

DEMOGRAPHIC FACTORS RESPONSIBLE FOR UNDERACHIEVEMENT AMONG UNDERGRADUATE ENGINEERING STUDENTS IN SOUTH-SOUTH FEDERAL UNIVERSITIES

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Abstract

The study investigated the Demographic factors responsible for Underachievement among Undergraduate Engineering students in South-South Federal Universities. The research design for this study was ex-post factor research design. The population of the study was 1,155 underachievers from year 2 to 5 in south-south federal universities. A sample size of 631 was used for the study. Three instruments were used for data collection; they are the Demographic Inventory (DI), the Standard Progressive Matrix (SPM) and the General Engineering Mathematics Underachievement Test (GEMUT) to measure underachievement in engineering mathematics. The reliability of these instruments was tested on 20 respondents using the Cronbach alpha method of internal consistency. The reliability indexes are 0.60, and 0.55 respectively for General Engineering Mathematics Underachievement Test (GEMUT) and Standard Progressive Matrix (SPM). Three research questions as well as three corresponding null hypotheses were formulated to guide this study. The data collected were analysed with t-test and One-way ANOVA. On the other hand, the null hypotheses were tested with t-test and one-way ANOVA associated with regression statistics. Findings revealed that federal institutions of study significantly influence underachievement, while gender and departments of study do not relate to underachievement. Based on the findings the researcher recommended that the government/non-governmental organizations have a major role to play in this issue of underachievement. They should ensure that they provide and supervise the utilization of funds in the federal institutions.

Introduction

The level of academic decadence, inability of graduates to become functional, and the increasing rate of examination malpractice in our tertiary institutions calls for attention. As such, the concept of underachievement among undergraduate engineering students in tertiary institutions is a critical academic issue which has become a thing of concern to lecturers, course advisers, counselors, psychologists, administrators and the society at large. The word underachievement was first used in the 15th century, and it denotes a regressive decrease in a students' potential to acquire certain skills and competencies needed for professionalism. Presently, the word underachievement is used in the formulation of educational policies and practice which is routinely used by nations, homes, religions, types, sectors of schooling, physiological, ethnic, social groups and individuals to mean low achievement. The fact is that the

word underachievement is goes beyond low achievement, because it looks at the achievement caused when the individual has or does not have a deficiency in that study area.

The word underachievement is defined as the negative unexpected outcome of education which is commonly measured in relation to what is attained during an instructional programme through achievement test, which is used in assessing the cognitive domain where the student has or does not have any disability in school settings. It is done with the use of teacher-made test or standardized test constructed in the free response type items (essay) or the short answer items (objective test). The focus of this study is on the teacher-made achievement test, and mental ability test, from which the underachievement scores of the students will be gotten and used.

The present level of underachievement which is common in most tertiary institutions in Nigeria is an issue of great concern to the Government and private individuals at large. This is because underachievement is known to culminate to other problems like unemployment, increase in workload of lecturers and course advisers, lack of interest in schooling activities, inability to further into higher degrees, depression, violence, and all forms of social vices. Underachievement later transforms to the occupational sector of the nation's economy, there by leading to low level of productivity. Underachievement is normally reflected through low academic performance. The word underachievement is defined as an act of doing less than expected or underperform in a standardized series of test (Logsdon, 2019). He sees underachievement in mathematics as when the learner's performance is not at par with members of his/her peers; rather he is failing the subject or course. Achievement test is usually constructed and standardized to measure proficiency in different courses were the learner has or does not have deficiency.

Wikipedia (2018) defined underachievement as the act of doing less than expected in school work, which is measured using scores from intelligence test. In the same vein, McCoach and Siegle (2003) defined underachievement as a discrepancy between potential or ability and performance or achievement. Based on this definition, underachievers are unable to acquire the objectives for which they are in school and they are unable to exert their low level of expertise in the wilder society and they are at the risk of failing and entering the society with lower levels of educational expectations. This implies that underachievement is not one point observation of measureable behaviour of a person; rather it is cumulative and progressive.

An underachiever is a person who fails to achieve his/her potential or does not do well as expected. These students who are unable to achieve their potentials while in school are referred to as learning disabled (ADHD). Categories of students

who fall under these categories of learners are the gifted, those with specific learning disability and the normal or average student. Lectures and concerned individuals have made frantic effort to help such students by setting up tutorial classes, and encouraging them to form study groups, but these students still underachieve.

Engineering mathematics is a fundamental course in the field of engineering. It is a foundational course in which every other course in engineering is embedded. If a student is deficient in engineering mathematics, it will definitely affect every other area in terms of course description and specification. Engineering mathematics is offered in year 2 and ends in year 4 first semesters and it entails the use of calculation to create concepts, manufacture goods, extract raw materials and transform them into finished goods. Engineers offer different services depending on their area of specialization. The mechanical engineer offer the service of repairing of cars and machines, the civil and environmental engineers are involved in the construction of roads, bridges and houses, while the petroleum and gas engineers are in charge of production of crude oil and other raw materials extract. Lastly, the electrical and electronic engineers are in charge of wiring of houses, and matching of current in circuit, chemical engineers manufacture chemicals and bombs. There are other emerging fields, like the computer engineering, agricultural engineering, and mechatronics engineering. All these fields or departments of engineering requires high rate of expertise in engineering mathematics, because of the risky nature of work and hazardous work environment. If engineering students have not achieved well as undergraduates, they will expose themselves, employers and consumers to high risk of danger and injuries. This could be the reason why most well established firms or companies employ experts who are well grounded with the necessary facilities in carrying out their practices. The researcher has observed that the performance of undergraduate engineering students in engineering mathematics is very poor. Personal

observation shows that some students do not take their studies seriously, especially during their tests and examinations. Such students do not carry out their academic activities effectively, in terms of attending lectures, taking of lecture notes, reading at home, doing practical and assignments and taking part in extra-curricular activities. They absent themselves from school, and believe that they may engage in examination malpractices; they end up performing poorly if their hope is not achieved. Gender is the biological sex of an individual whether male /female. The issue of gender is as old as man himself. Even Holy Scriptures tells that "in the beginning God made man and woman. Gender has been described as the sex of an individual, male or female. Whitley and Powell, 1983; in Ebeuwa-Okoh (2010), define gender as socially constructive role value expectations for female and distinct from male. In academic studies, the responsibility of being a male or female in the school within any institutions are realities that are currently in the consciousness of everyone. According to Amao-Kehinde (2006), in our societies, gender stratification system tends to favour male in some degrees. It is believed that women power is minimal and confined to the household; hence they have less interest in academic exercises, but the reverse is the case with the female engineering students. On the other hand, in egalitarian social systems women have important role institution sphere. Despite this today, women are crying out loud for equal academic opportunities as their male counterpart.

The relationship between male and female has traditionally been one of unequal power, with man in a dominant position over women. Men may originally have become powerful in pre-industrial times because of their size, physical strength, freedom from child bearing duties allowed them to dominate women. This pattern is breaking up because of the changing roles of women in contemporary society with the aid of peace education (Akpan – ita, 2008). Women who are very intelligent find it difficult to give up their academic, so they work very hard to avoid any

form of carry over(s). They quest for equality with men in the area of career which is a conflict between the traditional roles of being a mother, wife and home keeper as well as modern roles of a carrier woman.

Statement of the Problem

The opinion of the public concerning the standard of education in Nigeria has become obvious following the release of the convocation brochure, which has always revealed underachievement of students especially in the faculty of engineering, who graduate with third class or pass degrees. These students' achievements do not concur with the expectations of the university, government and investments of parents. Education in Nigeria is a veritable tool that brings about change into the life and pattern of an individual and the society at large. These students end up failing by so doing, increasing the work load of themselves, their lecturers, and course adviser(s). A student who sees education as stressful will miss lectures and perform extremely poorly in assessment test. In the worst cases, such student may stop attending lectures, and sit at home without any concern for career, education, and life. If such a student is employed in any construction company, he/she endangers his/her life and the lives of those that will receive their services. Personal contact with a large number of these students shows that whenever they perform poorly in a course, they feel they can never do well in that course or in any other course; hence they do not attend lectures of the failed course, and they will not acquire that knowledge.

It is based on these reasons that the researcher wishes to investigate the Demographic Factors responsible for underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Aim and Objectives of the Study

The aim of this study is to determine the demographic Factors responsible for underachievement among Undergraduate Engineering Students in South-South Federal

Universities. Specifically, the study determined the following to:

1. Determine the relationship between gender (female/male) and underachievement among Undergraduate Engineering Students in South-South Federal Universities.
2. Investigate the relationship between federal institutions of study (UPH, FUIO, UNIUYO, UNICAL & UNIBEN) and underachievement among Undergraduate Engineering Students in South-South Federal Universities.
3. Examine the relationship between departments of study and underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Research Questions

Three research questions were answered, to guide this study:

1. How does Gender (female/male) relate to Underachievement among Undergraduate Engineering students in South-South Federal Universities?
2. What is the relationship between federal institutions of study (UPH, FUIO, UNIUYO, UNICAL & UNIBEN) and Underachievement among Undergraduate Engineering students in South-South Federal Universities?
3. How do Departments of study relate with Underachievement among Undergraduate Engineering students in South-South Federal Universities?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant relationship between gender (female/male) and underachievement among Undergraduate Engineering Students in South-South Federal Universities.
2. There is no significant relationship between federal institutions of study (UPH, FUIO, UNIUYO, UNICAL & UNIBEN) and

underachievement among Undergraduate Engineering Students in South-South Federal Universities.

3. Departments of study do not significantly relate with underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Methodology

The design of this study was Expo-facto design. Expo-facto research design was defined by Nwankwo (2013) as a type of design which involves collecting and analyzing data about some variables which are already in place without manipulating any of them, in order to find out how some of them influence or are related to other variables. The researcher used this design to check the significant relationship among gender, institutions of study, and class levels on undergraduate engineering students' underachievement.

Population of the Study

The target population of the study will be all engineering students in 5 selected federal Universities in south-south geopolitical zone of Nigeria. As at the time of the study, they are 4,312 engineering students from year 2 to 4. Source: (Admissions Records from the selected federal Institutions), out of which 1,155 are underachievers from year 2 to year 4 (Source: Scores gotten from the SPM).

Sample and Sampling Techniques

The sample size of the study was 631 underachieving engineering students from year 2 to year 4 whose scores in the SPM and GEMUT below the required cutoff point. Firstly, the simple random sampling technique was used to select 10 departments in the faculty of engineering. Thereafter, the purposive sampling technique was used to get the required respondents for the study. In using purposive sampling technique, the instruments were given to all the engineering students at all levels for them to answer within the stipulated time and submit it.

Instruments for Data Collection

The demographic inventory (DI), the General Engineering Mathematics Underachievement Test (GEMUT) it has 25 items weighing 4 marks each; it is used alongside with the Standard Progressive Matrix (SPM) to measure underachievement in engineering mathematics. The SPM consists of 60 items, each item carries 1 mark. It has a minimum score of 30 marks and a cutoff of 45 marks. On the whole, the questionnaire items are eighty-five (85). Respondents are requested to rank them according to the extent to which they agree by ticking (✓) where applicable.

Validity of the Instrument

The face validities of the instruments were determined through expert judgment. Some copies of the preliminary versions of the instruments were given to one expert in Measurement and Evaluation in the department of Educational Psychology, Guidance and Counselling University of Port Harcourt for proper scrutiny. Some modifications were made on the scales to ascertaining its suitability of items to the respondents, their suggestions and corrections were reflected in the final version of the work.

Data Presentation and results

Hypothesis one: There is no significant relationship between gender (female/male) and underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Independent samples t-test showing the relationship between gender and underachievement

	Gender	N	tcal.	tcrit.	df	F	Sig.	Decision
Underachievement	Female	116	.290	1.96	628	.006	.766	Accept
	Male	514						

In table 1, when these scores were subjected to independent samples t-test, it was found that the calculated t-value .290 obtained was not significant at .766, which is higher than the chosen .05 level of probability. Furthermore, a t-test analysis testing of the significance of this value

Their criticism and corrections were considered in structuring the final draft, of all the instruments.

Reliability of the Instruments

The reliabilities of the instruments were established using cronbach alpha method of internal consistencies. The General Engineering Mathematics Underachievement Test (GEMUT) and the Standard Progressive Matrix (SPM) were given to 20 respondents who were not part of the main study. Its reliability indexes are 0.60 and 0.55 respectively. This indicated that the items in the scales have internal consistency.

Administration of the Instrument

The Standard Progressive Matrix (SPM) was established first to select the required number of underachievers thereafter; the GEMUT was administered to 631 underachievers. Only those who scored below 96 were used. The respondents filled the items and returned them at the spot to the researcher and her assistants.

Method of Data Analysis

The research questions were answered using t-test associated with simple regression, and One-way ANOVA associated with regression. On the other hand, hypothesis 1 was tested with t-test while hypotheses 2 and 3 were test with one-way ANOVA.

showed that an F-value of .006 was gotten at 628 degree of freedom which yielded an associated p-value of .766. Hence, the null hypothesis of no significant difference is accepted. This means that gender has no significant relationship with underachievement.

Research question two: What is the relationship between federal institutions of study (UPH, FOU, UNIUYO, UNICAL & UNIBEN) and Underachievement among Undergraduate Engineering students in South-South Federal Universities?

Hypothesis two: There is no significant relationship between federal institutions of study (UPH, FOU, UNIUYO, UNICAL & UNIBEN) and underachievement among Undergraduate

Engineering Students in South-South Federal Universities.

Research question two was answered by regressing the scores of respondents on federal institutions of study and underachievement, which yielded an adjusted regression coefficient. To test the significant of the regression coefficient obtained oneway-ANOVA associated with linear regression was conducted. The result for the answer to the research question and the testing of the hypothesis are summarized in table 2

Table 2: One-way ANOVA relationship between federal institutions of study (UPH, FOU, UNIUYO, UNICAL & UNIBEN) and underachievement

Model	N	Sum of Squares	df	Mean Square	F	Sig.
UPH	127					
FOU	190					
UNIUYO	67					
UNICAL	103					
UNIBEN	143					
Total	630					
Underachievement						
Between groups		3862.944	4	965.736	11.136	.000
		2090.915	1	2090.915	24.110	.000
		2338.683	1	2338.683	26.967	.000
		1524.261	3	508.087	5.859	.001
Within groups		54201.431	625	86.722		
Total		58064.375	629			

From the result displayed in Table 2, it can be seen that when one way-ANOVA was used to analyze the data on federal institutions of study and underachievement, the Mean Squares of 965.736, 2090.915, 2338.683 for between groups and 508.087 for within groups. The result is that there is a significant relationship between federal institutions of study and underachievement. Furthermore, since the F values (11.136, 24.110 and 26.967 for between groups and 5.859 for within groups) is greater than the critical t (1.96) at df of 4, 1, 1, and 3 for between groups and 625 for within groups at .001 level of significance for a one-tailed test, the null hypothesis is rejected. The result is that there is a significant relationship

between federal institutions of study (UPH, FOU, UNIUYO, UNICAL & UNIBEN) and underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Hypotheses three: How do Departments of study relate with Underachievement among Undergraduate Engineering students in South-South Federal Universities?

Hypothesis three: Departments of study do not significantly relate with underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Table 3: One-way ANOVA relationship between departments of study and underachievement

Model	N	Sum of Squares	df	Mean Square	F	Sig.
CHM	127					
MEC	156					
PGE	105					
EEE	86					

CEE	66				
COM	30				
MCE	21				
AGE	18				
FOE	6				
CPE	15				
Total	630				
Underachievement					
Between groups		771.661	9	85.740	.928 .500
		127.846	1	127.846	1.383 .240
		14.170	1	14.170	.153 .695
		757.491	8	94.686	1.025 .416
Within groups		57292.713	620	92.408	
Total		58064.375	629		

According to the result displayed in table 4.3, a one way-ANOVA was used to analyze the data on departments of study and underachievement, the Mean Squares of 85.740, 127.846, 14.170 and 94.686 for between groups and 92.408 for within groups. The result is that there is no significant relationship between departments of study and underachievement. Furthermore, since the F values (.928, 1.383 and .153 for between groups and 1.025 for within groups) is lesser than the critical t (1.96) at df of 9, 1, 1, and 8 for between groups and 620 for within groups at .416 level of significance for a one-tailed test, the null hypothesis is accepted. The result is that there is no significant relationship between departments of study and underachievement among Undergraduate Engineering Students in South-South Federal Universities.

Summary of Findings

The following are the findings of this study:

- Gender does not have a significant relationship with underachievement among Undergraduate Engineering students in South-South Federal Universities.
- Federal institutions of study have a significant relationship with underachievement among Undergraduate Engineering students in South-South Federal Universities.
- Departments of study do not have a significant relationship with underachievement among Undergraduate Engineering students in South-South Federal Universities.

Discussion of Findings

Gender and Underachievement

From the result obtained in the research questions and the corresponding null hypothesis, it was revealed that stress and gender does not have a significant relationship with underachievement as shown by undergraduate engineering students in south-south federal universities. From this result, it is deduced that students who reported a high level of stress do not report to exhibit underachievement and the gender difference in the course of study does not matter. This result is surprising because the researcher has always thought there is gender difference in underachievement level when it comes to faculty of engineering and that engineering students are faced with huge course work load that poses stress on them. This study has a two face view with compared study. Findings on stress are in contrast with the study of Tamara and Jelle (2013) while the findings of gender are in agreement with the compared study. Tamara and Jelle (2013) investigated the relationship between emotional wellbeing and underachievement in young adolescents: a neurocognitive perspective. The variables under investigation were emotional problems as a result of stress and the role of neurocognitive functioning in underachievement in English studies and mathematics. Demographic variables like age, gender, and educational qualification were considered. The descriptive survey research design was used in the study. A sample size of 2215 pupils who enrolled in 10 regular secondary schools and it consisted of 45%

females and 55% males. The Emotional Wellbeing Scale (EWS), academic report cards of underachievers and self-reports given on neurocognitive functioning. These questionnaires were answered online. Its items were constructed on a three point likert scale of 1 point which means not correct, 2 points partially correct and 3 points correct. The observed finding indicates that emotional wellbeing plays a very essential role in underachievement during the first year of secondary education, while the neurocognitive functioning does not. On the other hand, the demographic variables of age, gender and educational qualification does not significantly relate to underachievement and emotional wellbeing. The present study differs from the former, in the areas of type of respondents, research design, and the variables under study. The present study used undergraduate students in tertiary institutions while the former study used pupils who just transited from primary school to secondary school. The present study used the correlation and ex-*post facto* research designs while the former study used the descriptive survey research design. Gender is the only similar variable among all the other variables under study.

Limitations of the Study

Despite the success of the present study, some factors limited the generalization of this result based on the federal institutions of study. These factors include:

- Network was a big issue, but it was managed with the change of sim card.
- Accommodation was another issue. The researcher had to sleep in the classroom
- Bad climatic conditions. The study was carried out during the raining season.

Suggestions for further study

The researcher suggests that other states in Nigeria that were not covered by this study should be carried out by other scholars or researchers. Also, other psychological and sociological factors alongside the use of therapy can be used to test underachievement. Lastly a larger population and sample size should be carried out in this work.

Contributions to Knowledge

Conclusively, the result of the analyses has contributed to knowledge by establishing the direct predictive power of federal institutions of study which significantly influence underachievement, while gender and departments of study do not relate to underachievement.

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