolment of female students for tertiary education especially to study engineering as a career. It underlines the need to intensify effort in encouraging them.

Nevertheless, this gender imbalance does not have any serious consequence. This is because the outcome of statistical correlation does not indicate that gender has any significant influence on either entry qualification or academic performance in the universities ($p>0.05$). It implies that *ceteris paribus* a female engineering student is not affected by her gender to perform as much as her male counterpart. This result is at variance with what was reported by different researchers (Abdul-Raheem, 2012; Zembar and Blume, 2009) on certain specific subjects for both genders but in perfect agreement with the discovery of Lasode and Lasode (2009).

For instance, Abdul-Raheem (2012) reported that gender has no influence on the performance of students in English Language, males are better in social sciences and natural science subject including Mathematics while females are better in Arts except Yoruba native language. It was also reported that beginning at age 12, girls begin to dislike math and science and show more likeness for language arts and social studies than boys (Zembar and Blume, 2009; Udousoro, 2012). In higher education in Europe, according to HELENA (2011), women are overrepresented in the humanities, education, arts, health, welfare, agriculture or veterinary studies, while men opt for science, mathematics, and computing. Nevertheless, this finding may

be a relevant explanation for the low enrollment of female students in engineering which is based on mathematics, other natural and social sciences but not Arts.

Besides, it has been shown that entry qualification has a very significant influence on the performance of undergraduate engineering students in the universities ($p<0.05$). This is not unexpected as academic studies in the tertiary institutions bear their foundations on academic background of the students. Meanwhile, Martha (2009) has included admission points among the major factors that affect students' performance. This study has confirmed that assertion.

Conclusion

This result has revealed a gross imbalance ratio of 1:9 female to male gender population in engineering studentship. It implies about 83% reduction in the number of female students in secondary school choosing engineering as a career in the universities. Meanwhile, by this study, gender is not an issue with the performance of engineering students. A female candidate would, therefore, compete favorably with her male counterpart academically. With this postulation, it recommends an intensified effort to motivate female students to balance the existing gender deficit. However, less emphasis should be placed on this matter as it poses no constraint to academic progress or practice of the engineering profession.

More so, this paper has reported a significant influence of entry qualifications on the performance of engineering students in the universities. Therefore, consideration should only be given to candidates with a strong academic background. Weaknesses or deficiencies in any form, consequent upon undue concession with prerequisite standard during the admission process, may have a negative consequence on the performance. It, therefore, proposes that critical priorities must be given to entry qualification of the students intending to study engineering on admission. Universities' administrators and engineering colleges are tasked to enforce due standard to improve the quality of Nigerian Engineering graduates. Otherwise, the future of ill-qualified students, quality of the engineers and integrity of national development may be jeopardized.

References

Abdul-Raheem, B. O. (2012). The influence of gender on secondary school students' academic performance in South-West, Nigeria. Journal of Social Science. 31(1), 93-98.

Beddoes, K. & Borrego, M. (2011). Feminist Theory in three engineering education journals: 1995-2008, Journal of Engineering Education. 100 (2), 281-303

HELENA. (June 23-24, 2011). Gender and interdisciplinary education for engineers (GIEE). International conference on HELENA Project, Paris, France. pp27.

Ibraheem, U. F., Omotoso, G. S., Dauda, A. O. (2014). Engineering Career Prospects among Secondary School Pupils in Ekiti State. International Journal Modern Sciences and Engineering Technology. 1(4), 78-86.

Lasode, A.O. & Lasode, O. A.(2009). Relationship among mathematics entry qualification, mode of entry and performance in engineering mathematics: Implication for counseling. development and policy issues in Africa, 2 (1), 230-240.

Martha K. 2009). Factors affecting academic performance of undergraduate students at Uganda Christian University. A Dissertation Submitted to Graduate School for the award of the degree of Master of Arts in Educational Management of Makerere University.

Momoh, G.D., Gbodi, E., & Morenikeji, W. (2013). Effects of entry qualification on students' academic performance: A case study of 500 level students of the Federal University of Technology, Minna, Niger State Nigeria. Futminna Monograph Series, 28.

Mutekwe, E., Modiba, M., & Maphosa, C. (2012). Female students' perceptions of gender and academic achievement: A case of sixth form girls in Zimbabwean School. Journal of Social Science. 32(1), 111-120.

Ogweno, P. O., Kathuri N. N., & Obara, J. (2014). Influence of students characteristics on academic performance in secondary agriculture, in Rachuonyo North Sub County, Kenya. International Journal of Education and Research, 2(3), 1-12.

Sandford, S. (2015). Contradiction of terms: Feminist theory, philosophy, and transdisciplinarity. Theory, Culture & Society. 32 (5–6), 159–182.

Uden, M.K. (2017). Implementing Feminist Theory in Engineering: Obstacles Within The Gender Studies Tradition. European Journal of Engineering Education. 42 (3), 336-348.

Udousoro, U. J. (2012). Factors that promote gender imbalance in the teaching of science/mathematics: The views of practicing teachers. An International Multidisciplinary Journal, Ethiopia. 6 (1), 287-298.

Yusuf, T. A. (2015). The merits of engineering and the engineers. Wasladot Digital Prints, Abeokuta, Nigeria.

Yusuf, T. A., Onifade, C. A., & Bello, O.S. (2016). Impact of class size on learning, behavioural and general attitudes of students in secondary schools in Abeokuta, Ogun State Nigeria. Journal of Research Initiatives, 2 (1), 1-18.

Yusuf, T.A., Oseni, M. I., & Adejoh, G.O. (2016). Correlation of relationship between course of study and academic performance of undergraduate engineering students in universities. Journal of Language, Technology & Entrepreneurship In Africa. 7 (3), 72-81.

Zembar, M.J., Blume, L.B. (2009). Gender and academic achievement. middle childhood development: A contextual approach. Allyn & Bacon, an imprint of Pearson Education Inc.,